The Current Research on the Epidemiology of Head and Neck Cancer in Africa: Practice Implications for African Speech Therapists.

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Declaration

I hereby declare that this thesis is my own unaided work and that the assistance obtained has been only in the form of professional guidance and supervision. It is submitted for the degree Master of Arts in Speech Pathology to the Faculty of Humanities, Department of Speech Pathology and Audiology at the University of Witwatersrand, Johannesburg. It has not been previously submitted for any other degree or examination to any other university

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On this day 28 of February, 2021

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This research is dedicated to all those who have suffered from head and neck cancer (HNC) in Africa. This research and love for treating people with HNC came from the many clinical practical's done at Chris Hani Baragwaneth Hospital. The desire of these people to fight, and to push through the medical treatment and therapy received is an inspiration. For those that do not have access to healthcare, I can only hope this research contributes in some way to helping the healthcare system in Africa. To Gail, who continues to push through her cancer battle.

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Abstract

Background: Over the last decade, limited research has been done on the determinants and distribution of head and neck cancer (HNC) within an African context, or the role of the speech therapist (ST) in treating this population. The current study intended to fill this caveat, and highlight potential implications for STs from the epidemiological information.

Method: The main aim of the current study was to document the current epidemiological HNC research in Africa via a systematic review. The inclusion terminology pertained to the types; stages; signs and symptoms, and risk factors/comorbidities of people with HNC living in Africa, the treatment protocols being implemented, as well as demographic data. The following databases were consulted: PubMed, EBSCO, Scopus, Web of Science, Sabinet, and Google Scholar, as well as grey literature sources. Information was analysed with descriptive statistics, a narrative synthesis, and thematic analysis.

Results: Sixty-six articles met the inclusion criteria, and were used for analyses. The most prevalent cancer type was oral cancer/oropharyngeal cancer (OC/OPC) (74%). HNC's were diagnosed in the late stage, and signs and symptoms were severe in nature. Substance abuse remains the highest reported risk factor, and there has been a rise in infectious diseases as a risk factor. Surgical resection remains the primary medical intervention in Africa, whilst chemotherapy and radiation services remain limited.

Conclusion: HNC in Africa is a growing problem. Risk factors vary across regions and are increasing, particularly infectious diseases. The lack of resources and education has led to severe and advanced stage disease, with limited medical intervention.

Implications: There are implications for the role of the ST in treating HNC in Africa, in the type and intensity of treatment provided; and the role in community education programmes. The review highlighted the need for STs where HNC is increasing, thereby informing policy makers and governments of the need for STs, and education programmes across Africa.

Keywords: Africa; systematic review; epidemiology; head and neck cancer; speech therapy.

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List of Abbreviations

ACI	African Cancer Institute
ADR	African Digital Repository
ASHA	American Speech and Hearing Association
CRD	Centre for Reviews and Dissemination
DoH	Department of Health
ENT	Ear nose throat
HCP	Healthcare provider
HNC	Head and neck cancer
HNSCC	Head and neck squamous cell carcinoma
HPC	Hypopharyngeal cancer
HPV	Human papillomavirus
HPSCC	Hypopharyngeal squamous cell carcinoma
LC	Laryngeal cancer
LSCC	Laryngeal squamous cell carcinoma
LMIC	Low-to-middle income country
MDT	Multidisciplinary team
MMAT	Mixed Methods Appraisal Tool
NPC	Nasopharyngeal carcinoma
OC	Oral cancer
OPC	Oropharyngeal cancer
OPSCC	Oro-pharyngeal squamous cell carcinoma
OSCC	Oral squamous cell carcinoma

PC	Pharyngeal cancer
PRISMA	Preferred Reporting Items for Systematic Reviews and MetaAnalyses
QOL	Quality of life
SATD	South African Theses and Dissertations
SCC	Squamous cell carcinoma
SSA	Sub-Saharan Africa
ST	Speech therapist
UADTC	Upper-aerodigestive tract cancer
UICC	African Cancer Organisation
UNC	Undifferentiated nasopharyngeal carcinoma

Glossary of Terminology

AIDS-defining illness	An illness that is caused by HIV infection
Dysphagia	A difficulty swallowing and/or chewing
Epistaxis	Nose bleeds
GLOBOCAN	The Global Cancer Observatory that documents all cancer around the world
Halitosis	“bad” smelling breath
HIV-related cancer	Cancer that is caused by HIV infection
Latent theme	An existing theme that is not immediately obvious, explicit or occurring frequently, but which has significant implication
Leukoplakia	White patches on the tongue
Stridor	Audible breathing, and is a sign/symptom of some HNC’s
Neurological syndrome	Viruses that affect the brain and cause both central and peripheral neurological symptoms
Neffa	This is a form of smokeless tobacco that can be chewed or smoked, found commonly in Northern Africa
Odynophagia	Pain whilst swallowing
Otologic symptoms	Symptoms that are ear-related
Semantic theme	A theme that is explicit, obvious and revealed at surface-level
Shisha	This is a type of water pipe that contains tobacco, and originates from the Middle East
Tinnitus	A ringing in the ears. This can be low or high-pitched, intermittent or continuous
Toombak	This is a form of smokeless tobacco that can be chewed or smoked, found commonly in Sudan.
Trismus	Lockjaw

1. Introduction

This section will introduce the study, as well as highlight the rationale and significance for the current research. Current literature, key concepts and definitions will be discussed, highlighting the gaps in the current research.

Cancer is the second leading cause of death globally, and in 2018, accounted for more than 9.6 million deaths (World Health Organisation (WHO), 2018a). The cancer burden is on the rise globally, and this has an impact on the financial, physical and emotional wellbeing of individuals, communities, and health systems (Plummer et al., 2016). In countries that have established health systems, survival rates of various cancer types are improving. This is as a result of accessible and quality detection, and treatment (WHO, 2018a). The countries that do not have a strong health system tend to be in countries that are low to middle income, and cancer detection and management is often untimely, and inaccessible (WHO, 2018a).

Africa is the second largest continent in the world, and the second most populous. It has approximately 1.3 billion people, which accounts for 16% of the world's population (United Nations, Department of Economic and Social Affairs, Population Division, 2019). Although Africa has an abundance of natural resources, it continues to be the poorest and least-developed continent in the world (Azevedo, 2017). In a study conducted in 2018, it was found that Africa accounts for 7.3% of cancer-related deaths globally (Bray et al., 2018). Currently, there are limited to no resources available for cancer research in Africa, and the data that is available is unreliable and outdated (Ngoma, & Ngoma, 2019). The reason for this is that there are few researchers; missing patient files; and studies tend to be done on patients accessing tertiary hospitals only. Whilst the increasing burden of cancer in Africa is known, little is known to what extent, and what the specific distribution and determinants are. This includes head and neck cancer (HNC) in Africa.

This research investigated the current data on the epidemiology of HNC in Africa. Epidemiology is defined as the study and analysis of the distribution and determinants of health or diseases within a defined population. Distribution is concerned with the analysis of who, what and where of a defined population (Porta, 2014). Epidemiology in this research focused on documenting the population of people with HNC in Africa, referring specifically to the types of HNC, stages, signs and symptoms experienced, and risk factors. Thereafter, the people with HNC were grouped according to age, gender, socio-economic status (SES), and race. The current comparative study focused around identifying various geographical locations in Africa, as well as compared the demographic data to the

type of HNC, stage, symptoms, and risk factors. This provided important information pertaining to the current epidemiological data available on HNC in Africa. This in turn had implications on the practice and policy making for STs working in Africa. Prior to the current study, there were no systematic reviews on HNC in Africa, specifically identifying the implications for practicing STs.

The current study sought to analyse specifically the distribution, determinants, demographics, and treatment protocols involved with people with HNC in Africa. Analyses of these was done using a systematic review of the current literature over the past 10 years. It was pertinent for the researcher to initially document what the current research is and what gaps there are in the current literature. The types of data, and methodologies used were critically appraised, and the results from each study were further analysed to find associations between and within groups of the type of HNC's across studies done in Africa with the aim to provide pertinent information for all African healthcare workers in HNC, and specifically STs, in order to guide and direct treatment and therapy.

1.1. Research Rationale

As cancer is a growing burden in Africa, the need for cancer research in Africa is irrefutable and forms the basis of why the current study was conducted. Cancer research in Africa is pertinent in order to investigate and establish the reasons for the increasing incidence, and potential breakdowns in health systems. This will inform what decisions are made about cancer care in Africa; and what practices need to be implemented. The current study sought to collate and analyse the current research done on the epidemiology of HNC in Africa. The reason for this was to identify any gaps in literature, and to establish what the primary focus of research has been in the last decade. Furthermore, by understanding the current epidemiology, one can understand the severity of HNC in Africa pertaining to stage, type, signs and symptoms related; the people most at risk and their associated risk factors; and to identify what treatment is being done for these people, and who is involved in treating people with HNC.

These factors were critically appraised, as there is a variety of scientific information in Africa that may or may not be trustworthy. This critical appraisal will in turn, assist policy-makers, governments within Africa, researcher's, and healthcare professionals (HCPs) working with HNC to efficiently integrate existing information by providing data for rationale decision-making around cancer prevention and care. It will also assist in evaluating strategies for the control, management and prevention of HNC. The first step of decision-making is to understand the epidemiology of HNC within Africa, which was the primary aim of the current study. For purposes of the current study, the researcher collated and

described the epidemiology based on current literature in Africa, and sought to identify the implications for practicing STs.

A systematic review is useful in that it can establish if scientific findings are consistent, and can be generalised across settings, and populations. In the case of the current study, the researcher sought to specifically find commonalities or gaps pertaining to people with HNC in Africa.

2. Literature review

This section explains the concepts and highlight the current research outside of Africa on the following:

- Types of HNC
- Stages of HNC
- Signs and Symptoms
- Identified risk factors
- Relationship between HIV and AIDS, and cancer are explored, as well as
- The demographic information is described in relation to HNC.
- Types of treatment people with HNC receive, and complications that may arise from such treatment.
- The role of the multidisciplinary team (MDT) in HNC, with specific reference to the role of STs.
- Lastly, the African health context is described, with specific reference to access to healthcare, and levels of service delivery.

These areas were important to establish as they provided an overview of the current research pertaining to the aims. It also highlights the key concepts and terminology used in articles when discussing epidemiology in HNC, and what is already established in the area of HNC globally. Highlighting the research done outside of Africa provides a basis by which the epidemiological data within Africa can be compared to.

2.1 Types of Head and Neck Cancer

In order to determine the epidemiological data on HNC, what HNC is needs to be explained. HNC is a vast group of cancers that originate from any area of the head and neck. The predominant anatomical sites for HNC originates in the mouth, nose, throat, larynx, sinuses, or salivary glands and includes the region's most applicable to STs scope of practice (Wenig & Cohen, 2009). Figure 1 shows the anatomical regions of the upper aerodigestive tract (UADT). Table 1 expands on the different types of HNC according to their anatomical structure.

Figure 1

Head and Neck Cancer Regions of the Upper Aerodigestive Tract (Winslow, 2012)

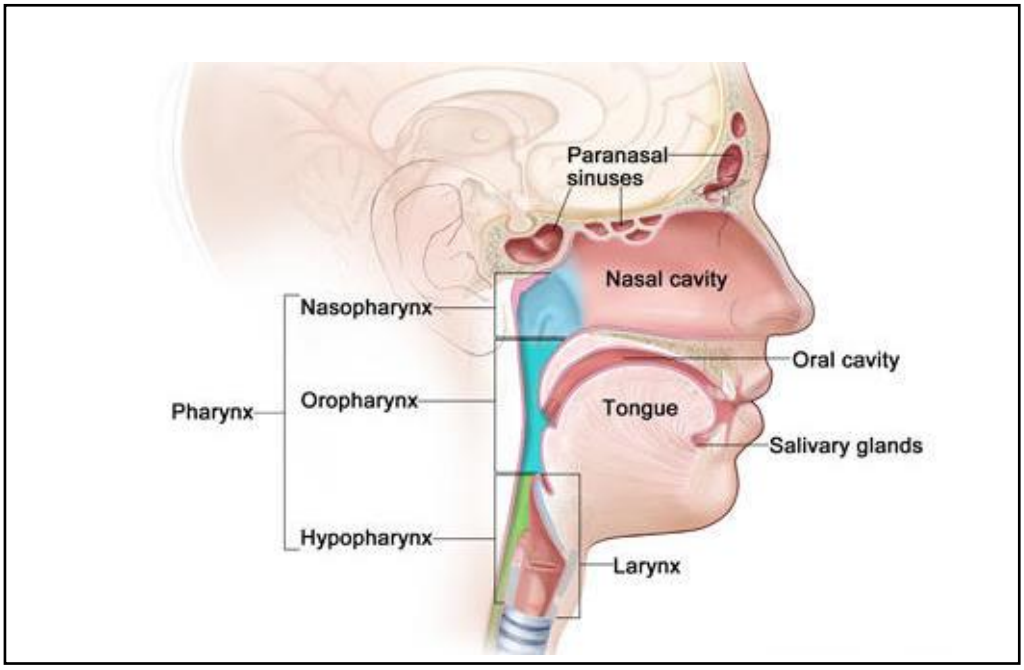


Table 1

Types of Head and Neck Cancers According to the Sub-sites (Wenig & Cohen, 2009)

Oral Cancer (OC)	Pharyngeal Cancer (PC)	Laryngeal Cancer (LC)
The mucosal lining of the: • Lip • Tongue • Cheeks • Hard palate • Floor of the mouth • Alveolar ridge	Oropharyngeal Cancer (OPC) includes the mucosal lining of: tongue base, palatine tonsils, soft palate, and oropharyngeal mucosa and constrictor muscles from the level of the palate to the hyoid bone.	Supraglottis cancer includes the mucosal lining of: the epiglottis, aryepiglottic folds, false vocal folds, and the deep pre-epiglottic and paraglottic space.
	Nasopharyngeal carcinoma (NPC) includes: squamous mucosa (NPSCC), lymphoid tissue (adenoids), the levator palatini muscle, and the torus tubarius (the projecting posterior lip of the pharyngeal opening of the Eustachian tube).	Glottis cancer includes the squamous mucosa of the: vocal cords and thyroid cartilage.

• Gingiva (gums)	Hypopharyngeal cancer (HPC) includes the squamous mucosa of: the pyriform sinuses, the pharyngeal walls and inferior and middle constrictors, and the post cricoid region.	Subglottis cancer is the mucosal lining of: the space between the glottis and trachea, and includes the cricoid cartilage.

As can be seen in Table 1, the distribution of HNC varies across anatomical regions. The most prevalent anatomical regions of the head and neck that are affected by cancer is the UADT, which includes the oral, pharyngeal and laryngeal structures, but is also inclusive of the upper oesophageal region, that being up to the level of the cervical oesophagus. The primary anatomical structures include the oral, pharyngeal and laryngeal cavities. Each anatomical structure has sub-sites within the cavity that can be affected in isolation, or if the HNC has spread to multiple sub-sites.

An awareness of the anatomical regions and sub-sites have implications on the types of symptoms that a ST should expect. An example is if the tongue is affected in the oral cavity, the oral phase, including food manipulation and propulsion would be the focus in speech therapy. It would also have an effect on specific phonemes that the person is attempting to articulate. It is therefore important to set the

The types of HNC are also classified according to histological types. Cancer histology pertains to the structure of the cancer cells, and where they originate. The five main types include carcinomas, sarcomas, lymphomas, melanoma and leukaemia (Winslow, 2012). Carcinomas originate from the skin, lungs, pancreas and other glands and organs. HNCs are most commonly carcinomas, specifically squamous cell carcinomas (SCCs), which account for 90% of all HNCs (Bray et al., 2019).

In a study done in the United States of America (USA), 44% of HNC are oral cancers (OC); 25% pharyngeal cancer (PC); and 31% laryngeal cancer (LC) (Ridge et al., 2016). The latest data, taken from GLOBOCAN (2012), indicated that lip and oral cavity cancer is higher than laryngeal and pharyngeal cancer. Oesophageal cancer, which can be defined as HNC if up to the cervical point, was the most common site in Africa, particularly in males (Adeola, 2018). The statistics from GLOBOCAN (2012), are unreliable, as these were hospital-based statistics, and not population-based statistics. Furthermore, the statistics do not differentiate between the histology's of HNC (for example, HNSCC versus HN lymphomas).

Like with any type of cancer, HNC is divided into various stages based on the size of the tumour and expected prognosis (Wesley Hodge et al., 2010). There is limited data on the typical staging of HNC in Africa. HNC is divided into five stages. Table 2 explains each stage and the spread of the tumour. The larger, and more the tumour has spread, the worse the prognosis (Deschler et al., 2014). This has implications on practitioners, including SLT's, in the type and intensity of therapy or treatment provided.

Table 2

Staging of HNC (Deschler et al., 2014)

Stage	Description of Tumour
0	- The tumour is only growing in the part of the head and neck where it started. - No cancer cells are present in deeper layers of tissue, nearby structures, lymph nodes or distant sites (carcinoma in situ).
I	- The primary tumour is 2 cm across or smaller - No cancer cells are present in nearby structures, lymph nodes or distant sites.
II	- The tumour measures 2-4 cm across - No cancer cells are present in nearby structures, lymph nodes or distant sites.
III	- Tumour is larger than 4 cm across, and no cancer cells are present in nearby structures, lymph nodes or distant sites. Or - Tumour is any size but no spreading into nearby structures or distant sites. However, cancer cells are present in one lymph node, which is located on the same side of the head or neck as the primary tumour and is smaller than 3 cm across.
IV	**Stage IVA** - Tumour is any size and is growing into nearby structures but has not spread to distant sites. - Cancer cells may not be present in the lymph nodes, or they may have spread to one lymph node, which is located on the same side of the head or neck as the primary tumour and is smaller than 3 cm across. **Stage IVB.** One of the following applies:

- The tumour has invaded deeper areas and/or tissues. It may or may not have spread to lymph nodes but not towards distant sites.
- Tumour is any size and may or may not have grown into other structures. It has spread to one or more lymph nodes larger than 6 cm across but has not spread to distant sites.

Stage IVC: Cancer cells have spread to distant sites. The head and neck cancer tumour is any size and may or may not have spread to the lymph nodes.

There is no spreading of the tumour from stages 0 to III. The size of the tumour is what differentiates the stages, as stage I, the tumour is still small at 2 cm. Stage III, the tumour must either be larger than 4cm, or it can be any size, but it has not spread to any other anatomical regions. The presence of cancerous cervical lymph nodes begins in stage III, and progresses into stage IV. Cancerous lymph nodes indicate a worse prognosis for people with HNC (Deschler et al., 2014). It is important to note that HNC is a fast spreading type of cancer (Westra & Lewis, 2017). If caught early, HNC is highly curable, however due to its aggressive nature, the mortality rates worldwide continue to be high (Westra & Lewis, 2017). This is important to note when collating the existing epidemiological data in Africa, and comparing this to global statistics.

2.2 Signs, Symptoms, and Causes of HNC

2.2.1. Signs, Symptoms and Associated Risk Factors Outside of Africa

Signs are objective, and can be identified by another person, whereas symptoms are subjective and relate to what the person is experiencing (Shaw & Beasley, 2016). Table 3 indicates the various types of cancer, the associated risk factors, and the signs and symptoms of each.

Table 3

Signs, Symptoms, and Causes of HNC (based on studies internationally) (Bray et al., 2013; Lambert, Sauvaget, de Carmargo Cancela, & Sankaranarayanay, 2011; Shaw & Beasley, 2016)

Type	Signs and symptoms	Causes (as per international studies in India, United Kingdom, South America, USA and Southeast Asia)
OC	Signs	• Tobacco use (floor of mouth (FOM) cancer) • Alcohol

	• A growth or lump inside the oral cavity • A white or reddish path around the oral cavity • Loose teeth • Jaw swelling • Constant bad breath (halitosis) • Difficulty chewing and manipulating food (dysphagia) Symptoms • Pain when chewing or swallowing • Ear or jaw pain	• Human Papillomavirus (HPV) • Smoking marijuana • Drinking Mate (drink from South America) • Chewing khat leaves or betal quid • Poor oral hygiene
PC	Signs • A lump or swelling in the neck • Nasal congestion or nosebleeds Symptoms • Changes in hearing • Tinnitus (ringing in the ears) • Persistent headaches	• Tobacco use • Alcohol consumption (particularly related to no. of years) • HPV (OPSCC) • Epstein-Barr virus (NPC) • Plummer-Vison Syndrome (HPSCC)
LC	Signs • Abnormal lump in the neck area • Persistent cough • Vocal hoarseness • Halitosis • Noisy breathing Symptoms • Difficulty breathing • Pain when swallowing (odynophagia) • Dysphagia • Pain in the neck region • Persistent ear pain • Halitosis	• High tobacco use in conjunction with alcohol consumption • Alcohol consumption (particularly related to amount of alcohol) • Work exposure (gases or particles of material when doing metal, ceramic, or construction work) • Gastro-oesophageal reflux • HPV

Symptoms and signs related to oral, pharyngeal and laryngeal cancer have been commented on in studies outside of Africa, and it is currently not known the extent of research that has been done on reporting on the symptomatology associated with people in Africa. Varying signs or symptoms experienced can indicate the severity of the disease. For example, the presence of a mildly hoarse voice is less severe and likely someone with early stage cancer, versus someone with total aphonia

(loss of voice). It is important for clinicians, including SLT's to understand the symptomatology when treating people with HNC, and to target therapy accordingly, whilst considering potential limitations of practice when people are experiencing severe symptoms.

In developed countries, including the United Kingdom (UK) and USA, main symptoms of HNC include redness, swelling, vocal hoarseness, mild dysphagia and communication deficits (Lambert et al., 2011). Symptoms in low to middle income countries (LMICs) compared to high income countries are the same, however the stage of diagnoses is different, hence the signs and symptoms at the time of diagnoses tend to be more severe. Therefore, in LMICs severe symptoms include dysphagia and communication deficits, loose teeth, difficulty breathing and/or hearing, and severe swelling and pain (Bray et al., 2013). The severity of symptoms is also worse in Africa, due to multiple comorbidities that arise from the burden of disease profile (Bray et al., 2013). The burden of disease in Africa is comprised of a cluster of colliding epidemics that being, maternal, new-born and child health; infectious diseases (including HIV/AIDS, malaria, and tuberculosis [TB]; non-communicable diseases; and violence and injury) (de-Graft Aikins et al., 2010). As a result, the diseases and symptoms experienced may be more severe. One of the most prevalent diseases Africans face is HIV and AIDS (D'Souza et al., 2015). Opportunistic infections, such as cancer, may develop when people have AIDS (Bohlius et al., 2016). The extent and variation of the symptomatology across Africa needs to be analysed, as some regions may present with particular symptomatology over others. This allows practicing HCP's, including SLT's to have an awareness of the area in which they are working, and by understanding and creating a clinical pathway based on the symptomatology and severity of these.

2.2.2. HIV, AIDS and Cancer

HIV stands for human immunodeficiency virus, which can be contracted from the exchange of bodily fluids (Bohlius et al., 2016). AIDS (acquired immuno-deficiency syndrome) differs in that it is a condition that may develop from having HIV thereby causing a weak immune-system. Whilst treatment and preventative measures for HIV and AIDS has been a focus for the national governments in Africa and global institutions (O'Morhason-Bello, 2013), it is unclear how much awareness has been raised about the impact and relationship between cancer and HIV and AIDS, and the implications of those already living with AIDS-defining conditions, such as certain cancers (O'Morhason-Bello, 2013). With approximately 25.7 million people in Africa having HIV, it is pertinent to consider the long-term effects and secondary conditions that may result (WHO, 2018a).

HIV-related cancer has been studied globally (Clifford et al., 2005; Dal Maso et al., 2009), however limited studies have been done on the African population and context. People with HIV have an

increased risk of developing non-Hodgkin lymphoma, cervical cancer, and Kaposi's sarcoma. If one of these three conditions is developing, it could mean that a person will have already developed AIDS (Silverberg et al., 2009). This is known as HIV-related cancer (Silverberg et al., 2009). HNSCC is the third most common head and neck malignancy for patients with HIV, after Kaposi's sarcoma and non-Hodgkin's lymphoma respectively, even though it is not an AIDS-defining illness (D'Souza et al., 2015).

Secondary to this, recent research has indicated that HIV-infected people have elevated rates of several cancers, including tobacco/alcohol-related cancers due to a higher prevalence of HIV-induced immunodeficiency, inflammation, and tobacco use (D'Souza et al., 2015). Studies have found that tobacco use is higher in HIV-infected individuals in comparison to uninfected individuals (Tesoriero et al., 2008, as cited in D'Souza et al., 2015). This adds a secondary risk of contracting HNC for the African population. Collating the current evidence of HIV-related HNC in Africa needs to be done in order to establish if it is, in fact, an established comorbidity, and what the association and presentation is of these two diseases.

2.2.3. Lifestyle, Work, and Other Viruses

Risk factors associated with HNC vary between countries or regions, as different health-related habits are present between different countries. As a result, Africa's health-related habits and HNC risk factors must be assessed independently across population groups and geographical regions. Currently there is a paucity of information for the African population, and across African regions, and the current research needs to be collated and highlighted.

A known risk factor associated with oral squamous cell carcinoma (OSCC) includes tobacco and alcohol (WHO, 2016). Oral and oropharyngeal SCCs are also linked to human papillomavirus (HPV), poor oral hygiene, and regular consumption of khat leaves, smoking marijuana, and drinking mate. These are risk factors from studies done in various countries, including India, South-East Asia, and South America (Lambert et al., 2011; Wesley Hodge et al., 2010). In Africa, there are limited studies reviewing the use of these substances, rate of infectious disease and lifestyle habits, and the statistics that are available, are unreliable (Lambert et al., 2011).

The risk of HNC is also greater in LMICs as there is increased disease burden, and higher carcinogenic work exposure (Lambert et al., 2011). In high income countries, namely USA and the UK, the largest risk factors include smoking, drinking and HPV (Shaw & Beasley, 2016). The incidence rates and anatomic distribution of HNC in developed countries is particularly widespread in the geographical variation, due to demographic differences in the habits of alcohol and tobacco use. The risk of HNC in

the UK and USA has declined in recent years, due to an improved awareness of tobacco risks, and thus less tobacco use (Bray et al., 2013; Shaw & Beasley, 2016). It is unclear what the specific risk factors for HNC in Africa are, which regions in Africa tend to be most at risk, and the associated lifestyle habits of people with HNC in Africa.

Smoking or chewing of tobacco, Toombak (leaf), and Neffa (leaf) has been found to be risk factors within Africa, and particularly countries with a Middle Eastern influence. That being, countries in Northern Africa (Quadri et al., 2019). These have been found to be associated with developing OC (Quadri, et al., 2019). It is unclear what the risk is for obtaining other types of HNC.

HPV is an emerging leading cause of OSCC and OPSCC, according to international studies, and it is estimated that over half of HNC's will be related to HPV by 2030 (Chaturvedi et al, 2011, as cited in Pytynia et al., 2014). HPV is predominantly a sexually transmitted disease (STD), and it is the most prevalent STD in the USA. Although incidence of HPV-related OPC has been well-documented in USA, Europe and Australia, there is minimal to non-existent research in South America, Africa and Asia (Pytynia et al.,2014).

PC sub sites are illustrated in Table 3, and include oropharyngeal cancer (OPC), nasopharyngeal cancer (NPC), and hypopharyngeal cancer (HPC). The risk of developing PC is higher than that of developing LC when there is increased alcohol consumption, particularly if the number of years is high when related to a person's consumption (Thomson, 2014). In studies conducted internationally, there was found to be an association with exposure to Epstein-Barr virus and developing NPC was found (Prabhu & Wilson, 2016). Epstein-Barr virus is a type of herpes virus (Prabhu & Wilson, 2016). Another association is Plummer-Vison Syndrome, which is a rare disease in which people have chronic iron deficiency. It may cause growths in the oesophagus, thereby increasing the chance of obtaining hypo-pharyngeal cancer (Wenig & Cohen, 2009). Some studies have suggested a risk of obtaining OSCC with a vegetable or fruit- deficient diet (Wenig & Cohen 2009). Specific associations of these diseases, and other lifestyle habits causing PC in African populations have not been found.

As noted in Table 3, LC includes the supraglottis, glottis, and subglottis. Increased alcohol consumption increases the risk of developing laryngeal squamous cell carcinoma (LSCC). This is because there is an association between alcohol-metabolizing enzymes and developing UADTC (Bray et al., 2018). In addition, high tobacco use, and a combination of alcohol consumption and smoking is a risk factor for developing LSCC. Although people with HPV have a higher risk of obtaining OPC, there is also a risk for

obtaining LSCC (Bray et al., 2018). Currently, the precise risk factors associated with obtaining LSCC in Africa are unknown.

Gathering and analysing the risk factors associated with HNC in Africa is pertinent in order to establish clear pathways for early detection in people with the established risk factor, as well as for SLT's to assist in prevention, promotion, as well as understanding the potential severity of disease, if comorbidities are present.

2.3 Demographic Information

2.3.1. Prevalence of HNC

The number of people with HNC is increasing globally due to increased substance abuse, infectious diseases, lifestyle and diet trends (Plammer et al., 2016). As discussed, 70% of cancer-related deaths ate attributed to LMICs (Plummer et al., 2016). According to Knaul et al. (2013), LMICs account for 80% of the cancer burden globally, whilst only receiving 5% of the global financial resources for cancer care. The burden and severity of disease in LMICs related to care is severely disproportionate.

Globally, there are more than 650,000 cases of HNC, and it accounts for 330,000 deaths annually. HNSCC is the sixth leading cancer in the world in terms of incidence (Bray et al., 2018). Worldwide, there are close to three quarters of a million people who previously had OC and are alive at five years after diagnosis (Warnakulasuriya, 2009). The proportion alive at five years is lower in LMICs compared to earlier years. The incidence of OC is the highest of HNC's, with over 300 000 new cases annually around the world. Of all countries around the world, two thirds of the cases seen occur in developing countries, with an approximately 5-year survival rate (Akhtar & Khan, 2018). The prevalence of HNC over a 5-year period across Africa is unknown.

In the USA, HNC accounts for 3% of cancer malignancies, and 4% in Europe. That is, 53 000 and 250 000 people respectively. In USA, 10 800 people die annually from HNC, and a further 63 500 people in Europe (Bray et al.,2018).

According to Adeola et al. (2018), HNC is the third most prevalent cancer in Africa (accounting for 7.3% of all cancers), and UADTC ranks as the second, accounting for 11.7% of cancers. These statistics are based on GLOBOCAN (2012). They may be unreliable due to under-reporting of cases in Africa, and statistics are not separated according to the histological types (e.g. HNSCC versus

Rhabdomyosarcoma) (Adeaola et al., 2018). Furthermore, whilst understanding that HNC is rising in Africa, the specific reasons for this needs to be established. This study sought to collate the information on epidemiology that is known, and information that is unknown.

2.3.2. Gender Differences in HNC

Globally, there are more males than females who present with HNC. It is estimated that 50.4% of the world's population is male, whereas 49.6% are female at birth (WHO. 2019). Men tend to have a higher risk of dying than women globally due to both external causes (war, violence, and accidents), as well as natural death causes (WHO, 2019). There is a 50:50 ratio of males to females currently across Africa (Ritchie & Roser, 2019). Research on gender differences in obtaining HNC in Africa is unclear, specifically in comparing these to the types of HNC across Africa, and exploring the possible reasons for potential similarities or differences within the types of HNC, as well as between population groups in Africa. The study sought to identify gender differences across various regions in Africa, based on the current literature. By establishing this, clinicians across regions in Africa can aim to target prevention and promotion programmes, as well as early detection screenings.

2.3.3. Age as an Influence on HNC

The estimated life expectancy is 71.5 years globally (The United Nations, Department of Economic and Social Affairs, Population Division, 2017). The life expectancy of Africa is lower than the global average, and is 63 years (The World Bank, 2019). The incidence of HNC globally increases with age, and particularly after 50 years, and in the USA, is diagnosed between 50 to 70 years (Vigneswaran & Williams, 2014). Therefore, in an ageing population, disease is high. The younger age groups tend to be females, and/or have HPV-related HNC. In recent years, younger people have been at a high risk of developing HNSCC due to the increase in HPV. Globally, the most common age group for people with HPV-related head and neck cancer is from 30-40 years (Ridge et al., 2016). Research pertaining to age differences within the African context is unclear currently. This is specifically when comparing the types of HNC to the various ages. The current study sought to identify the various types of HNC amongst various ages in Africa, and highlighted associations to other demographic information, and the type, and stage of HNC.

2.3.4 Socio-economic Status and Lifestyle Practices of People with HNC

SES can be determined by evaluating a combination of the income, education and occupation of a group of individuals (STATSSA, 2012). These are relative to the country or region. Africa predominantly has LMICs, with a range of wealth within each country. Definitions of SES within the current study

sought to include income, education and occupations and how these are defined within each article/setting (Perkins, 2016).

A lower SES has been associated with a higher prevalence of cancer globally (Clegg et al., 2009). A study in USA further conceded this, and also found that later stage diagnoses are associated with a lower SES (Clegg et al.,2009). The current study identified the varying SES's within the African context, and sought to explore if people in Africa are being diagnosed at a later stage and how this correlates with their SES.

A study done in 2017 reviewed the association of lower SES to risk factors associated with obtaining cancer in women in LMICs such as South Africa, Mexico, Russia, India and China (Akinyemiju, Ogunsina, Okwali, Sakhuja, & Braithwaite, 2017). Results revealed that women with a lower SES are more likely to have poor nutrition, consume more alcohol; and smoke more. These factors put them at a greater risk for obtaining cancer. This may be the case across Africa, with most countries being LMICs. The systematic review sought to extrapolate the SES of people with HNC in Africa, and differences between regions in Africa.

2.3.5 Race and Cultural Practices of People with HNC

Globally, the incidence of HNC in various ethnic and race groups relates strongly to social and cultural practices (Warnakulasiriya, 2009). These practices vary from country to country, but are related to smoke inhalation, and tobacco, marijuana, and alcohol use (Warnakulasiriya, 2009). The incidence of HNC in Asian and Indian populations is higher due to the high prevalence of risk factors (including betel nut, or tobacco chewing). Over 200 000 people are diagnosed with HNC in India annually, versus that of the USA, with only 30 000 cases (Francis, 2018).

Another example of the incidence of HNC relating to cultural practices includes people living in the regions of southern China, Northern Africa, and the far Northern Hemisphere, who eat large quantities of salted meat and fish. These population groups have a higher incidence of NPC, as this is associated with Epstein-Barr virus. This virus has a higher contraction rate in people with a high salt diet. Cooking salt-cured meat and fish releases a chemical called nitrosamine, which increases the risk of developing Epstein-Barr virus (Ridge et al., 2016; Shah & Johnson, 2018). Therefore, the race of people that carry out these practices will be most at risk for developing the Epstein-Barr virus, and also NPC.

The extent of information pertaining to race differences among people with HNC in Africa remains indistinct, as well as the differences between the types of HNC. The current study identified the current research on race differences for obtaining HNC, and highlighted if a particular race is more at risk. The current study sought to identify the risk factors around various geographical locations around Africa, which may be useful for future research when exploring potential cultural and ethnic habits and linking them to potential risk factors.

2.4. Treatment Options for HNC

Treatment for all HNC depends on the severity of the disease. As seen in Table 3, the later the stage of the disease, the more combinations of surgery, chemotherapy and radiation are used. In the advanced metastatic stages of the disease, palliative care and radiation therapy is considered to reduce the size of the tumour (Shah & Johnson, 2018).

According to the American Society of Clinical Oncology (ASCO), the recommended treatment approach is to eliminate the HNC, whilst preserving as much of the tissue, nerves and organs in the area in order to preserve function as far as possible (Koyfman et al., 2019). Guidelines for medical treatment advise a combination of treatments, including surgical and chemo-radiation. It is further recommended that the treating oncologist must take into account all the above-mentioned factors prior to deciding on treatment regimens (Koyfman et al., 2019).

Surgical treatment includes the resection of the tumour and surrounding affected areas. It also may include reconstruction, after the tumour has been removed. In the case of people with HNC, surgical free flaps may be done in order to reconstruct the resection portion (McCarty et al., 2019). Free flap surgery is the transplantation of tissue from one part of the body to another. “Free” pertains to the fact that that the tissue is completely separated from its blood supply at the original location (the donor site) and then transferred to another part of the body (recipient site), and the circulation in the tissue is re-established. The flaps may include multiple tissue types in addition to bone, including skin, subcutaneous tissue, fascia, and muscle (McCarty et al., 2019). Various surgical procedures may include removal of one structure or many. A COMMANDO procedure (COMbined MAndibulectomy and Neck Dissection Operation) comprises of a glossectomy, and portions of the mandibular and neck being resected. The removal of any portions of the HN may impose multiple difficulties with eating, drinking and speaking (Kerawala, 2010).

Chemotherapy is a process of using medication systemically to prevent the spread of cancer (Frank & Sessions, 2009). The medication used varies according to a person's age and the type, and severity of cancer. Chemotherapy can lead to the damage of healthy cells, which can cause numerous side effects (Frank & Sessions, 2009).

Radiation therapy is different in that it is aimed at killing the cancer cells, and therefore is targeted at the location of disease (Frank & Sessions, 2009). Rather than administering medication, radiation therapy makes use of high energy particles, or waves that attempt to destroy the cancer cells. Similar to chemotherapy, radiation kills both cancer and healthy cells. Radiation, however, allows for the healthy cells to repair themselves. Radiation therapy can be administered either externally or internally. For HNC, both internal and external radiation measures can be used (Frank & Sessions, 2009). Chemoradiation is the combination of radiation and chemotherapy, which can either be sequential or concurrent (Dalvie, 2019).

The current study sought to identify current research on the treatment protocols for HNC in Africa, and thereby identify how these have potential implications on the role of various MDT members, including STs. Furthermore, the treatment methods will have various complications which need to be considered when providing therapy to people with HNC.

2.5 The Role of the Multidisciplinary Team (MDT) in HNC

2.5.1. Multidisciplinary team and patient-centred models

There are several MDT members when working with people with head and neck cancer. Doctors involved in the diagnosis and management of these patients include the oncologist; physician, ear, nose and throat (ENT) specialist; maxillofacial surgeon; oral surgeon; and dentist (Frank & Sessions, 2018). Allied health professions can include specialised nursing, physiotherapy, occupational therapy; dietetics, psychology; social work; audiology and speech therapy (Frank & Sessions, 2018). A MDT is defined as a group of professionals from one or more clinical fields who make decisions on the treatment of an individual (Frank & Sessions, 2018). It is crucial that all members work as a MDT to ensure effective treatment, and higher patient outcomes, and satisfaction. The team involved with HNC must formulate a comprehensive plan to address the persons' physical and psychosocial needs; manage the complications arising from treatments; and prevent or limit long-term complications that may affect the quality of life (QOL) of these individuals (Frank & Sessions, 2018). It is pertinent that the MDT be patient-centred and contextually relevant, so as to make appropriate decisions pertaining

to the care and treatment that people with HNC in Africa receive. By investigating the current literature on the epidemiology of HNC in Africa, one may better understand the implications and context that is relevant to HNC patients in Africa.

If there are a limited number of professionals, one professional may take on the role of others in managing patients. This tends to be the case in Africa, as a result of limited HCPs (Fagan, 2018). This is known as a transdisciplinary approach. This approach is defined as the sharing of roles across disciplinary boundaries, in order to maximise communication and collaboration (King et al., 2009). In this approach, one member of the MDT is designated as the lead interventionist for the person with HNC, and receives training from the other team members as needed (King et al., 2009). A crucial member of any team is the patient and family. The team will account for the environment and organizational context in which the person with an illness is in, as well as accounting for the person's characteristics; medical, mental, and emotional state; their values and personal preferences (Satterfield et al., 2009). Whilst the transdisciplinary approach may be ideal in the context of Africa, it may not materialise in all contexts.

The MDT model has relevance for the role of the ST in the area of HNC (Collins, Flynn, Melville, Richardson, & Eastwood, 2005). The impact on a person's QOL is a reality, necessitating in management by various HCPs (The Oral Cancer Foundation, 2019). Establishing and abiding by a model that is patient-centred has implications for guiding the role of STs with this population group, and providing guidelines for how to include people with HNC in their treatment/therapy. It is first crucial to establish their epidemiology, to better comprehend the environmental, cultural and contextual factors of patients seen. Information and research pertaining to MDT work in Africa for people with HNC needs to be collated and explored, in order to establish what services are present, and what are potential existing roles and guidelines of professionals working with people with HNC.

2.5.2. Role of Speech Therapy in Managing HNC

2.5.2.1. The Distribution of ST Services. It is currently not clear how many STs are practicing in Africa, and what the distribution of STs are across the continent. According to a study done in 2017, ST services in Africa continue to be limited or non-existent (Mulwafu et al., 2017). The study done by Mulwafu et al. (2017) aimed to follow up on the 2009 study (Fagan & Jacobs, 2009) by identifying ST services across Sub-Saharan Africa (SSA). It was found that little change has occurred since 2009 and it was found that there was an average of one ST to every 1.3 million people. This statistic includes the

countries with the most STs at the time, that being South Africa (a reported 1470 STs), Kenya (16 STs), and Cameroon (25 STs). These numbers may have changed since the study was conducted, however, when excluding these numbers, the proportion of STs to the general population is extremely low. Two countries reported having no STs which included Uganda and Malawi, and seven countries only reported having one ST. Those countries included Zambia, Lesotho, Ethiopia, Guinea Conakry, Madagascar, Rwanda and Zimbabwe. Reasons for this is a severe lack of training services for STs, with only four countries offering ST training in SSA, which includes South Africa, Ghana, Kenya and Togo (Mulwafu et al., 2017; & Fagan, 2018). These statistics are outdated, and it is currently unclear what the precise number of STs in each country is, as well as how developed each therapy department is. The study further highlighted that the speech programme has just started in Ghana (Mulwafu et al., 2017). An outdated study done reviewing ST services in East Africa highlighted the specific challenges, explaining that limited resources and funding led to poor establishment of the profession (Jochman, 2006). As the current study sought to identify the potential practice implications, it was pertinent to provide the type of context in which STs in Africa work. This included describing the health resources, challenges, and the scope of practice.

The lack of ST's in Africa is of great concern, as people with acute and chronic conditions associated with HNC can be missed. This includes assessing and managing dysphagia, voice and speech difficulties. If there are no ST's to facilitate with these areas, the person's overall QOL is reduced, as they may not be able to eat, or communicate, or have significant difficulty with these. There may also be limited awareness of people receiving HNC treatment, what the potential effects are before, during, and after treatment in relation to the swallow, speech, or voice.

2.5.2.2. The ST scope of practice in HNC. The Health Professions Council of South Africa (HPCSA, 2020) has provided general policy guidelines for STs at all levels of service delivery. The guidelines make mention of HNC, outlining that STs must provide specialist consultative clinics for people with HNC at tertiary hospitals, however guidelines on how to do this is not specified. The role of STs for people with HNC at each service delivery level is also unspecified. As there may be a paucity of information on the role of STs in Africa in treating people with HNC, the guidelines from the American Speech and Hearing Association (ASHA) are considered. According to ASHA (2019) the role of the ST in HNC includes clinical/educational services (diagnosis, assessment, planning, and treatment of speech, language or swallowing disorders); prevention and advocacy; education and research. Specifically, STs are to:

- Provide preventative information to known high risk groups for HNC and to other healthcare providers (HCPs) working with this population group.
- Educate other HCPs about the needs of people with HNC and education of speech therapy services in managing this group.
- Assess and diagnose speech, language, voice, resonance, cognition and/or feeding impairments associated with HNC. Assessments must be culturally, socially, and linguistically appropriate.
- Refer to other HCPs if indicated.
- Treat the associated impairments, whilst document progress made and determine appropriate discharge criteria.
- Account for the impact of the associated deficits on QOL, and try to minimise these as much as possible.
- Counsel before and after medical management with the person suffering from HNC and his/her family, specifically with regards to the possible communication or swallowing difficulties, and educate around preventing further complications related to the impairments.
- Remain informed with regards to current research on the advances in HNC and helping to expand the knowledge base through research.
- To work as an integral team member in the MDT

The scope of practice for STs in South Africa according to the HPCSA (2017) includes the area of communication and swallowing; clinical services; promotion; prevention and advocacy; education and training; administration; practice settings; and range of clients. When describing the range of clients seen, it is stated that, "Speech- language therapists provide their service to all age groups, individual patients, their families, and groups from diverse linguistic and cultural backgrounds" (DoH, 2017, p. 38). Furthermore, the dysphagia (swallowing) guidelines provided by the South African Speech-Language-Hearing Association (SASLHA, 2011) indicates the overall guidelines for assessing, treating and considering ethical issues around dysphagia, opposed to specific guidelines for HNC. Guidelines on the South African STs' role in specialised population groups, such as HNC, is not specified. Therefore, there is a need for specific guidelines for STs when treating this group. It is also important to establish how ST's clinically apply work, and potential challenges faced.

In addition, how the role of the ST changes depending on the severity of the cancer, type of treatment being received and the presenting symptomatology has not been documented. The study aimed to identify the current research on the epidemiological trends across Africa, and postulate what

implications there are for practicing STs. Although guidelines from USA are available, it is unclear if these guidelines for best practice can be applied in the same manner to STs working in an African health context. There are limited ST services in developing countries, and therefore patient care in this regard is ineffective (Fagan & Jacobs, 2009; Vartanian, Carrera-de-Angelis, & Kowalski, 2013). The current study sought to identify the epidemiological information in Africa that may impact on the guidelines for ST treatment.

2.6. Problem Statement

The number of people with HNC globally is increasing due to increased substance abuse, infectious diseases, lifestyle and diet trends (Plummer et al., 2019). Thus, research on HNC is needed, particularly as the disease grows in LMICs, such as countries in Africa. To understand HNC in Africa and the effect of it, it is essential to consider the epidemiological data, namely the prevalence; pattern of disease (staging, anatomical sites involved, and signs and symptoms experienced); distribution between population groups and their lifestyle habits; populations most at risk; as well as the current treatment protocols implemented. The current epidemiology of HNC in Africa is unknown, and there is currently a lack of collated and analysed epidemiological data, a lack of collated information related to medical treatment, and a lack of collated information related to the MDT, in relation to HNC that STs are involved with.

As HNC numbers increase, effective and accessible treatment, and the number of professionals treating those with HNC needs to increase, but they are not. Studies that confirm the need for ST services are lacking, as well as information on where STs in Africa actually are in relation to the prevalence of HNC. As epidemiological data exists in isolation, there is a need to collate and consolidate the current literature, and to find the gaps in research and practice. This critical review of the current research on epidemiology in Africa is required in order to then find implications for practicing STs in the African context. The epidemiology provides a basis by which any HCP must understand when working with people with a health condition. The implications for ST in the African context are specifically needed for teaching, research and guideline and protocol development.

3. Methodology

The following section describes the methodology that was used to achieve the aims of this systematic review. Details of the main aim, objectives, inclusion/exclusion criteria, study selection, data extraction, quality assessment and data analysis that were used are described.

3.1. Research Question

What is the epidemiology of HNC in Africa from the current literature and by implication what does this data mean for STs in practice?

3.2. Aim of the Study

To document and consolidate the current epidemiology of HNC in Africa, based on the current literature.

3.3. Objectives

3.3.1. To identify the presentation of HNC in Africa in terms of:

a. Geographic location of studies (areas of Africa, as well as clinics vs hospitals)
b. Types of HNC and most common anatomic sites and histology's
c. Stage of HNC at the time of diagnosis
d. Signs and symptoms reported by patients
e. Risk factors and/or comorbidities associated with people obtaining HNC
f. Treatment protocols currently being used
g. MDT involvement with HNC management, with specific reference to the involvement and role of the ST

3.3.2 To capture the demographic information pertaining to HNC presentation according to

a. Race
b. Gender
c. Age at diagnosis
d. Socioeconomic status

3.4. Research Design

The study employed a mixed methods explanatory design, in the form of a systematic review. A systematic review is a critical review of all empirical evidence that fits pre-specified eligibility criteria in order to gain insight into a specific area. The data is analysed both quantitatively and qualitatively (Grant & Booth, 2009). In the case of the current study, the data was analysed quantitatively initially,

and then explained by means of thematic analyses. Systematic reviews are useful in that they provide an unbiased summary of the best data available on a particular topic (Kaura, 2015).

A systematic review was specifically chosen to study the current data on HNC, as no participants were required. People with HNC (regardless of stage of cancer) are a vulnerable population. In addition, the data collection for current study was conducted in the midst in the COVID-19 pandemic, which limited the researcher's ability to actively collect data from participants, or from hospitals. It was not deemed ethical to use a virtual platform to collect data from individuals with HNC, as the questions could unintentionally cause distress and with restrictions on face-to-face interactions, a distress protocol would not be ideally implemented should it have been required. A systematic review provided for an unbiased approach to the research findings, as all the data was already captured, and the researcher did not have any interaction with people with HNC.

Table 4

Advantages and Disadvantages of Systematic Reviews (Kaura, 2015)

Advantages	Disadvantages
Informs evidence-based practice, which gives the best possible estimate of any true effect	The clinical question may be too narrow, and therefore this could reduce the applicability to individual patients.
Inexpensive	There may be a limited amount of high-quality data available to review.
Information is already available	Does not account for perspectives of group studied
Can shorten the lag time between research findings and the implementation of these into clinical practice	
In comparison to a single study, many studies are evaluated so that results may be generalised to a broader population across various settings.	

When conducting systematic reviews, data on a topic is critically reviewed, and this in turn informs practice that is evidence based across fields and between a broader population. Systematic reviews are advantageous as they have little expense as no medical equipment needs to be used, and there

are no medical trials being conducted (Kaura, 2015). The information obtained is already available, and has been analysed. This is useful in reflecting back over the information obtained and verifying information (Vasar & Holtsman, 2013). Another advantage is that the data can be analysed and implemented immediately, whereas a single study needs to be validated prior to implementation. Furthermore, in comparison to a single study, many studies are critically analysed and these results can be generalised across regions, populations, and amongst various settings (Kaura, 2015).

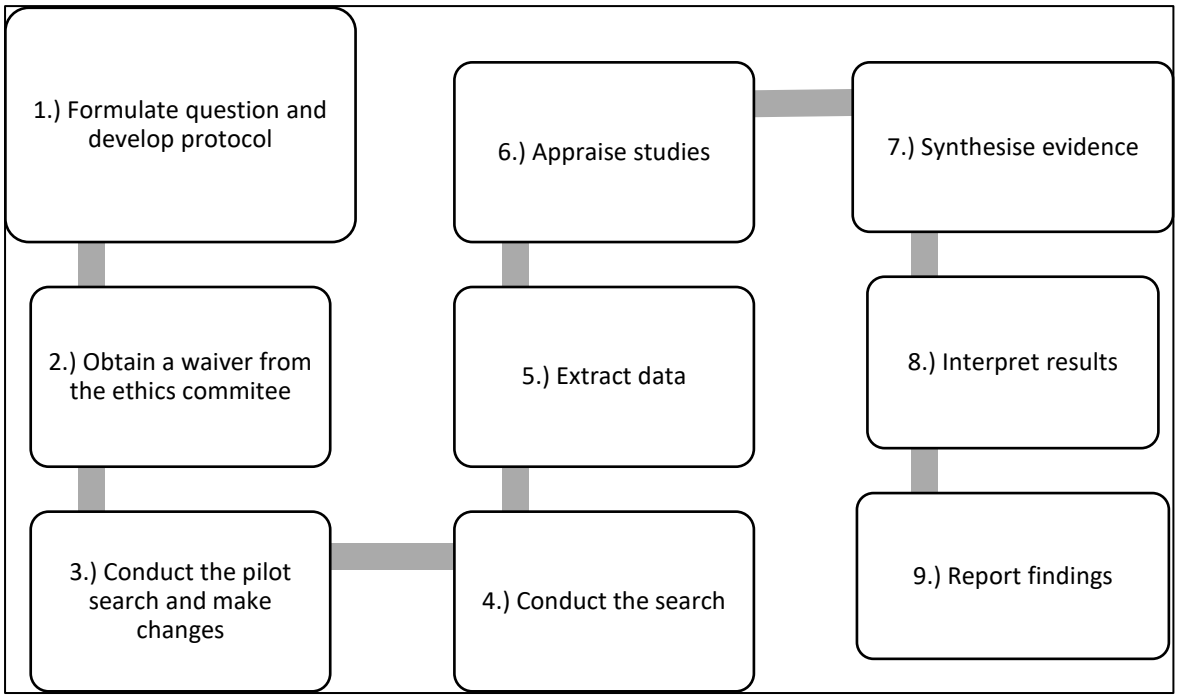
The disadvantage of systematic reviews, in contrast, is that the research topic may be too narrow, in which case it may not be applicable to particular patients, or populations. As part of a systematic review, careful consideration of which data being used needs to be accounted for in order to ensure that the data is high-level (Kaura, 2015). High-level pertains to data that is peer-reviewed, critical in its analysis, relevant, valid, reliable and complete (Woodall, Oberhofer, & Borek, 2014). When conducting the current study, there may be limited high-quality data available to analyse. As systematic reviews are not participants, the study is unable to account for personal perspectives of people with the health condition that is being studied. Therefore, specific conclusions cannot be assumed and rather just commented on (Worster & Haines, 2004).

3.5. Research Process

The following describes the research process that was implemented by the researcher, and includes processes of before, during, and after the data collection, which is depicted in Figure 2.

Figure 2

A Description of the Research Process for a Systematic Review (Lefebvre et al., 2019)



1. The researcher made use of the Cochrane protocol to guide the research process (Lefebvre et al., 2019). The researcher initially developed the research question and protocol for the study. This included all the search criteria, sources, and strategies. Furthermore, templates were made for when data collection occurred. The search process, and search results were documented.
2. The researcher obtained ethical clearance from the first proposal on 09/12/2019 from the University of Witwatersrand Human Research Ethics Committee: Medical, which was changed due to COVID-19. As a result, for a waiver from the ethics department was obtained for the current research, which can be referred to in Appendix 8.
3. The researcher conducted a pilot search in which the bibliographic data and grey literature were searched. The researcher and research assistant reviewed if the search strategies implemented were effective. The pilot study search aims are elaborated on in section 4.6.3.2. Thereafter, the appropriate modifications to the terms used were made and the search was conducted.
4. The researcher then conducted the search, which included the initial keyword search of all databases and grey literature. These were included in the total records extracted. The data

screening process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and MetaAnalyses) flowchart (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009). This diagram will be further explained in the results section. Duplicate records were removed and recorded. Thereafter, the researcher screened the data by reviewing the article titles only, according to the inclusion and exclusion criteria. Then, the same process was done by reviewing abstracts. The researcher then finally reviewed the eligibility of articles by reading the full-text and removing articles that did not fit the inclusion criteria. At each stage, the researcher explained why data was not included. Appendix 4 shows a template of the documentation of search results, and is expanded upon below.

5. The data extracted from the chosen articles followed a data extraction form, which was developed by the researcher. See data extraction in section 4.6 for more details.
6. The data extracted was appraised according to its quality. The researcher used the MMAT (Mixed Methods Appraisal Tool, 2018) to review the observational studies. See quality of data for more information in section 4.6.1.
7. All of the data extracted was synthesised and analysed thematically using tables and Braun and Clarke's Six Steps (Braun and Clarke, 2006). These steps will be expanded on in the data analysis section (3.9.2.).
8. The research was written up, and the results and implications were reported and discussed.

3.6. Study Selection

The section pertains to the inclusion and exclusion criteria; the types of data searched; the sources of data and the strategies used for data collection.

3.6.1 Search Criteria and Types of Data

The data that was analysed was chosen according to the objectives specified. The types of data obtained followed various inclusion and exclusion criteria so as to narrow and refine quality data, within a specific time frame. The exclusion criteria were documented and kept for the analyses of the research. The inclusion and exclusion criteria include the following:

Inclusion criteria:

1. Journal articles were used including published original research.
2. Grey literature including unpublished original research, institutional or disciplinary repositories (dissertations for degree purposes), information from professional societies, books, and case studies.

3. Data from cancer registries in Africa. Access to these registries could not be obtained, therefore journal articles highlighting the findings from cancer registries were used.
4. Research that reviewed HNSCC and all types of NPC from the nasopharynx down to the cervical oesophagus only. The reason for this is that 90% of HNCs are HNSCCs, and have distinct risk factors and presentations (Bray et al., 2019). Similarly, with NPC, there is a high prevalence in the North African region and therefore needs to be included (Ridge et al., 2019). For articles that included both HNSCC/NPC and other types of HNC, the ones that had the predominant amount being HNSCC or NPC were included.
5. Research papers employing qualitative, quantitative and mixed method designs were used. Both experimental and observational studies were included. Descriptive, epidemiological studies were sought out, as these pertain to the epidemiology of HNC. Other study designs, however, were also included.
6. Research that was in English only, as it is the universal language of science (Drubin & Kellogg, 2012).
7. Research that was done in Africa. As it is crucial to determine the implications for African STs, research in Africa only was obtained.
8. Research that included human participants only. The objectives sought to capture epidemiological information on people with HNC, and therefore research on human participants only was employed.
9. Research that has been done over the last 10 years (2010- June 2020), as this research sought to systematically review the most current research done.
10. Research of participants over 18 years of age. As HNSCC and NPC is predominantly an acquired, adult condition, articles pertaining to HNSCC in children were excluded.
11. Research pertaining to epidemiological data, HNSCC and/or NPC presentation, or/and MDT in assessment/management of people with HNSCC and NPC.
12. Research articles retrieved from the references of other systematic reviews, scoping reviews and narrative analyses.

Exclusion criteria:

1. Systematic review papers, narrative analyses, or scoping reviews. As this research is a systematic review, no review papers were included in the data collection, as this would duplicate information/data obtained. Rather these papers' references were searched to validate the retrieved data.

2. Articles citing original research that are the secondary source of information. As this review is highlighting the current original research, articles that cite data found in original research were excluded.
3. Trial registries were not included in the search, as they provide information based on interventions, opposed to epidemiological information.
4. Duplicate journal articles. Duplicate articles were excluded from the main analysis.
5. Research that was older than 10 years.
6. Research that pertains to other types of HNC, as HNSCC and NPC is the focus of the aim. SCCs of the paranasal sinuses and nasal cavity were excluded as the signs and symptoms associated with these are not remediated by STs.
7. Research where the full-text is not available.

3.6.2 Search Sources

As briefly described in the inclusion criteria, various types of journal articles, and grey literature were included in the search for data. It is recommended that at least three to five bibliographic databases be used to effectively search for data (Lefebvre et al., 2019). This section will highlight all types of literature that were included in the study, as the first process in extracting data.

3.6.2.1. Bibliographic databases. The databases used were accessed via the University of Witwatersrand online library. A study done in 2017 revealed that for biomedical systematic reviews, the following four databases provide the best combination for information recall (Bramer, Rethlefsen, Kleijnen, & Franco, 2017):

- Embase (via Scopus)
- Medline (via PubMed, EBSCO or OVID)
- Web of Science, and
- Google Scholar (the first 200 relevant references)

According to the article review, 98% of the available research on the biomedical topic was recalled (Bramer et al., 2017). The first three databases listed above were used, Google Scholar and Google were used to cross-check for any missing information, both journal articles and grey literature. Google was used as a cross-check as it included more grey literature, comprising of organisational websites and NGO's discussing HNC in Africa. Sabinet was also included in the search as it includes many studies conducted in Africa. For Embase, the researcher used the Scopus database, which includes most of

the literature published by Embase. Furthermore, the entire database of PubMed was included (Lefebvre et al., 2019), as well as EBSCO.

Table 5

Databases Searched

Database provider name	Databases included	Description of database
EBSCO	- Africa-Wide - Academic Search Ultimate - Dentistry and Oral Sciences eBooks collection - Global Health - Health Source - Nursing/Academic Edition - MEDLINE Complete - Newspaper Source Plus - Open Dissertations - Webnews - CINAHL (Cumulative Index of Nursing and Allied Health Literature)	- Includes a wide range of bibliographic and grey literature. - Specific topics include biomedicine, life sciences, life sciences, nursing, and allied healthcare (EBSCO, 2020).
SCOPUS	Embase	- Produced by Elsevier - Includes research within the biomedical and pharmacological data fields. - Over 32 million records from over 8500 published journals from over 95 various countries (Elsevier, 2020). - The researcher had access to Scopus, containing most research from Embase (Elsevier, 2020). - Scopus has largest abstract and citation database of peer-reviewed literature (Elsevier, 2020).
PubMed	PubMed	- Includes biomedical and life sciences journals (PubMed, 2020) - Includes all journal articles from IARC (International Agency of Research on Cancer), which is associated with the WHO, and is the primary website for cancer registries and cancer reporting globally.
Web of Science	Web of Science	- Includes research on scientific and social science fields. - Covers original articles, reviews, citations, editorials and proceedings (Jacso, 2010).
Sabinet	Sabinet	- South African and African journals, as well as other forms of grey literature.

		- Includes a wide variety of bibliographic and citation references, news archives and over 500 African journals and publications.
Google Scholar	All	- Freely accessible search engine - Includes scholarly literature from various publishing formats and fields of study (Google Scholar, 2020). - Scholarly literature includes articles, theses, conference proceedings, and patents. - Used in the grey literature search.

All databases used were applicable to the fields of science and medicine, which was indicated for the current study. Data was also collected through bibliographic searching, as well as recommendations given by each database. Appendix 2 shows the order for which terms were searched. Some organisational websites have published both journal articles and grey literature. These were included in the data source, and are expanded on in section 4.6.2.2.

3.6.2.2. Grey Literature. Grey literature was searched for in the current study as it includes a wealth of information that is unavailable on commercially published literature. Grey literature includes governmental or organizational literature, theses/doctorates, conferences, trial registers, websites, and books (Tyndall, 2016). This researcher explored various grey literature using the following methods:

- The researcher reviewed the bibliographic databases (as mentioned above) for grey literature. These specifically included theses, doctorates, newspaper articles and conferences.
- Search various grey literature databases. GreyNet (2020) is a website that provides a list of relevant grey literature databases that are specific for various areas of research. In the case of life sciences and medicine, GreyNet (2020) recommended the following databases. From these, the researcher searched the applicable ones for the topic. These included the following:
    - Grey Horizon. This database is a grey literature awareness blog tool in cancer care.
    - GreyLit (literature that is produced by the New York Academy of Medicine from 1999-2016).
    - Centre for Reviews and Dissemination (CRD) is produced by the University of York and specialises in reviews and dissemination of information.
- Databases that include dissertations or theses from various universities included the following:
    - African Digital Repository (ADR) includes theses and dissertations from universities across Africa.

    - South African theses and dissertations
    - PROQUEST dissertations and theses includes dissertations and theses from both Africa, and around the world.
- Specific publications or reports on websites relating to epidemiology, head and neck cancer, and research in Africa were searched. This included the following websites:
    - Directory of Data Repositories in Africa - DODRIA
    - UNESCO Data Centre
    - WHO African Region
    - GLOBOCAN (Global Cancer Observatory) (associated with WHO)
    - CANSA (The Cancer Association of South Africa)
    - IARC (International Agency for Research on Cancer) (associated with the WHO)
    - African Cancer Registry Network (ACRN). The ACRN is a partner of the IARC and WHO, and focuses on documenting cancer in SSA.
    - Cancer Index
    - African Cancer Organisation (UICC)
    - African Cancer Institute (ACI)
    - AORTIC (African Organisation for Research and Training in Cancer
    - African Head and Neck Society (AfHNS)

No clinical trials were searched as epidemiological studies do not involve any form of clinical trial (Lefebvre et al., 2019). The grey literature and bibliographic databases used were evaluated and analysed.

3.6.3 Search Strategies

This research employed keywords to identify articles that were reviewed. The following steps indicate the various search strategies for keywords, in order to exhaust all resources on the topic.

3.6.3.1. Identifying Key Concepts. Key concepts are required as the initial part of a keyword search, and are based on the research's main aim. Appendix 1 shows the core concepts related to the study. The keywords used were altered after the pilot study, and ultimately the primary keywords used were "head and neck cancer" and "Africa".

3.6.3.2 Development of Free-Text Search Terms, and Controlled Vocabulary Terms, and Exploding of Terms. Free-text search terms are alternate words for the key concepts, including

laymen's/medical terms; synonyms; US/UK terms; abbreviations, or alternate words (Aromataris & Riirano, 2014). Appendix 1 shows the free-text search words for each key concept. When searching for data, free-text terms for the current study was searched as text words, which includes words in the abstract, title or authors keywords. Upon conducting the pilot study, it was noted that articles were automatically searched for according to their alternative terms.

Controlled vocabulary is used within various databases and assists in describing the content within each article. Within this, subject headings are used to describe the content. Between various databases, there are various subject headings between various databases, and therefore various controlled vocabulary needs to be established. For PubMed, Medline, and Cochrane databases, medical subject headings (MeSH) are used. Furthermore, Embase database uses Emtree, CINAHL uses CINAHL Headings and Web of Science uses Author Keywords and Keywords Plus.

Making use of subject headings within a search for data is useful as they retrieve articles that may use different words around the same concept, and they allow for a greater variety of words within a similar scope (Aromataris & Riirano, 2014). Appendix 1 indicates the controlled vocabulary based on the key concepts within the current study. When relevant subject headings are searched, terms are placed along a hierarchy from most broad down to most specific terms. The researcher chose words along the tree diagrams that were most relevant to the study. Appendix 1 depicts this, which indicates the controlled vocabulary used and the key for which database words were retrieved from, as there are slight variations. Major concepts are also highlighted in Appendix 1, which indicates which words were used in each database as the primary word. This means that all the words following it, in the tree diagram, were searched for, which has been the preferred term used in each database when initially searched. To not lose any potential data, all of the text words were searched. The use of MeSH terms and controlled vocabulary was not used after the pilot study, as too many irrelevant results were yielded.

3.6.3.3. Phrase Searching, Truncation, and Wildcards. The researcher was required to search for phrases within quotation marks. For example, "head and neck cancer" was searched as a phrase, but was also searched at keyword level.

Truncation was also applied to keywords, as seen in Appendix 1. Truncation is a technique that broadens a search to take various word endings into account. Therefore, the root words are used, and the truncation symbol is added which will include other variations. For example, the root word "pharyn" was used, and the truncation symbol (*) is applied, which will allow the databases to find all other word ending variations including "pharynx, pharyngeal, pharyngeal, and pharynxes".

Wildcard characters are used when words are spelt in various ways, for example American or British English variants. Wildcard characters have been applied to the search words as seen in Appendix 1. For example, “#etiology” finds both “aetiology” and “etiology”.

All of the bibliographic databases use phrase searching, truncation and wild cards. Google Scholar does not use wild cards or truncation, however it makes use of automatic stemming, which finds the exact words inputted, as well as alternative endings.

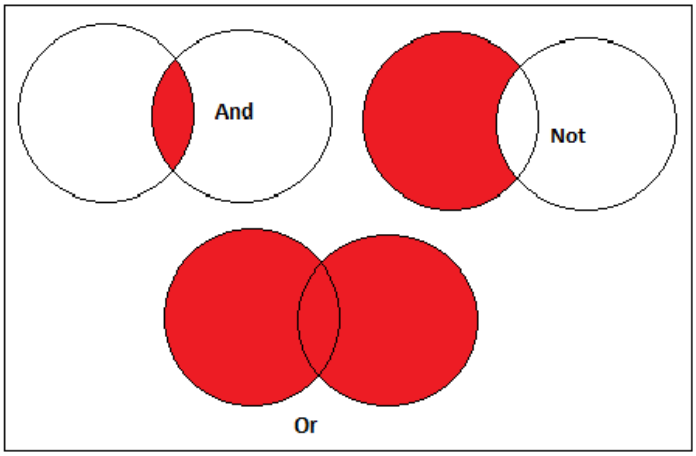
The use of wildcards and truncation was adjusted after the pilot study.

3.6.3.4 Boolean Operators. Boolean operators are used between two words, and are used when starting the search process. Boolean operators are recommended as they search for terms individually, and then make use of the correct Boolean operator which combines the terms. The reason for Boolean operators is because it allows the researcher to search for terms that add value to the search, but also to search for particular terms that produce too many irrelevant results. Figure 3 shows an example of the Boolean operators “and”, “or” and “but”, which has been adapted from Aromataris & Riirano (2014). The figure demonstrates that the researcher is searching for “determinants and distribution”, “determinants or distribution”, or “distribution and not determinants”.

To further expand, an “and” between terms will find all information that is common to both search terms, and this will narrow the search field, as databases will search for articles with both terms only. An “or” operator will find information that includes either of the two terms, and this will broaden the search field as one or the other will be found. The “not” term will exclude terms from the search. This is specifically useful if narrowing the search, and wanting to look at a particular field. In this example, the researcher may want to include all studies that pertain to distribution, and to exclude all that include the determinants.

Figure 3

Boolean Operators Within a Search Strategy



The Boolean operators were piloted and changed ultimately for the search.

3.6.3.5 Search Limits. Search limits were done according to the inclusion and exclusion criteria, specifically pertaining to the following:

- Year of publication
- Language
- Species – i.e. human subjects only

After the pilot study was conducted, only year of publication and language was used to filter the articles.

3.6.3.6. Validating, Verifying and Revising Search Strategies. It is pertinent for the researcher to validate and verify the search strategies to ensure that no potential data is missed. Using multiple databases is a method of validating the data available on the topic (Lefebvre et al., 2019). Furthermore, it is crucial to pilot the search strategy used. This was done with a research assistant, who assisted the researcher in piloting the search strategies, as well as assisting with inter-rater reliability for when the data extraction occurred. The aims and results of the pilot study are in section 4.7. Both the researcher and research assistant sampled the search strategy and extrapolated the first 20 files each. These were compared to evaluate if the same files were obtained using the same search strategies.

The research assistant did not need to be a ST. The assistant was trained by the researcher prior to and during the pilot search. The research assistant received remuneration for her work and travel

expenses, as per the research assistant guidelines provided by the University of Witwatersrand for paying research assistants. Furthermore, a statistician working at the University of Witwatersrand assisted in analysing the data provided. She was remunerated for her work, as per her hourly rate in accordance with the South African Statistical Association.

The Cochrane Handbook for Systematic Reviews (Lefebvre et al., 2019) recommends doing the following steps for the search, which was done by the researcher:

1. When conducting the search using Boolean operators, the researcher reviewed how many search results appeared. If the results are too few, then the combinations used may be too narrow. Similarly, if the results yield too many results, the Boolean operators were changed and documented.
2. Conduct a reference search of all the research done. The researcher reviewed all the references from the data obtained and identified if any articles could be applied to the study.
3. Conduct a cited references search. The researcher identified all cited research from the articles already found, and identified if the articles in which the cited research is found can be included in the systematic review.
4. Author search. The researcher reviewed other work done by the authors found in the search, and identified if any articles may be of value in the systematic review.
5. Hand searching. The researcher finally hand searched for key journals, not following the inclusion/exclusion filters, and not making use of Appendix 1.

These steps were done in the pilot study stage and then again once conducting the search. Results from the pilot search are in section 3.7., and the results from the final search are in the results section, in point 4.2.

3.6.3.7 Documenting Search Strategies and Results. The appendices indicate the various search strategies employed within the various databases. As databases varied, so did the search strategies and the terms used within each. Appendix 2 shows the search methodologies that were employed for the pilot study, including the number of keywords, as well as the exact keywords and collaborations of words used, according to all the search strategies described in 4.6.3. The various codes relate to the search strategies as described above, and the "+" sign indicates that each term can be exploded in the search.

Furthermore, Appendix 4 shows the template that was used by the researcher to document the search results. This includes the authors searched; when; using which terms; the filters applied; the number of records received; the number of records received; number of records excluded upon screening; and number of records included. The search strategies and search process need to be detailed in order to

ensure that all searches of the databases are reproducible (Lefebvre et al., 2019). Appendix 4 was used in conjunction with the PRISMA flowchart, which will in turn represent the data results.

3.7. Pilot Study

A pilot study was conducted prior to the data collection, particularly to alter the search methodologies and strategies as described in 4.6.3. The pilot study was conducted with the research assistant in order to review if the search strategies could be reproducible. The pilot study aimed to do the following:

- To identify if the databases used are appropriate for what the researcher is searching for. It was found that all the databases were appropriate for the areas of search required. This was verified in that the types of articles retrieved pertained to epidemiology of HNC in Africa, and all articles retrieved related to health or biomedical topics around head and neck cancer.

- To fine tune the search strategies and keywords used, in order to yield the most applicable responses. The search strategies were adjusted, as the pilot study revealed the results yielded too many results, or too few results, as well as results that were irrelevant to the objectives. Appendix 3 shows the terms initially used for each database, the results yielded, and the reasons for changing the terms. It was found that the initial search terms were too specific and did not yield the results pertaining to the objectives. When the search terms were expanded, articles that were not yielded initially but were pertinent to the study were generated. This meant more hand searching for the researcher, however this meant that no studies were excluded by not being retrieved in the search. This was specifically the case for the larger databases, that being PubMed and EBSCO. In summary, Table 6 shows the final terms that were used for each database.

Table 6

Search Terms for Each Database

Bibliographic Database	Terms used
PubMed	(head and neck cancer) AND (africa)
EBSCO	(head and neck cancer or oral cancer or oropharyngeal cancer or hnc) AND (africa or african countries)
Web of Science	(TS=(epidemiolog* OR presentation OR determinants OR risk factor* OR treatment* OR demographic* OR age OR race OR socio-economic status OR trend* OR distribution*)) AND (TS=(Africa OR African countr*)) AND (TS=("head and neck

	cancer" OR head and neck neoplasm OR "head and neck squamous cell carcinoma"))
Scopus	TITLE-ABS-KEY ((africa OR "african country") AND ("head and neck cancer" OR "head and neck neoplasm" OR "head and neck squamous cell carcinoma"))
Sabinet	“head and neck cancer” [all fields] AND “Africa” [all fields]
Google Scholar	"africa" "head and neck cancer" and option for “with all the words”
Grey literature	
GreyLit	“Oral cancer” OR “head cancer” OR “laryngeal cancer” OR “pharyngeal cancer”
Grey Horizon	(head and neck cancer) AND (Africa)
CRD	(head and neck cancer) AND (Africa)
SATD	(head and neck cancer) AND (Africa)
African Digital Repository	Oral cancer or “head and neck cancer” – exact words
ProQuest dissertations and theses	head AND neck cancer)(All text) AND subject(Africa / Africa)

For each database search, the filters “English” and the dates from 2010-2020 were applied. All searches were done in the advanced search of each database. As depicted in Appendix 3, alternative words to the primary words (as described in 4.6.3.2.) were automatically retrieved in each database. Therefore, one search was done per database. PubMed was the first database to be piloted, as it is the largest. Appendix 3 shows the variations in the results and how these were trialled. Thereafter, the pilot searches of the other databases were easily adjusted.

Furthermore, most of the grey literature was rather hand selected, with only the filters of 2010-2020 applied.

- To identify if the same number of results are yielded between the researcher and research assistant. After using the applied search strategies, the research and research assistant were required to apply these to all the databases and cross check if the same number of results were yielded. The same results were in fact yielded and titles included according to the inclusion criteria. Those titles that were not to be included were discussed between the research and

research assistant, as per the exclusion criteria. Furthermore, for grey literature, the hand searching strategies were discussed prior to and during the data collection of the researcher and research assistant. The inter-rater reliability score is discussed below in section 3.8.1.

3.8. Data Extraction

Once the final articles were selected, the researcher extracted the data using a data extraction form in order to:

- Summarise the studies in a common format objectively for information synthesis
- Identify numerical data for descriptive statistical analysis
- To objectively assess the applicability of studies

This section will explain how the data quality was assessed, how data was stored, which tools were used to extract the data, and finally which data was extracted.

3.8.1. Assessing Quality of Data and Critical Appraisal

The researcher and research assistant needed to finalise the articles for review by evaluating their quality. For data that had quality issues, the researcher critically evaluated why, however still included these articles. The reason for this is due to the limited data available in Africa. In order to evaluate and appraise the data, the researcher followed a standardised appraisal checklist. All of the articles were observational quantitative, or qualitative, and therefore the MMAT (2018) was used. This tool can be used to review both quantitative, qualitative and mixed method research designs and is appropriate to evaluate the variety of research designs included for the systematic review (Hong et al., 2018). The MMAT evaluates the methodological quality of data. That included evaluating if the articles have appropriate sampling strategies, sample sizes, low risk of nonresponse biases, appropriate statistical analyses; and complete outcome data (Hong et al., 2018). The MMAT has five criteria to score for each research design; a score of 20% was attributed to each 'yes' answer, and zero for 'no' or 'not addressed'.

The MMAT discourages giving a raw score, and to rather interpret the results in a more detailed approach. The quality of data was high, as 68% (n=45) of articles obtained a full score of 100%. That being, all five questions were answered in the positive which pertained to the article having a high level of methodological quality. Each article included in the final check was reviewed according to these criteria. The remaining articles that achieved less than 100% comprised of non-randomised and

descriptive quantitative studies. The articles that were found to have a reduced quality were scored a "no" or "cannot tell" response for various aspects. These included the following:

- The most prevalent limitation across the articles was the low risk of nonresponse bias was not indicated (n=8 articles), or the risk of nonresponse bias was high (n=3). Eight articles did not indicate the number of people that were excluded or did not participate in the study. Three articles had a high rate of nonresponses for the target population.
- Four articles' participants did not represent the target population. In this case, the articles aimed to study HNC across the whole country, when in fact it was only within a small region. For five articles, the researcher could not tell if the participants represented the target population, as the target population was not indicated in the study.
- One article found the measurements inappropriate and one article found the statistical analysis inappropriate to answer the research question. The reason for these two was that both articles had incorrect documented values.
- Two articles had incomplete outcome data due to a high proportion of missing data. One article, the researcher could not tell if the outcome data was completed, as there was no mention of missing data, even though the participant numbers reported did not equate to the variables discussed.
- Two articles did not account for the confounders in the design and analysis. Confounders are factors that predict the outcome of interest and the intervention/exposure at baseline (Hone et al., 2018). The reason for this was that both articles did not state any other risk factors that the participants could have been exposed to prior to or in conjunction with the studied risk factor. This could not be concluded in one study, as the article mentioned that other risk factors may have been included, but did not specify numeric values.

Appendix 5 expands on these results, and explains why each article did not achieve 100%. The MMAT was done by the researcher and research assistant to ensure reliability (inter-rater reliability method, following Cohen's Kappa), and construct validity of the tool. Inter-rater reliability was done by the researcher and research assistant. The first 25% (n=17) of relevant studies were critically appraised by both researchers to ensure inter-rater reliability. It was noted that there was a 91% level of agreement for each answer (P_o). This equates to 77/85 questions. In eight of the questions, there was a level of disagreement equating to a $P_{correct}$ score of 0.77 and a $P_{Incorrect}$ score of 0.014, resulting in a Cohen's Kappa (K) score of 0.59. Therefore, a moderate level of agreement was achieved. The eight questions that were disagreed upon were discussed, and a level of agreement was reached.

3.8.2 Storing of Data

The research articles were stored and categorised in Mendeley™, which is a data storing programme. The data was divided according to the PRISMA flowchart steps, which separate data according to titles, abstracts, and full texts according to the inclusion/exclusion criteria. The folders were divided into the following:

- All folders
- Non-English titles
- Non-relevant titles
- Systematic reviews or meta-analyses
- Non-duplicated titles
- Relevant abstracts
- Relevant titles without abstracts
- Non-relevant full-text papers
- Relevant abstracts without papers (no access)
- Poor quality of data exclusions
- Study relevant papers (bibliographic data)
- Study relevant papers (grey literature)
- The data from the "study relevant papers" folder for both bibliographic data and grey literature was then ready to be extracted.

3.8.3. Data Extraction Tools

The data extraction tool was done on an Excel spreadsheet. The researcher documented the background information, methods, and findings of each research study. As the data was descriptive in nature, the commonalities were combined with descriptive statistics and then various studies expanded on qualitatively.

3.8.4. Data Extracted

The data extracted pertained to the study's objectives, as well as identifying the information about each article. The data was retrieved using a closed-set of options. This was done to extrapolate commonalities between data. The following nominal data was extrapolated:

- Background information. This included the study title, author, country it was done, year of study, type of study, and number of participants. Appendix 6 shows the data that was

extrapolated for each study. Thereafter, the data was summarised and commonalities were extrapolated manually.

- Methodology. This is important as various studies will have different methodologies, which may have an effect on the studies outcomes, and risk of bias. This includes the various epidemiological study designs, sampling strategy used, study limits, and study start and end date. Appendix 6 shows the data extrapolated from each study. This was done for all full-texts that were eligible for the study. The data was retrieved using a closed-set of options. This was done to extrapolate commonalities between data.
- Findings of the research included the research results. These results were documented according to the primary to identify the epidemiological information in Africa. It included the following:

    - Demographic data, including age, race, SES, and gender of participants
    - Types of HNC and most common anatomic sites
    - Signs and symptoms experienced by patients. It should be noted that some articles documented the most prevalent symptom, whereas others documented all symptoms experienced by each participant.
    - Stages of HNC when diagnosed
    - Risk factors associated with people obtaining HNC
    - Treatments currently being used
    - Various locations where studies have been conducted. This includes areas of Africa, countries, as well as settings (clinics vs hospitals)

3.9. Data Synthesis and Analyses

As the data was not statistically heterogeneous, a meta-analysis could not be done.

3.9.1. Analysing the Type of Data Extracted

The data obtained on the studies was represented in a PRISMA flowchart, to indicate how many studies were found at various stages of identification of data, as well as reasons for exclusion. Furthermore, the following data was documented and quantitatively analysed:

- Number of total participants in the studies
- Countries/regions where the studies took place
- Dates when data was published

- Study designs
- Limitations to the study
- Focus of the articles

This data is nominal in nature, and therefore the variables were grouped together and the frequency was calculated and compared, as well as discussed as part of the narrative synthesis. The next step was analyses of the studies.

3.9.2. Analysing Data Within the Studies

3.9.2.1 Documenting the Types of HNC, the Stage, and the Signs and Symptoms of People Diagnosed with HNC. The data was analysed qualitatively. As this is a systematic review, no raw data could be obtained for each study, and consequentially non-parametric and parametric statistics could not be done. The type of data that was collected is nominal and continuous in nature. Nominal data is a type of data that is used to label variables without any quantitative value. Nominal data cannot be ordered or measured, unlike ordinal data (Howell, 2009). When analysing nominal data, the variables can be grouped together and compared amongst each other. The variables were grouped together into categories, and for each category, the frequency or percentage was calculated. This included the types of HNC, and the stage. This is important for comparing the data between other variables. In this case, these percentages can be compared to the age, race, gender, geographical location and SES. The data from the subcategory of HNC was analysed thematically. The emerging themes were documented manually, by re-reading the articles, and through the process of immersion into the data, coding, generating categories, and the identifying themes (Guest et al., 2012). Furthermore, thematic analysis was done by making use of Braun and Clarke's six steps. These included:

1. Becoming familiar with the data, by reading and re-reading the articles and making notes of initial ideas.
2. Generating codes for the relevant ideas.
3. Searching for themes for the initial phase pf interpretative analysis of the codes. The themes were sorted into main themes, and subthemes, and identifying relationships between these. The themes were identified according to the objectives of the study, and thus a top-down approach/deductive was used.
4. Reviewing of the themes to determine those that can be discarded, combined and/or refined.
5. Defining and naming of themes, which included refining the themes and subthemes, as well as further analysing the data for enhancing the themes

6. Producing the report, by discussing the themes, and the relationships between themes.
7. Although these steps are sequential, the thematic process was recursive, as the researcher went back and forth between steps to ensure each step was reviewed and consolidated (Braun & Clarke, 2006).

It is important to consider the level of analysis one would like to achieve. Research can either be analysed at a sematic level, and/or at a latent level. At the semantic level, Boyatzis (1998) explains that these are explicit and are at a surface level relating to the data. These can either be major or minor themes. Major, meaning they are recurring and a primary focus of the data, versus minor occurring less frequently but still pertaining to the objectives. Latent themes are existing themes that are not immediately obvious, explicit, and require the researcher to identify underlying ideas and patterns that require a deeper interpretation of the data (Braun & Clarke, 2006). The researcher identified major and minor semantic themes. Once the data was arranged in codes/categories at a descriptive level, semantic themes were drawn and evidence of these themes were provided to understand the reasons behind them.

3.9.2.2. Listing the Treatment Provided, Identifying the Medical Team Involved, and Documenting Signs and Symptoms, and Risk Factors. When describing the risk factors, signs and symptoms, professionals and management provided, the researcher also identified the frequency within each category. This included initially identifying the signs and symptoms; the associated risk factors for each type of HNC; which professionals were referred to; the symptoms experienced before medical treatment; what the treatment protocol was in terms of treatment received. Then, the researcher identified if there is an association between the type of head and neck cancer, as well as the stage of cancer to the risk factors, signs and symptoms, medical treatment received, the signs and symptoms; and the medical professionals referred to. This was done by discussing the frequency and themes within the articles.

3.9.2.3 Identifying the Age, Race, Gender, and SES and Making Between Group and Within Group Comparisons. The researcher identified the frequency of the race, age, geographical location, gender and SES within the articles, by making use of frequency percentages. These were compared to the type of HNC and the signs and symptoms associated. The demographic data in relation to the risk factors were also discussed thematically.

4. Results

The systematic review aimed to highlight the current research on the epidemiology of HNC in Africa, and to ultimately investigate the implications for practicing STs. Since the researcher specifically studied HSCC and NPC, HNC will now be referred to HNSCC/NPC in the paper. Data was retrieved between January 2010 and June 2020 from various databases. The specific objectives were to identify demographic data of patients with HNSCC; namely age, race, gender and SES. Amongst these patients, the type of HNSCC, stage at diagnosis, signs and symptoms, and risk factors were documented. This chapter presents the results of the systematic review, using frequency tables, a narrative analysis of all the articles that expands on the descriptive statistics, as well as thematic analysis of the first subcategory of HNC, which included all types of HNC.

To present the results in a concise manner, the following headings were used: Overview of Appropriate Studies; Description of studies; Overview of the Epidemiology of HNSCC/NPC; Cancer Type, Histology, and Stage; Cancer Signs and Symptoms, Risk Factors and Treatment; and Demographic Data.

4.1. Overview of Appropriate Studies

As part of the results, it is important to document the number and types of articles retrieved. A systematic review was conducted amongst six databases, and 22 grey literature sources. A total of 1885 articles were obtained, based on the search terms applied in each database, and hand searching grey literature that did not have a search box. Table 7 shows the number of results obtained within each data source, after the filters were applied, and the number of articles included upon the initial title search.

Table 7

Search Results Based on Search Terms

Data source	Terms used	Results
Bibliographic databases		
PubMed	(head and neck cancer) AND (africa)	657
EBSCO	(head and neck cancer or oral cancer or oropharyngeal cancer or hnc) AND (africa or african countries)	414
Web of Science	(TS=(epidemiolog* OR presentation OR determinants OR risk factor* OR treatment* OR demographic* OR age OR race OR socio-economic status OR trend* OR distribution*)) AND	23

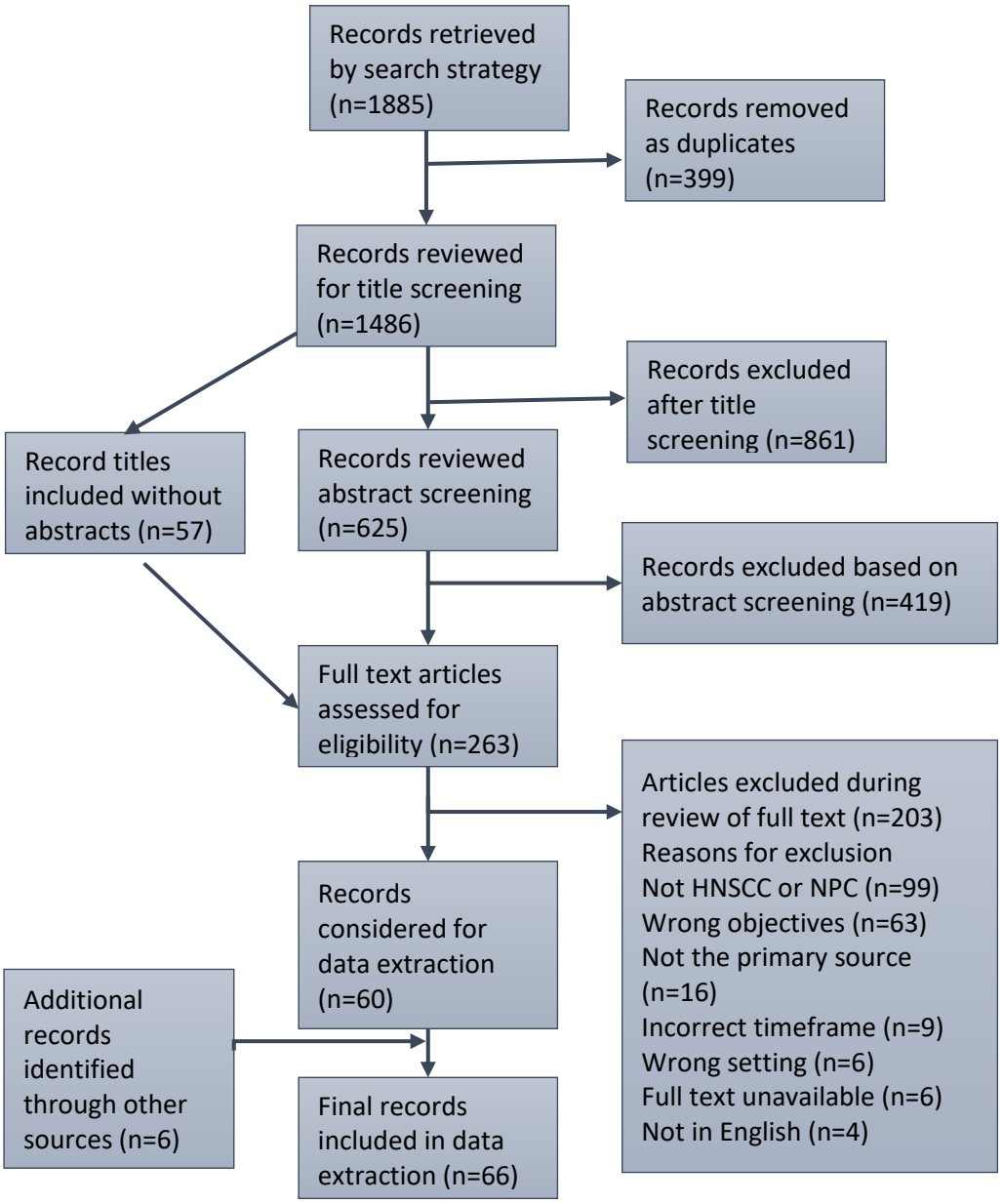
	(TS=(Africa OR African countr*)) AND (TS=("head and neck cancer" OR head and neck neoplasm OR "head and neck squamous cell carcinoma"))	
Scopus	TITLE-ABS-KEY ((africa OR "african country") AND ("head and neck cancer" OR "head and neck neoplasm" OR "head and neck squamous cell carcinoma"))	89
Sabinet	“head and neck cancer” [all fields] AND “Africa” [all fields]	3
Google Scholar	"africa" "head and neck cancer" and option for “with all the words”	18500 (only first relevant 200 titles)
Grey literature		
GreyLit	“Oral cancer” OR “head cancer” OR “laryngeal cancer” OR “pharyngeal cancer”	60
Grey Horizon	(head and neck cancer) AND (Africa)	0
CRD	(head and neck cancer) AND (Africa)	0
SATD	(head and neck cancer) AND (Africa)	5
ADR	Oral cancer or “head and neck cancer” – exact words	18
ProQuest	head AND neck cancer)(All text) AND subject(Africa / Africa)	139
ACI	Manual searching	17
AORTIC	Manuel searching	31
AFHNS	Manuel searching	0
IARC	Manuel searching	0
ACRN	Manuel searching	11
Cancer Index	Manuel searching	23
GLOBOCAN	Manuel searching	6
WHO African Region	Manuel searching	0
DODRIA	Manuel searching	0
UNESCO	Manuel searching	6
CANSA	Manuel searching	160
UICC	Manuel searching	23
Total:		1885

The table shows that most results were obtained from PubMed and EBSCO, however these needed to be hand searched further in order to meet the objectives, specifically as the keywords did not pertain to epidemiology and thus many articles not reviewing the epidemiology were yielded. The researcher also yielded many results from Google Scholar, which indicated irrelevant results past the first 200 results. There were six grey literature databases that did not yield any results from the title search pertaining to the epidemiology of HNC in Africa.

The researcher then began the final selection process, by initially removing duplicates, then identifying relevant versus irrelevant titles; removing irrelevant abstracts, and full texts. Figure 4 is the PRISMA flowchart, which shows how the final articles were retrieved.

Figure 4

PRISMA Flowchart for Article Selection



The initial search yielded 1885 results across all the grey literature sources and databases. Thereafter, duplicates were removed, of which there were 399 duplicates. The researcher then reviewed each title (n=1486) and separated these into three categories:

1. Titles included (with abstracts) (n=625). This included grey literature and bibliographic articles.
2. Titles included (without abstracts) (n=57). This consisted only of grey literature.
3. Titles excluded (n=861). This included grey literature and bibliographic articles.

The researcher then read the abstracts from the first category listed above (titles included with abstracts) and divided these into included abstracts (n= 206) and excluded abstracts (n=419). The abstracts included (n=206) and the titles included (without abstracts) (n=57) were added together (n=263), for the researcher to read the full texts of these. Most abstracts were excluded as they did not meet the objectives of the study, as well as did not pertain to HNSCC or NPC, and rather HNC.

The researcher reviewed all full papers (papers with and without abstracts), and 203 articles were excluded. Reasons for this include the full papers not differentiating between the HNC, i.e., did not specify HNSCC/NPC (n=99). Secondly, the objectives of the articles/grey literature were not in alignment with the researchers' objectives in the study (n=63). Some grey literature and articles commented on the epidemiological features of HNSCC in Africa, however were secondary sources. The original sources of these were either included in the study, or were not retrieved as they were published prior to 2010 (n=16). Nine articles were retrieved that were published prior to 2010, even with the timeframe filter applied. Six articles were excluded as they were done based on an African population, and a further six articles were excluded as the full text was unavailable to the researcher, even after attempting to gain access by contacting the authors. Finally, four articles were excluded as the full text was not in English. A final review of the bibliographies was conducted, and a further six articles were found. The final number of articles included in the study was therefore 66.

It is important to note that no grey literature was included in the final data extraction. This includes GLOBOCAN, and other cancer surveillances around Africa. The main reason for this is because they do not specify HNSCC of the UADT, but rather document HNC as a whole. This was particularly the case with dissertations and theses done in Africa.

4.2. Description of Studies, and Various Locations

The general characteristics of the articles include the title; author; the year the article was published; the time period of data collection; affiliations, and the location. Table 8 indicates the general characteristics of the studies included, and each of these have been explained.

Table 8

General Characteristics of the Included Articles

Author	Title of article	Country of research	Data collection period
Aboagye et al., 2019[1]	Human Papillomavirus Detection in Head and Neck Squamous Cell Carcinomas at a Tertiary Hospital in Sub-Saharan Africa	Ghana	2007-2016
Abram et al., 2012	Epidemiology of oral squamous cell carcinoma.	South Africa	1997-2009
Adesina et al., 2018	Review of 109 cases of primary malignant orofacial lesions seen at a Nigerian tertiary hospital	Nigeria	2008-2017
Adewuyi et al., 2013	Clinicopathologic characterization of nasopharyngeal carcinoma seen in the radiotherapy and oncology department, ahmadu bello university teaching hospital, Zaria, Nigeria: 2006-2010	Nigeria	2006-2010
Adeyemi et al., 2013	Clinical presentation of oral squamous cell carcinoma	Nigeria	1990-2008
Adeyemi et al., 2011	A retrospective histopathological review of oral squamous cell carcinoma in a Nigerian teaching hospital.	Nigeria	1990-2008
Adeyemi et al., 2011	Oral squamous cell carcinoma, socioeconomic status and history of exposure to alcohol and tobacco	Nigeria	1990-2008
Adoga et al., 2010	Clinicopathological profile of malignant tumors of the oropharynx: a case series.	Nigeria	1998-2008
Ahmed et al., 2012	Human papilloma virus attributable head and neck cancer in the Sudan assessed by p16ink4a immunostaining	Sudan	-

Akinshipo et al., 2017	Head and neck cancers: An histopathologic review of cases seen in three tertiary hospitals in North-western Nigeria	Nigeria	2006-2013
Alabi et al., 2010	Clinico-pathological pattern of nasopharyngeal carcinoma in ilorin, Nigeria	Nigeria	1999-2008
Alex-Okoro et al., 2016	The comparison of the pathological data of oropharyngeal masses between HIV and non-HIV patients	Nigeria	2007-2014
Amusa et al., 2011	Laryngeal carcinoma: Experience in lle-lfe, Nigeria	Nigeria	1994-2004
Asante et al., 2017	Detection of Human Papillomavirus Genotypes and Epstein-Barr Virus in Nasopharyngeal Carcinomas at the Korle-Bu Teaching Hospital, Ghana	Ghana	2006-2012
Ayo-Yusuf et al., 2013	Trends and ethnic disparities in oral and oro-pharyngeal cancers in South Africa, 1992-2001.	South Africa	1992-2001
Bassey et al., 2015	Analysis of 46 cases of malignant jaw tumours in Calabar, Nigeria	Nigeria	2000-2013
Blumberg et al., 2015	Investigation of the presence of HPV related oropharyngeal and oral tongue squamous cell carcinoma in Mozambique.	Mozambique	2005-2013
Butt et al., 2012	Oral squamous cell carcinoma in human immunodeficiency virus positive patients: Clinicopathological audit	Kenya	-
dos Passos et al., 2015	Loupe magnification for head and neck free flap reconstruction in a developing country	South Africa	-
Douthit et al., 2016	Social determinants of health: Poverty, national infrastructure and investment	Ethiopia	-
Edreis et al., 2016	Molecular Detection of Epstein - Barr virus in Nasopharyngeal Carcinoma among Sudanese population	Sudan	2015-2016

El-Amrani-Joutey et al., 2018	Infection by Epstein–Barr virus in Fes (Morocco). Prevalence and predictors of positivity in nasopharyngeal cancer	Morocco	2012-2014
Elfeky et al., 2015	Hypopharyngeal reconstruction: a comparison of three alternatives	Egypt	2007-2010
Erasmus et al., 2013	The histology of nasopharyngeal masses: A comparison between HIV positive and HIV negative patients	South Africa	2006-2011
Erinoso et al., 2016	Emerging trends in the epidemiological pattern of head and neck cancers in Lagos, Nigeria	Nigeria	2003-2013
Faggons et al., 2017	Human papilloma virus in head and neck squamous cell carcinoma: A descriptive study of histologically confirmed cases at Kamuzu Central Hospital in Lilongwe, Malawi	Malawi	2010-2014
Garrana et al., 2018	Oral Squamous Cell Carcinoma, a growing problem.	South Africa	1990-2010
Gilyoma et al., 2015	Head and neck cancers: A clinico-pathological profile and management challenges in a resource-limited setting	Tanzania	2009-2013
Hounkpatin et al., 2020	Histo-Epidemiological Profile of Head and Neck Cancers in Benin	Benin	2009-2014
Ilboudo et al., 2019	Characterization of high-risk oncogenic human papillomavirus genotypes in histologically confirmed ear, nose and throat (Ent) cancers in burkina faso	Burkina Faso	2007-2017
Iseh et al., 2011	Total laryngectomy for laryngeal cancer in a Nigerian tertiary health center: Prognosis and outcome	Nigeria	2000-2009
Jalouli et al., 2010	Presence of human papilloma virus, herpes simplex virus and Epstein-Barr virus DNA in oral biopsies from Sudanese patients with regard to toombak use	Sudan	-
Jalouli et al., 2012	Human papilloma virus, herpes simplex virus and Epstein Barr virus in oral squamous cell carcinoma from eight different countries	Sudan	-

Kakande et al., 2010	Head and neck squamous cell carcinoma in a Ugandan population: A descriptive epidemiological study	Uganda	2004-2009
Kamulegey et al., 2017	Head and Neck Cancers Case Control Study of HIV Positive Compared to Negative Patients in a Ugandan Population Sample	Uganda	2014-2017
Kariche et al., 2018	Comparative assessment of HPV, alcohol and tobacco etiological fractions in Algerian patients with laryngeal squamous cell carcinoma	Algeria	2012-2016
Khaali et al., 2016	No association between TGF-β1 polymorphisms and risk of nasopharyngeal carcinoma in a large North African case-control study	Algeria, Morocco, Tunisia	2001-2004
Khammissa et al., 2014	Oral squamous cell carcinoma in a South African sample: Race/ethnicity, age, gender, and degree of histopathological differentiation	South Africa	1995-2002
Khlifi et al., 2014	Risk of laryngeal and nasopharyngeal cancer associated with arsenic and cadmium in the Tunisian population	Tunisia	2007-2009
Khlifi et al.,2013	Arsenic, cadmium, chromium and nickel in cancerous and healthy tissues from patients with head and neck cancer	Tunisia	2007-2009
Kodiya et al.,2016	Epidemiology of Head and Neck Cancers in Maiduguri-Northeastern Nigeria	Nigeria	2010-2014
Kofi et al., 2019	Infrequent detection of human papillomavirus infection in head and neck cancers in the Central African Republic: A retrospective study	Central African Republic	2009-2017
Laantri et al., 2011	XRCC1 and hOGG1 genes and risk of nasopharyngeal carcinoma in North African countries	Algeria, Morocco, Tunisia	2001-2004

Lasisi et al., 2012	Oro-facial squamous cell carcinoma--a twenty-year retrospective clinicopathological study.	Nigeria	1990-2009
Lawal et al., 2011	Social profile and habits of oral cancer patients in Ibadan.	Nigeria	1 year, 6 months
Makni et al., 2019	Association of common il-10 promoter gene variants with the susceptibility to head and neck cancer in Tunisia	Tunisia	2012-2015
Masamba et al., 2013	Case Report: Down-staging locally advanced head and neck cancer in an HIV infected patient in a limited resource setting	Malawi	-
Milad et al., 2018	Prevalence of human papillomavirus in benign and malignant laryngeal lesions in Egyptian patients: Cross-sectional study	Egypt	2014-2015
Mokni-Baizig et al., 2017	HLA-A*26-A*30 and HLA-DRB1*10 could be predictors of nasopharyngeal carcinoma risk in high-risk Tunisian families	Tunisia	-
Molomo et al., 2015	Discoid lupus erythematosus-related squamous cell carcinoma of the lip in an HIV-seropositive black male	South Africa	-
Moumad et al., 2018	Joint effect of smoking and NQO1 C609T polymorphism on undifferentiated nasopharyngeal carcinoma risk in a North African population	Algeria, Morocco, Tunisia	2002-2004
Moumad et al., 2013	Genetic polymorphisms in host innate immune sensor genes and the risk of nasopharyngeal carcinoma in North Africa	Algeria, Morocco, Tunisia	2001-2004
Mwansasu et al., 2015	Pattern of head and neck cancers among patients attending Muhimbili National Hospital Tanzania	Tanzania	2012-2013
Nabukenya et al., 2018	Head and Neck Squamous Cell Carcinoma in Western Uganda: Disease of Uncertainty and Poor Prognosis	Uganda	2016-2016

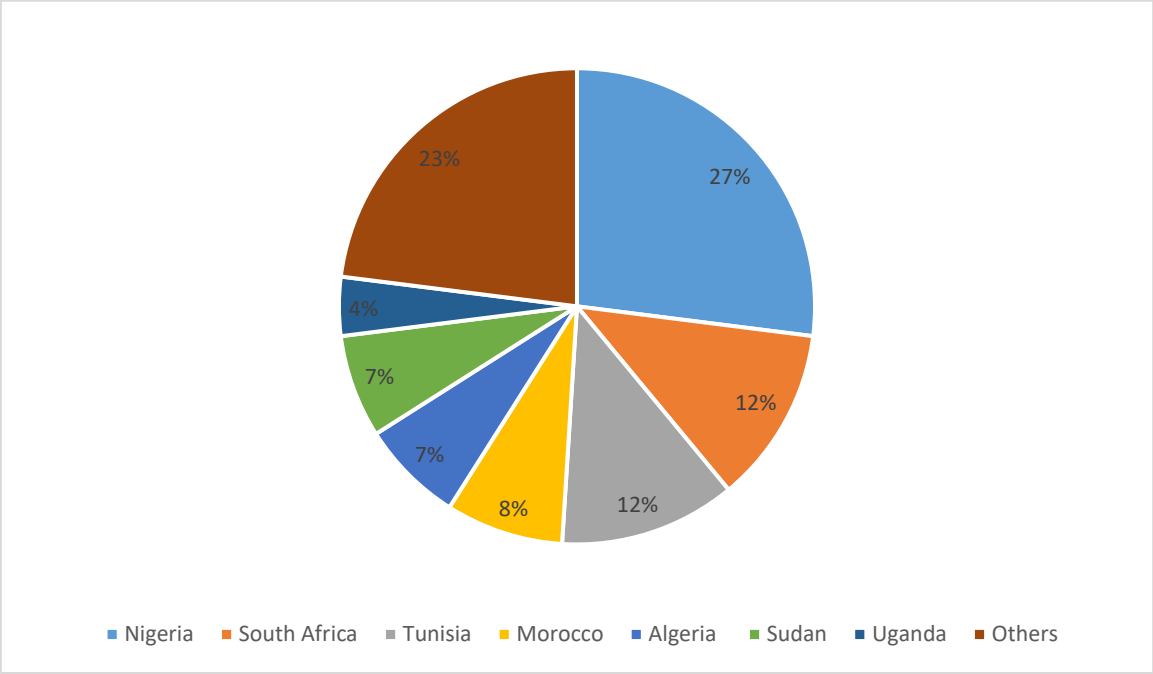
Ndiaye et al., 2013	The role of human papillomavirus in head and neck cancer in Senegal	Senegal	2002-2010
Oga et al., 2016	Paucity of HPV-Related Head and Neck Cancers (HNC) in Nigeria	Nigeria	1990-2011
Okwor et al., 2017	Survivorship of patients with head and neck cancer receiving care in a tertiary health facility in Nigeria	Nigeria	2002-2011
Omitola et al., 2017	A multi-centre evaluation of oral cancer in southern and western Nigeria: An African oral pathology research consortium initiative	Nigeria	1990-2016
Osman et al., 2010	Pattern of malignant tumors registered at a referral oral and maxillofacial hospital in Sudan during 2006 and 2007	Sudan	2006-2007
Paquette et al., 2013	Evidence That Alpha-9 Human Papillomavirus Infections are a Major Etiologic Factor for Oropharyngeal Carcinoma in Black South Africans	South Africa	2005-2010
Raissouni et al., 2013	Clinical prognostic factors in locally advanced nasopharyngeal carcinoma in Moroccan population	Morocco	2003-2005
Rettig et al., 2019	Oral Human Papillomavirus Infection and Head and Neck Squamous Cell Carcinoma in Rural Northwest Cameroon	Cameroon	2011-2017
Sabageh et al., 2015	Malignant tumors of the upper aerodigestive tract as seen in a Nigerian tertiary health institution	Nigeria	2000-2009
Sekee et al., 2018	Human papillomavirus in head and neck squamous cell carcinomas in a South African cohort	South Africa	2014-2017
Tealab et al., 2019	Prevalence of human papilloma virus in oropharyngeal, tongue and lip squamous cell carcinoma: An experience from the Egyptian National Cancer Institute	Egypt	2008-2015
Wided et al., 2015	Nasopharyngeal carcinoma incidence in North Tunisia: Negative trends in adults but not adolescents, 1994-2006	Tunisia	1994-2006

Note. A dash is in place where the date was not specified

As seen in Table 8, research on HNSCC was conducted in 19 out of the 54 African countries. Figure 5 demonstrates the country of each study.

Figure 5

Countries Where Studies Were Conducted

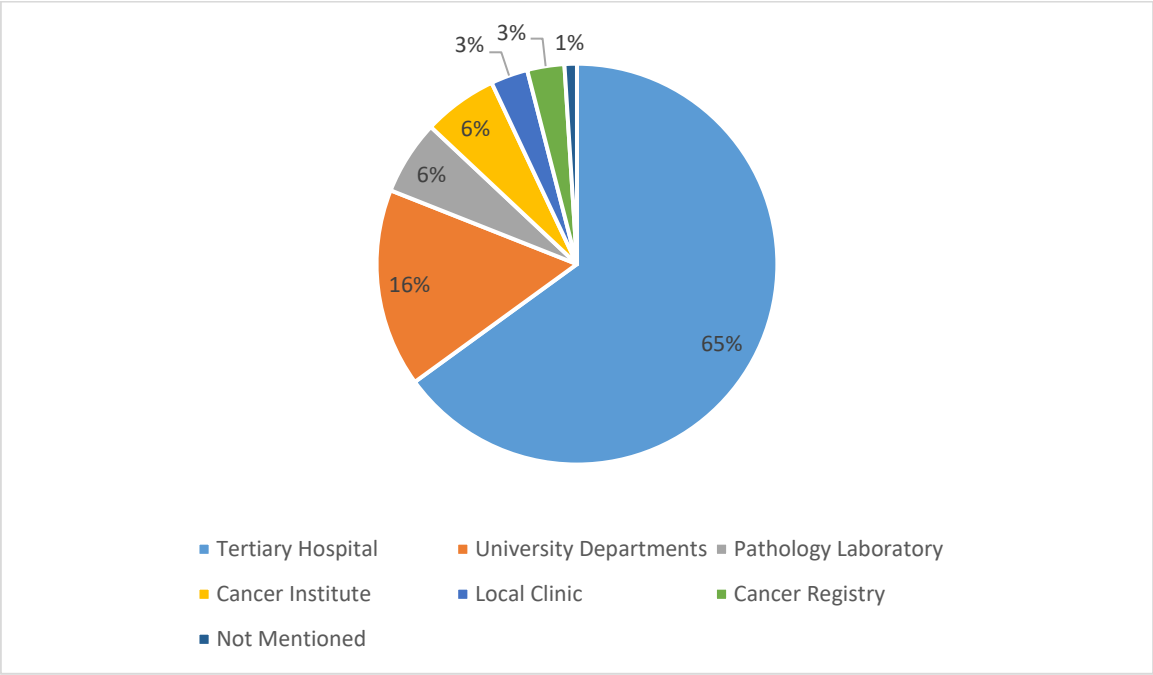


There were four studies that were conducted in more than one country, which included then a total of 74 countries between the 66 articles. Of these, most were conducted in Nigeria (n=20, 27%), with an emphasis on researching OSCC or OPSCC and the clinical pattern in various parts of Nigeria, as well as identifying risk factors with obtaining HNSCC, as seen in Table 8. The other counties, accounting for 23% of the countries, each had two or one study originating from the country, indicating a scarce amount of information in these regions. Countries in the Northern portion of Africa tended to study NPC. Southern African countries studied the epidemiology of HNSCC, as well as the impact of HIV on HNSCC, as well as HPV as a risk factor for OPC. Few studies from the articles were conducted in eastern and western Africa.

There were 98 sites for data collection between the 54 countries. Most articles focused on the main cities within their country. Figure 6 indicates the various types of locations that each study was done.

Figure 6

Context Where Studies Were Done



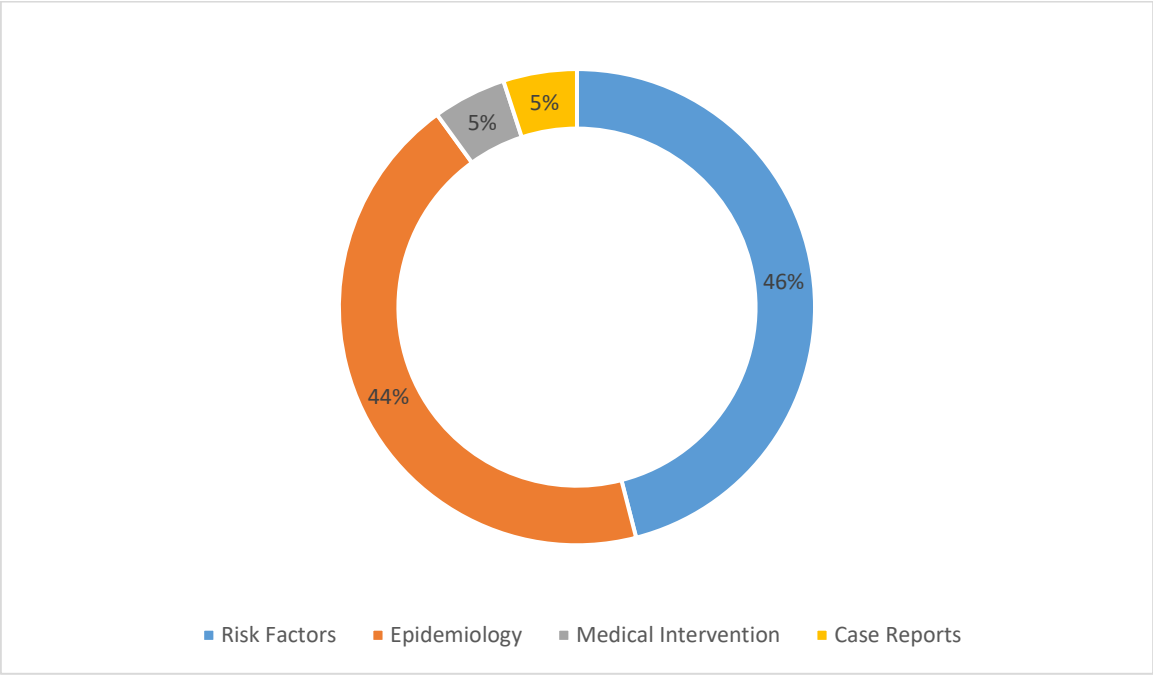
Of the 98 sites, 64 (65.3%) were conducted at tertiary/academic hospitals, as depicted in Figure 6. The studies done at the university departments (16.3%) were conducted at the local university's ENT, pathology, or oral medicine departments. The three studies conducted at the local clinic was only in Burkina Faso, as there is no tertiary hospital. One site was not mentioned. All of the articles were affiliated to a university. Six articles had an affiliation to an NGO as well as a university.

As depicted in Table 8, most of the studies collected data after 2000, however 14/66 (21.2%) collected data beginning from 1990, and ranging to the first decade of 2000. Most of these were done in Nigeria. The earliest data collection was from 1990, and latest was 2016. As a result, the collected data is studying a total population that extends over a period of 26 years.

The primary focus of the articles, as seen in Table 8, tended to be identifying risk factors. Figure 7 shows the focus of the articles.

Figure 7

Focus of the Articles



As seen in Figure 7, the primary focus in the articles aimed to identify the associated risk factors within a region, as well as identifying if specific risk factors are associated with obtaining HNSCC/NPC. That included, HPV, occupational inhalants, and substance abuse. The articles focusing on epidemiology (44%) included studies identifying the epidemiology, histopathology, or clinical pattern of HNSCC. All of the articles that focused on risk factors were a quantitative non-randomised study design. The remaining articles were quantitative descriptive study designs (n=32) and qualitative (n=3). The study designs inadvertently provide various limitations.

The most noteworthy limitations found between the studies were that they were retrospective in nature; studies not being representative of the country population; the sample sizes were too small; and there was missing data. Due to the retrospective nature of the study designs, the researchers had no control over the data they reviewed. Most of the data were retrieved from hospital patient files, or pathology specimens. As a result, there was often missing data/specimens. Furthermore, the hospital-based demographics means that the individuals are not necessarily representative of a whole country. Rather, the demographics relate to the specific hospital.

The limitation of missing information is supported by the primary theme of poor access to healthcare and resources. The thematic analysis of the first subgroup of HNC supports this idea of missing

information in an article by Gilyoma et al. (2015, pg. 779), who stated, “One of the salient and challenging outcomes of this analysis is the poor levels of staging for cancer. Most of the cancers were poorly staged or the records could not be verified” (Gilyoma et al., 2015, pg. 779). The themes found in the systematic review are discussed in the following section.

4.3. Overview of the Epidemiology of HNC

The results retrieved from the articles were primarily analysed quantitatively, by using descriptive statistics and qualitatively with thematic analyses for the articles studying the epidemiology of HNC as a whole, and not specific sub-sites.

Through thorough and repeated reading of the 24 articles related to HNC, the emerging themes were coded and grouped together into categories, according to the primary objectives. That included initially documenting the types of HNC, the signs and symptoms experienced; stages of HNC; risk factors; treatment protocols; and the MDT involved. Secondly, the race, gender, age at diagnosis, and SES were commented on. The primary themes emerged and these will be expanded on in each section, after the quantitative results are discussed. Semantic, explicit minor and major themes emerged from the data. The emerging themes depicted in Table 9.

Table 9

Emerging Themes from the Systematic Review

Major Themes
1. Increasing Prevalence
- OC and OPC is on the rise around Africa, relating to substance abuse, and in some countries, HPV
- NPC is increasing in Northern Africa, relating to tobacco, occupational exposure, diet and genetic predispositions, predominantly older males.
2. Identification of Risk Factors
- Primary focus of articles
- HPV
- Use of tobacco and alcohol
3. Poor Access to Healthcare and Resources
- Limited research on HNC

- Late stage cancer and health-seeking behaviours
- Medical intervention is primarily surgery
- Follow up services limited, and poor adherence to treatment
- Prevention and education programmes
- Lower SES are more at risk

Minor Themes
1. Limited data on signs and symptoms experiences, MDT involved, and race differences
2. Males more at risk
3. Age relates to risk factors

The themes, with the evidence from the articles will be expanded on in each section, after the quantitative data has been presented.

4.4. Types of HNSCC/NPC, Anatomic Sites, and Histology

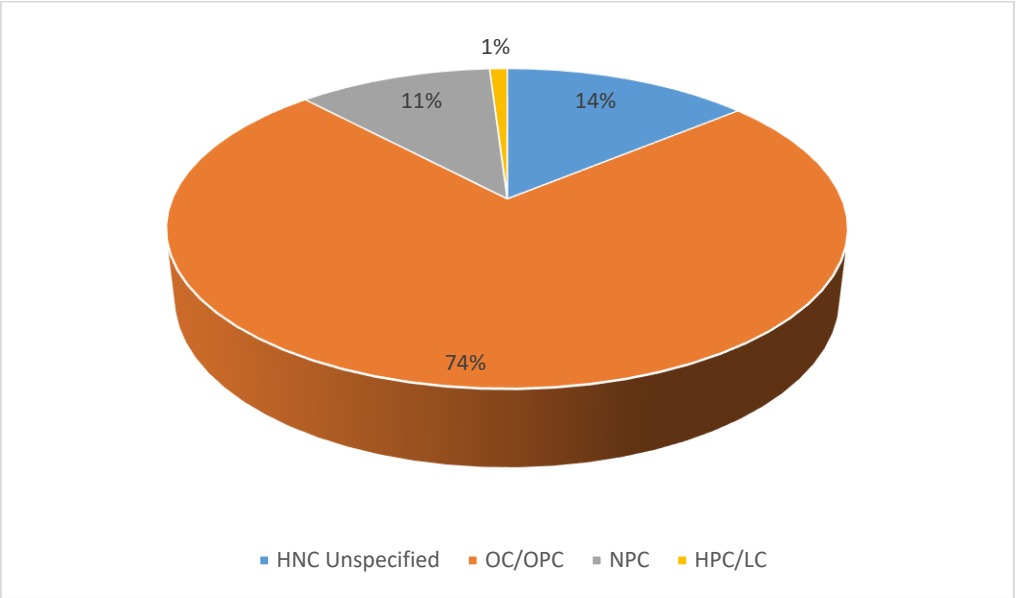
4.4.1. Types of HNSCC/NPC and Anatomic Regions

A total of 66 articles were identified, which included 35409 patients that were diagnosed with HNSCC/NPC. Of the 35409 participants, 35463 specimens were obtained, as some participants had more than one anatomical region affected. The data was divided into four main categories, i.e. HNC (24 articles); OC/OPC (23 articles); NPC (14 articles); and LC/HPC (5 articles). Appendix 7 includes the name of each article, and the subcategory it belongs to. Although the 4th edition of the WHO's classification done in 2017 has divided oral cancer and oropharyngeal cancer as a result of the association of HPV and OPC, most studies were done prior to 2017 and therefore combined the two sub-sites (Westra & Lewis, 2017). A primary theme revealed from the first subcategory (HNC) was an increase in the prevalence of HNC across Africa. Reasons for the increased prevalence included the increase in sexual practices causing HPV, and the use of tobacco, and alcohol. Trends of increasing NPC have revealed Epstein-Barr Virus, substance abuse and a genetic component. These will be further discussed in the risk factors section (section 5.4.2.).

Of these articles, the participants were diagnosed with various types of HNC. Figure 8 shows the distribution of HNC, which were grouped according to the anatomical proximity of the regions, as well as how the authors within articles grouped them.

Figure 8

Distribution of Types of HNC



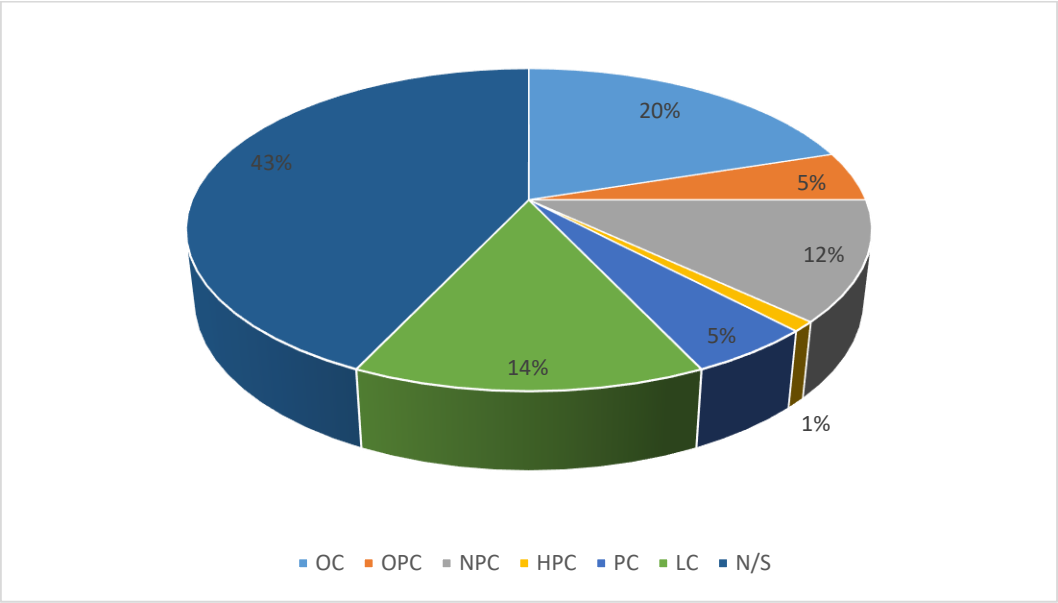
Note. HNC Unspecified is the first subcategory that was used for the thematic analysis.

Oral and oropharyngeal cancer were the most studied HNC, and, as depicted in Figure 8, with the highest frequency of participants (74%). This relates to the first theme of increasing prevalence. The increase in prevalence has called for an increase in research on OC/OPC. Some articles could not identify the reasons for the increased prevalence, whilst six articles identified the rise of HPV incidence as a primary cause.

The category of HNC included articles that pertained to HNSCC as well as HNC (with the primary diagnosis being HNSCC). Figures 9-11 indicates the anatomic sub-site, as well as the number of participants in each article. Figure 9 represents the articles that studied HNC as a whole in Africa, and the sub-sites of those included OC, OPC, NPC, HPC, PC, AND LC. The same articles in the HNC subcategory were used for the thematic analysis.

Figure 9

Affected Anatomic Sub-sites of Head and Neck Region



Note. OC is oral cancer; OPC is oropharyngeal cancer; NPC is nasopharyngeal carcinoma; HPC is hypopharyngeal cancer; PC is pharyngeal cancer; LC is laryngeal cancer; N/S is not specified.

Most of the articles in the HNC category did not specify the sub-site, but rather grouped the HNC together. The most common reported sub-site of the articles that did differentiate was oral cancer (20%), and the least reported was hypopharyngeal cancer. This is synonymous to the remaining data found by the researcher, as most of articles reviewed pertained to the oral cavity and least to the hypopharynx. That being 23 out of the 66 articles (35%), and 1 out of 66 (2%) respectively. Furthermore, thematic analysis on the articles conceded that OC/OPC is a growing problem across Africa.

Not only was OC/OPC the most prevalent HNC studied, OC/OPC was mentioned in 16 of the 24 articles thematically analysed, and accounted for 1244/2805 of the participants (44%) where the sub-site was specified. The rise of OC/OPC is related to the use of tobacco and alcohol, and in four countries, to HPV. These countries included South Africa, Burkina Faso, Sudan, and Ghana (Aboagye et al., 2019; Ahmed et al., 2012; Gilyoma et al., 2015; Sekee et al., 2019). Five studies from the thematic analysis found little association between those with HNSCC/NPC and HPV. These countries included Cameroon, Senegal, Malawi, Nigeria, and Central African Republic (Faggons et al., 2017; Kofi et al., 2019; Ndiaye et al. 2013; Oga et al., 2016; Rettig et al., 2019). Risk factors within these countries, however, could not be obtained, and further studies to identify the associated risk factors were suggested.

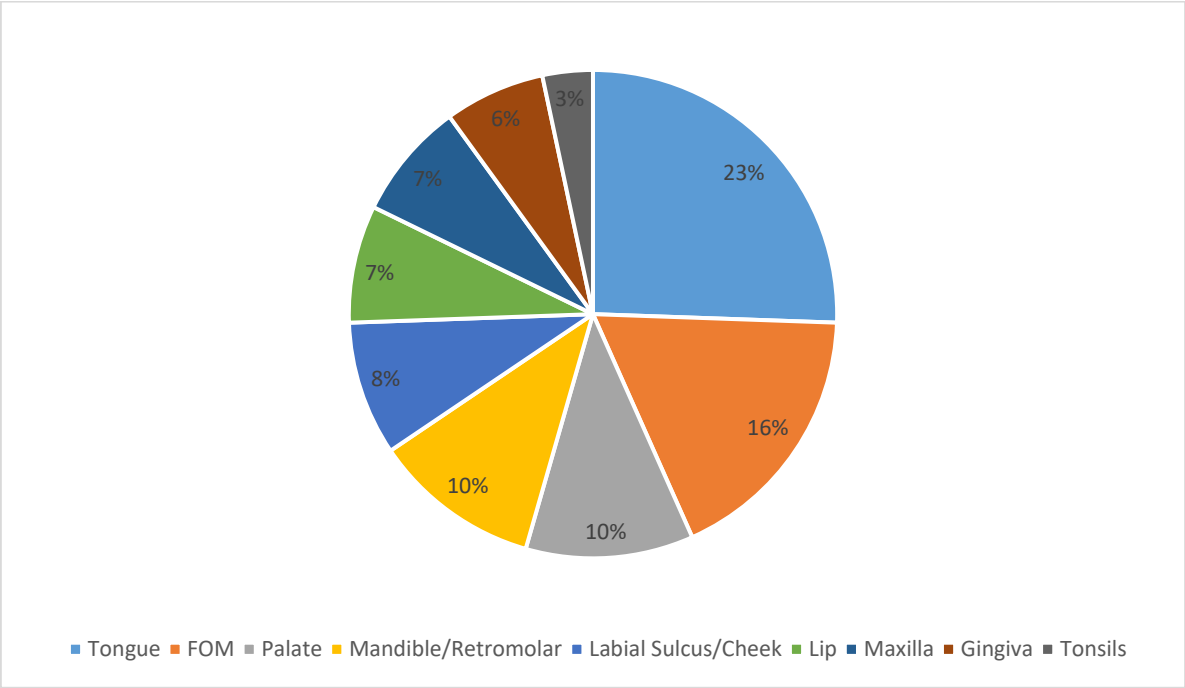
Reasons as to why HPV is a risk factor for some countries versus others will be expanded further in section 4.7. The results revealed that HPV is strongly related to obtaining OC/OPC, opposed to other types of HNC, and the study done by Ahmed et al. (2012, p. 6085) is in line with this finding in saying that "HPV infections were more frequently identified in the tumour tissues from oral (40%) followed by larynx and pharynx". The thematic analysis of OC/OPC being on the rise is further supported by the lack of HPV prevention and promotion programmes in Africa. The countries that found an association all concluded that "The appropriate HPV vaccination will considerably reduce the number of these cancers" (Ilboudo, 2019, p. 3429). Although HPV plays a role in some articles, thematic analysis confirmed the use of tobacco and alcohol as a primary reason for increasing HNSCC, including OC/OPC, LC/HPC, and NPC.

The study done in Nigeria by Akinshipo et al. (2012, p. 113) concluded that "This present study demonstrates the rising trend of HNCs in these regions and highlights the urgent need for adoption of grass root policies that would incorporate public participation especially those under 40 years, in the awareness on the harmful use of carcinogenic substances such as tobacco and alcohol and dangerous sexual habits." This highlights the increasing burden of HNC, and the need to target younger populations about the associated risk factors and practices. The gender and age differences related to OC/OPC in Africa will be discussed in section 4.10. with the other demographic data.

Figure 10 indicates the articles that researched OC/OPC specifically. The researcher combined these two sub-sites, as many articles combined these two areas as they are anatomically proximal.

Figure 10

Affected Anatomical Sub-sites for the Oral and Oropharyngeal Cavity



Note. FOM is for floor of mouth.

Most OC/OPC articles did not identify the anatomic sub-site but differentiated between OP verses OPC (13/23, 57%), of which most participants studied had OPC (71%). There were 10% of articles that did not differentiate a sub-site at all. Two articles had more than one sub-site per participant, and therefore sub-sites are calculated in comparison to total sub-sites, versus participants.

Figure 10 indicates that the tongue is the most prevalent anatomic sub-site (23%). Reasons for why this is the case were not given. The South African study done by Khammisa et al. (2014) further found an association with tongue cancer being more prevalent in people of a black race, whereas the FOM is the most affected area, which also accounted for 16% of the participants. Reasons for this were not given.

NPC is the third subcategory found between articles. None of the articles discussed the sub-site within the NP cavity. Rather, the NPC was differentiated between the histological types. The increasing number of NPC was confirmed in that 14/66 (21%) made it the primary focus of the study. Furthermore, the thematic analysis of the HNC subcategory found that 606/2805 (22%) of the participants with a specified anatomic type had NPC. This is further supported by the study done in southern part of Nigeria (Ibadan) by Okwor et al. (2017) who found that NPC was the most prevalent

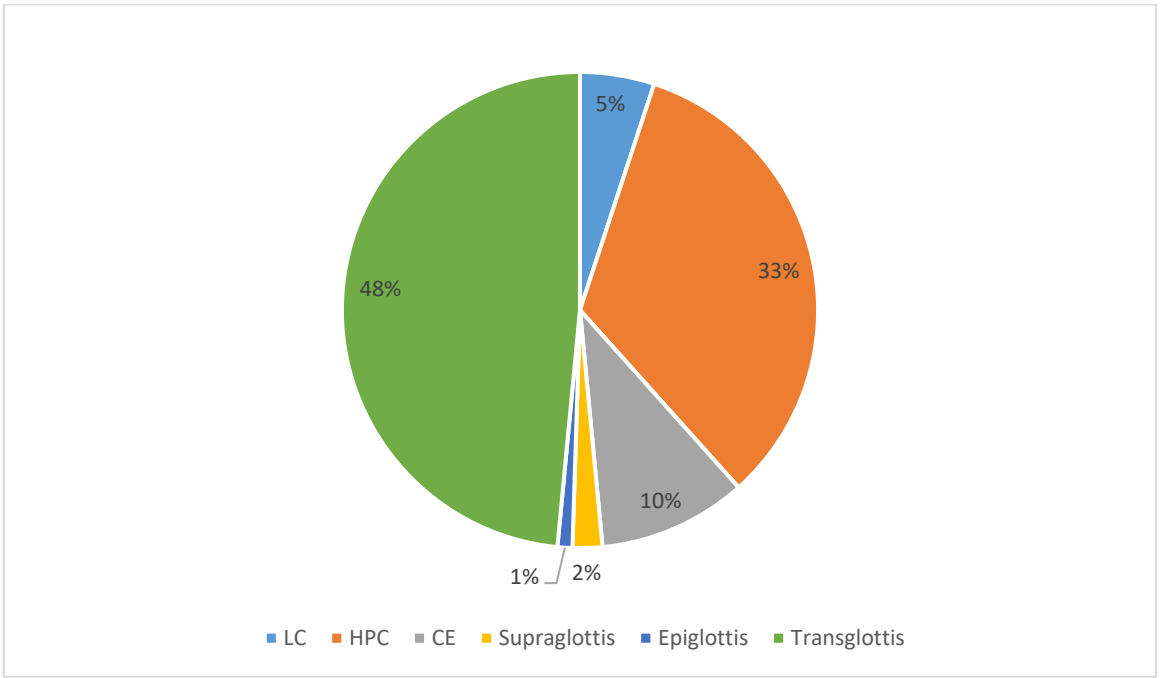
of HNC's. This is in contrast to the study done by Eriniso et al. (2017) who found the most prevalent of HNC's in southwest Nigeria (Lagos) are oral cavity. The reason for the higher prevalence of OC versus NPC in this region in Eriniso et al.'s (2017) study could not be concluded.

The rise of NPC, particularly in the Northern part of Africa is supported by the study done by Makni et al. (2019) who attempted to review the association of gene variants with the susceptibility of HNC (namely NPC) in Tunisia. The results concluded that there are gene variations that cause an increased susceptibility in obtaining NPC, and a "possible role for these variants as biomarkers for early detection of HNC and especially the NPC subtype" (Makni et al. 2019, p. 127). The thematic analysis further supports the rise of NPC in the Northern part of Africa, when studies done by Khlifi et al. (2013 & 2014) attempted to find associations of exposure of chemicals (arsenic, cadium, chromium and nickel) to people with NPC and LC in Tunisia. The study concluded that those exposed to these metals via occupational exposure and tobacco are at an increased risk of obtaining NPC and LC. The demographic data revealed by the thematic analysis relating to NPC will be discussed in section 4.10.

HPC/LC is the fourth category and was combined as some articles combined the two sub-sites due to their proximity anatomically. Figure 11 indicates the articles that documented the affected sub-sites of the HP and LC cavities.

Figure 11

Affected Anatomical Sub-sites of the Hypopharyngeal and Laryngeal Cavity



Note. LC is for laryngeal cancer; HPC is for hypopharyngeal cancer; CE is for cervical oesophagus

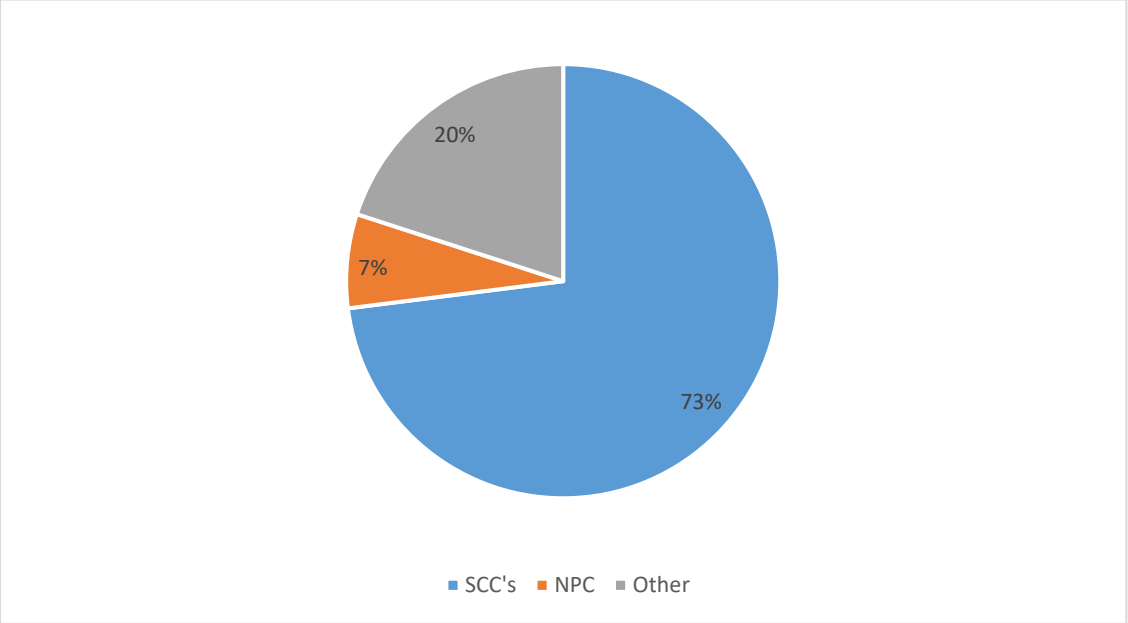
Only one of the five articles specifically documented the hypopharynx, however had the most participants, accounting for 104/260 (40%) of the participants. The most reported sub-site was the transglottis (48%), followed by the hypopharynx (33%); and the cervical oesophagus (10%). The remaining sub-sites attributed to 5% or less of the reported sites.

4.4.2. Histology of the HNSCCs/NPCs

As the researcher aimed to identify cancers specifically that were SCC, the predominant histological type was SCC, with the exception of NPC, which has its own subcategories. The data was divided into SCC, NPC (either WHO I, II or III), and other. Figure 12 shows the distribution of histological types.

Figure 12

Histological Types of HNC



As shown in Figure 12, the predominant histological type is SCC (73%). The "other" subcategory included other carcinomas, lymphomas, sarcomas, benign masses, and premalignant masses, as well as articles that did not specify the histological type. Most noteworthy "other" cancers included non-Hodgkin lymphoma (n= 34/5416, 1%) and Kaposi's sarcoma (n=27/5416, 1%), even though they make up a small proportion overall.

The subcategory of OC/OPC included the predominant amount of SCCs in the current study, that being 22420 (86% of SCCs). The "other" histological types accounted for 3728 of the cancers found in the subcategory of OC/OPC, which was 14%. All of the cancers in the LC/HPC category were SCCs (240/240,

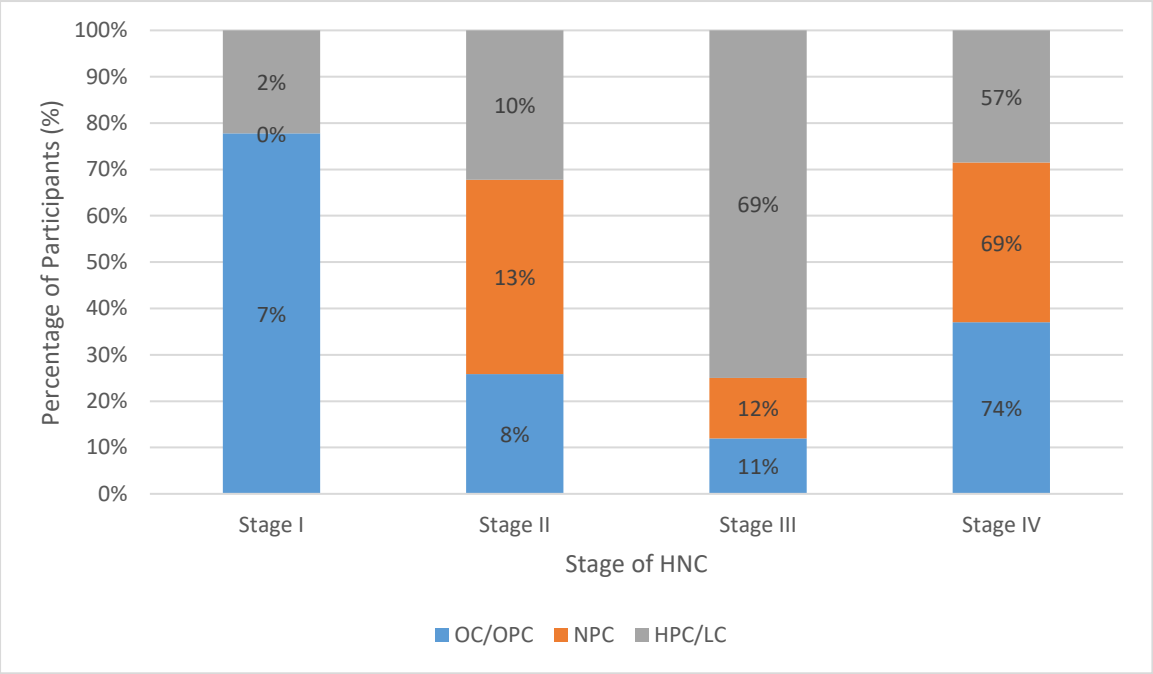
100%). The most prevalent histological type for NPC was WHO type III (UNC), accounting for 97% (n=2238/2317) of the specified NPC histological types. Type I and type II only accounted for 1% (n=16/2317) and 3% (n=63/2317) respectively. The remaining 1804 participants in the NPC subcategory did not have their histological types specified.

4.5. Stage of HNSCC/NPC

In total, there were 19/66 (29%) articles that reported the stage of HNSCC/NPC, with a total of 2489 participants. Of the articles reporting stage, there was missing data for 16% of the participants (n=404). Furthermore, five of the 19 articles only commented on early versus late stage cancer. Majority of the participants were reported to have late stage cancer (n=432, 94%). Figure 13 shows the articles that commented on the stages, and is divided according to the anatomic regions that were affected.

Figure 13

Stages of HNC According to Anatomic Region



Of the documented stages from I-IV, majority of participants (934/1653, 57%) were diagnosed with stage IV cancer. With regards to the types of HNC, the largest proportion of stage IV cancers was found in the OC/OPC group (n= 272, 74%), and secondly the NPC group (n=400, 69%). HPC/LC was predominantly diagnosed at stage III (n=64, 80%). Only 19% of the participants had early stage cancer, i.e. stage I, and II. Most were stage II versus stage I, and the HNC with the highest proportion of stage

I and II was the HPC/LC group (20%). Data relating to the stage of HNC was missing for 16% of participants.

The findings support the thematic analysis of the first subcategory which found that most HNC's were diagnosed at a late stage. There were six articles in the thematic analysis that identified the stage of HNC. Of the six, 946/1051 (90%) of participants were diagnosed at a late stage, that being, stage III and IV versus the 105 participants (10%) diagnosed at stage I and II. Nabukenya et al. (2018, p. 6) conceded this by saying "The majority of our patients with HNSCC present with late stage, and the prognosis is poor." Late stage HNC from the thematic analysis was found in South Africa (dos Passos et al., 2015); Tanzania (Gilyoma et al., 2015); Tunisia (Khlifi et al., 2013); Nigeria (Okwor et al., 2017); and two in the southern and western part of Uganda (Kamulegey & Otiti, 2017; Nabukenya et al., 2018).

Three of the articles attempted to find associations between the stage of cancer and other attributing factors. The article by Kamulegey and Otiti (2017) from Uganda, found no association between stage of HNC and those with HIV and not with HIV, however concluded that more studies would need to be done to prove this. The article by Khlifi et al. (2013) found no association between the type of cancer and the stage of HNC, however the article by Nabukenya et al. (2018) found that LC was typically diagnosed earlier (60% of LC cases) as a result of the primary symptom being difficulty breathing, and thus causing participants to attend the clinic sooner and get diagnosed earlier versus the participants with OC/OPC and LC. The same study also found that later stage diagnosis was related to a lower SES. Reasons for this were not given (Nabukenya et al., 2018). The late stage diagnosis relates to the primary theme that emerged that there is poor access to healthcare and resources, and the health-seeking behaviours.

According to the articles, the reason for late stage diagnoses could not be specifically identified, as all of the studies were retrospective in nature. The researchers thus postulated that the late stage diagnosis could be as a result of poor public knowledge and education related to HNC and the associated risk factors; screening programmes, and poor prevention and control measures within each country. The study done by Okwor et al. 2017 particularly suggested that a reason for late stage diagnosis was related to poor education of HCPs and the general public around HNC and risk factors. The article by Gilyoma et al. (2015) conceded this by concluding "The large number of patients with advanced stage at the time of diagnosis may be attributed to by the fact that the majority of patients

in the current study presented late to our health facility." Gilyoma et al. (2015) further postulated that the reason for this was because of the following:

> The majority of the patients in our environment, especially those in the rural areas lack the financial means to access modern health facilities due to high poverty level and this is further compounded by harmful traditional beliefs and practices which make them visit the herbalist for solution their $_{\text{health}}$ problems so that by the time they present to us, their tumours would have reached advanced stages and hence a poor outcome in management. (p. 776).

This suggests that late stage diagnosis is multifaceted but can be related to health-seeking behaviours, financial means, and education/knowledge around HNC and early identification of diseases. Okwor et al. 2017 (p.8) suggested that "Health care providers should be trained to refer suspected cases promptly to tertiary health facilities for management".

The stage of HNC is strongly related to the signs and symptoms associated, as the more severe the disease, the more severe the signs/symptoms will be (Faggons et al., 2017).

4.6. Signs and Symptoms Associated with HNSCC/NPC

There was a total of 45 different signs and symptoms reported and an overall 2343 reported signs and symptoms, of which some studies documented the most prevalent sign or symptom (i.e. one sign or symptom per participant), and others listed all of them (more than one per participant). The distribution of symptoms was wide spread. There were 14 articles that extrapolated the signs and symptoms of the participants. Of which, one was in the subcategory HNC, six within OP/OPC, four within NPC, and three within HPC. The signs and symptoms were aligned with the type of HNC.

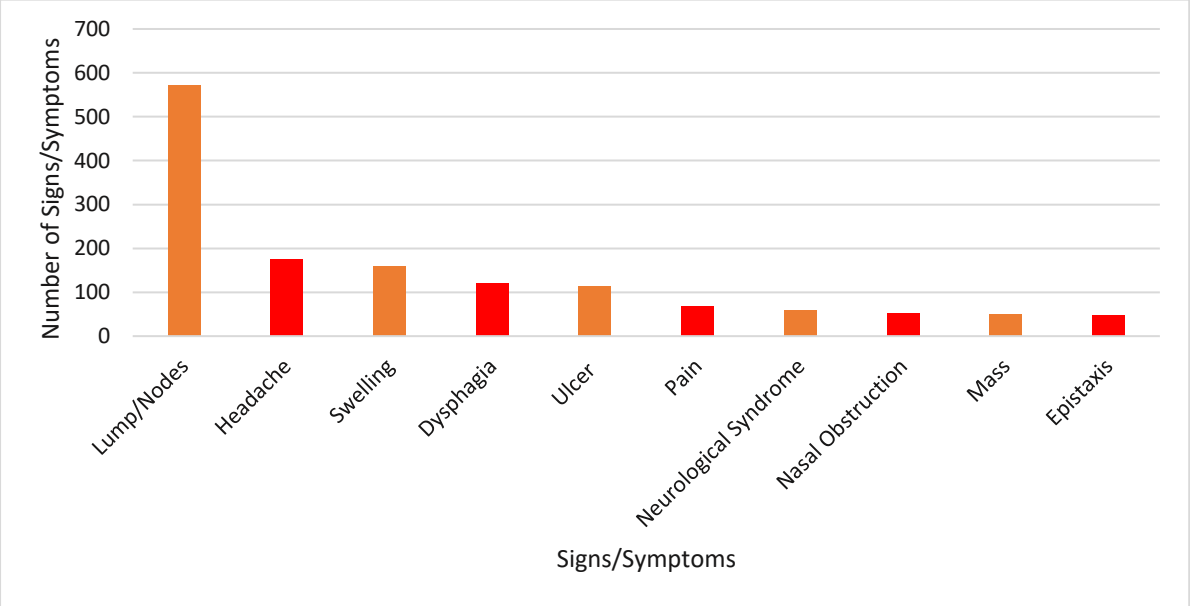
It was also noted that there were three primary categories of symptoms, which were also reflective of the type of cancer, namely oral symptoms, associated with OC/OPC; nasal symptoms and otologic symptoms associated with NPC; and pharyngeal/laryngeal symptoms associated with HPC/LC.

Oral symptoms accounted for 121/2343 (5%) of all signs and symptoms, and included oral dysphagia (difficulty in the oral phase of swallowing), loss of taste, deviation of tongue, missing/loose teeth, toothache, tooth decay, trismus (lockjaw), halitosis (bad breath), and leukoplakia (white lesions in the mouth). Nasal and otologic symptoms, associated with NPC, accounted for 369 (16%) of all signs and symptoms and included loss of smell, nasal bleeding or discharge, sinus discharge, nasal obstruction,

stridor (audible breathing) and difficulty breathing. Otological symptoms accounted for 282 (12%) of all signs and symptoms and included ear discharge, earache, tinnitus (ringing in the ears), and/or hearing loss. Pharyngeal/laryngeal symptoms accounted for 238 of all symptoms/signs (10%), and included hoarse or muffled voice, coughing, pharyngeal dysphagia (difficulty swallowing), odynophagia (pain when swallowing), and requiring an emergency tracheostomy due to difficulty breathing. The top ten most reported signs and symptoms amongst HNC are depicted in Figure 14.

Figure 14

The Top Ten Most Reported Signs and Symptoms



The development of lumps or lymph nodes in the cervical area was, by far, the most reported sign, accounting for 572/2343 (24%) of all reported signs and symptoms. Most articles that reported cranial nerve (CN) damage, did not specify which CN's were damaged. The largest nasal symptom was nasal obstruction, which accounted for 53 (2%) of all signs and symptoms. The last most reported symptom/sign was epistaxis (nose bleeds) (n=48, 2%). The remaining 35 signs and symptoms accounted for less than two percent of all signs and symptoms.

4.7. Risk factors of HNSCC/NPC

The majority (30/66, 45%) of the articles obtained sought to identify specific associated risk factors, or all of them upon patient file review. Of these, 13 were in the overall category of HNC, 7 within OC/OPC, 8 for NPC, and 2 for LC/HPC. A total of 6425 participants were between the 48 studies that documented risk factors. Of which, there was missing data for 520 participants, and 1052 participants claiming to not have one or more of the risk factors. All of the articles in the HNC category evaluating

risk factors had a predominance of SCC, and therefore the results are a clear reflection of SCC, and/or NPC. Thematic analysis of the 24 articles conceded that the identification of risk factors was a primary focus of research. There were 13/24 (54%) articles attempting to identify various risk factors.

In total, there were 25 different risk factors identified between the studies. The largest risk factor identified overall was tobacco, accounting for 2007 of the 4853 reported risk factors (41%). That includes the subcategories of smoking, or chewing tobacco; smoking occasionally; being exposed to second hand smoke; and smoking "shisha", which contains tobacco.

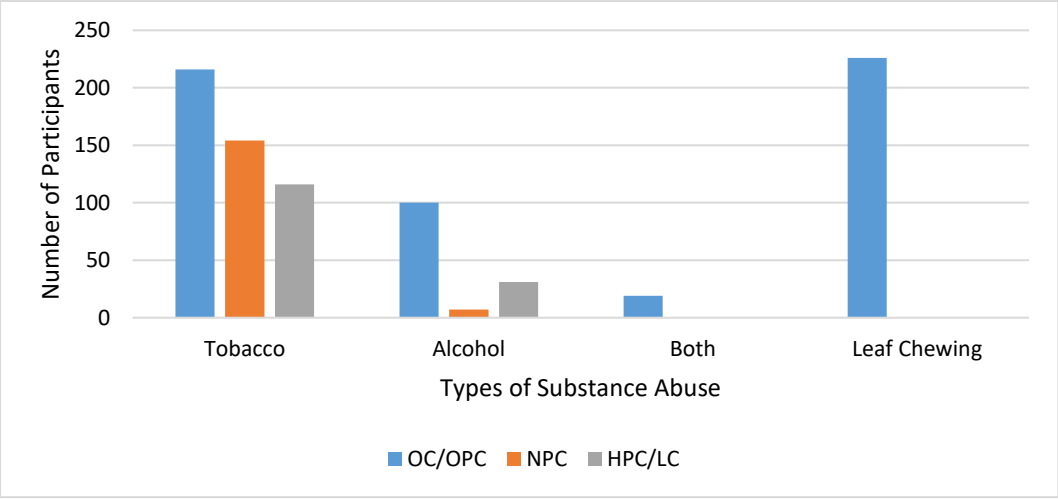
Overall, two primary categories for risk factors were revealed, including substance abuse and infectious diseases. A third category including other less significant has been discussed, which included diet, genetic predisposition, and occupational inhalants.

4.7.1. Substance Abuse Risk Factors

Figure 15 shows the various types of HNCs related to the types of substance abuse. The types included alcohol use, tobacco use, both (smoking and alcohol), and leaf chewing.

Figure 15

Substance Abuse Risk Factors for HNC



Tobacco use was the overall largest substance being used between all three HNC subcategories (56%). Leaf chewing was also a significant risk factor for OP/OPC, accounting for 40% (n=226) of substances abused for OP/OPC. Of which, Toombak was the only leaf chewed, and participants were all from Sudan between three studies (Jalouli et al., 2010; Jalouli et al., 2012; & Osman et al., 2010). Within the thematic analysis, Neffa (leaf) was also found to be chewed in one study done in Tunisia (Khlifi et

al., 2013). The contribution of alcohol as a risk factor accounts for 18% of the OC/OPC risk factors. Although, alcohol appears to be a relatively low risk factor for the NPC (n=7, 4%) and HPC/LC (n=31, 21%) group, the thematic analysis of the HNC subgroup revealed that alcohol is still a primary risk factor for developing HNC.

The reason for a lower alcohol risk factor is related to the use of alcohol of the NPC and HPC/LC group, that is attributed to the geographical location of the studies and the religious practices. There were 22/25 Northern African countries within the NPC and HPC/LC group whose largest religion is Islam (Reid, 2012). That included Nigeria, Sudan, Morocco, Algeria, Egypt, and Tunisia. The authors of these studies concluded that the reason for low alcohol use can be related to the Islamic practices of alcohol abstinence (Adewuyi et al., 2013; Alabi et al., 2010; Hortal et al., 2018; & Wided et al., 2015). Thematic analysis of the larger HNC category that reviewed alcohol as a risk factor conceded this finding, as they were not in the above-mentioned Islamic countries, but rather in countries that are predominantly Christian and do not practice alcohol abstinence. These countries were South Africa, Malawi, Tanzania, and Uganda.

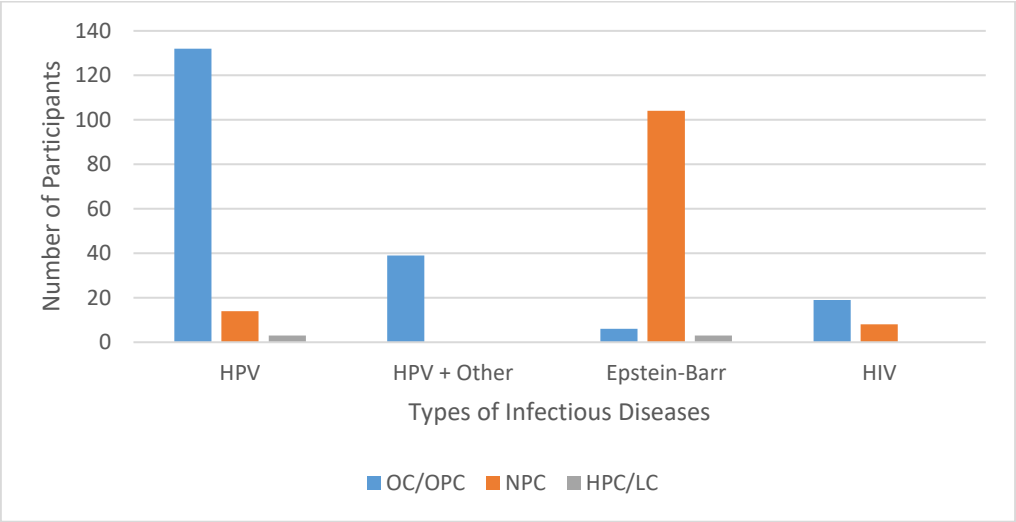
The systematic review revealed that tobacco and alcohol use remain the two largest risk factors, when compared to all other risk factors; however, the rise of HPV has led to an increased risk of HPV-related HNC.

4.7.2. Infectious Diseases as Risk Factors

HPV amongst other infectious diseases is illustrated in Figure 16.

Figure 16

Infectious Diseases as Risk Factors for HNC



Infectious diseases accounted for far less than substance abuse, which was identified in the thematic analysis, when five countries found it not to be a risk factor. The discrepancy in participants and the associated risk factors included 869 participants that made use of a substance, verses 328 participants with an infectious disease. One of the most noteworthy infectious diseases was HPV as a risk factor for OC/OPC, accounting for 67% (n=132) of infectious diseases amongst the OC/OPC group.

Although HPV levels versus substance abuse was a lower risk factor, the majority of articles focused on identifying if it was a risk factor in the country. That included nine articles in the HNC subcategory/thematic analysis, five for OC/OPC, one for NPC, and two for HPC/LC subcategories. The focus of research indicated a rise of HPV and other infectious diseases as a risk factor, as well as the results from the studies.

Thematic analysis of the first overall category of HNC conceded this, and identified HPV as a contributing risk factor, with 258 people overall having HPV and/or HPV and another infectious disease. Although this only accounts for 5% of the risk factors, researchers indicated that the numbers are rising in particular countries versus others. The main countries from the systematic review that found HPV to be a risk factor for obtaining HNC, particularly OPC included Kenya, South Africa, Sudan, Burkina Faso, and Ghana (Aboagye et al., 2019; Butt et al., 2012; Ilboudo et al., 2019; Jalouli et al., 2010; Jalouli et al., 2012; & Paquette et al., 2013). Countries that did not find it to be a risk factor after specifically assessing for it included Cameroon, Mozambique, Malawi, Central African Republic,

Senegal and Nigeria (Blumberg et al., 2018; Faggons et al., 2017; Kofi et al., 2019; Ndiaye et al., 2013; Oga et al., 2016; & Rettig et al., 2019).

This is further supported by the thematic analysis, which found some countries having HPV as a risk factor (Aboagye et al., 2019; Ahmed et al., 2012; Gilyoma et al., 2015; Sekee et al., 2019) and some not (Faggons et al., 2017; Kofi et al., 2019; Oga et al., 2016; Rettig et al., 2019). Reasons why it was versus was not a risk factor in all of the countries suggested a possible discrepancy in sexual practices. This was specifically the case in Malawi, who concluded that oral sex, that can cause HPV-related HNC, is uncommon, versus the rate of cervical cancer related to HPV being high due to unprotected vaginal sex (Faggons et al., 2017). The study in Central African Republic (Kofi et al., 2019, pg. 3) suggested "that other established risk factors such as alcohol and tobacco consumption as well as eating habits may play a more significant etiological role than HPV infection in HNC in this country". All of the studies also suggested limitations to the study, in that the sample sizes were small and specific to one hospital (Faggons et al., 2017, Kofi et al., 2019; & Rettig et al., 2019); as well as "possible poor tissue processing" (Oga et al., 2016).

The second largest infectious disease amongst NPC was Epstein-Barr Virus. Two articles done in Sudan found that people with OC/OPC, can be co-infected with HPV and another STI, including EBV and HSV (herpes simplex virus), or all three (n=39, 20%). Both studies concluded, however, that the influence of viral coexistence in OC development remains unclear.

HIV was studied in six articles between the OC/OPC, NPC, and HPC/LC subgroups. Of this, there were 78 participants that had their HIV status recorded. Of the 78, 27 were HIV positive (35%). This is a high proportion, and conclusions from all the studies, included in the thematic analysis revealed that more research on the reasons for this high proportion, and to identify the role of HIV in developing HNSCC/NPC in Africa. There was one study that documented HIV in people with HNC in the thematic analysis. The current study done by Kamulegey and Otiti (2017) in Uganda which found an increased prevalence of HNC in people with HIV (15% of participants) versus the countries overall HIV prevalence of 7.3%. The participants were separated people with HNC that were HIV positive and those that were negative. The study sought out participants in order to have matching genders, ages, and diagnosis in order to limit any contributing factors. The findings suggested that there was no difference in presentation of the disease between those with HIV and those without. The primary difference was that those with HIV sought care significantly later than those without. Reasons for this could not be

commented on. Furthermore, the study that the reasons for a higher prevalence of HIV in those with HNC could not be concluded, indicating a need for more research.

4.7.3. Other Associated Risk Factors

The final subcategory includes the least proportionate of risk factors when compared to substance abuse and infectious diseases. Most noteworthy of these includes poor diet as part of developing OPC/OC, and genetic predisposition for developing NPC. Occupational inhalants were found in the NPC subcategory, and thematically in the general HNC group. There were no noted risk factors in this subcategory for the HPC/LC group.

Poor diet was found to be a risk factor when developing OPC, however this was only documented in one article. It was found that 81% (n=26) of the participants did not have daily vegetable intake, and 94% (n=30) did not have regular fruit intake.

Three studies within the NPC and general HNC categories documented the increased consumption of salted and fresh fish and tap water, however only one study concluded that salted fish was an identified risk factor for the development of NPC. The articles in the HNC category included participants with NPC, and LC/HPC. The arsenic (As), cadmium (Cd), nickel (Ni) and chromium (Cr) levels were evaluated in two studies in Tunisia, and found to be higher in people with HNC than those without, which was attributed mainly to occupational inhalants and tobacco use, and that As and Cd levels were significantly higher among both tobacco consumers and workers occupationally exposed. Occupational exposure was found in the two studies in Tunisia, as well as in two other studies. One study in Nigeria detailed that 6/481 (1%) participants with HNC had organic hydrocarbon exposure, which was found to be insignificant. Similarly, insignificant, one study in Morocco found that 5/29 participants (17%) with NPC had exposure to pesticides.

A genetic predisposition to obtaining NPC was found in three articles in the NPC category, as well as one article from the thematic analysis from the HNC category, which also reviewed the genetic susceptibility of obtaining LC. All studies were done in the Northern part of Africa. A variety of gene variants were found to be biomarkers for obtaining NPC, and all articles concluded that screening of families of people with NPC would be useful in early detection. The thematic analysis of Makni et al.'s (2019) article indicated that the genetic variants shown to be present in people with NPC from Northern Africa differ from those in Asian countries (Makni et al., 2019).

The risk factors and associated cultural practices identified indicates the variety within each country, which need to individually be considered by STs in treating people with HNC. This is pertinent when STs provide education, and facilitate prevention programmes for HNC, depending on which region the ST is working. Furthermore, the risk factors have implications for the type of HNC, and the type of treatment the person must receive.

4.8. Treatment Protocols for HNC

There were 15/66 articles (23%) that documented the treatment type, which included 1845 participants. Most of the participants had one type of treatment (99%, n=1433), whilst 1% (n=17) had a combination. Information was unavailable for 395 people, as a result of either being referred to another hospital, participants dying prior to treatment, or not commencing treatment at all. Of the participants that started treatment, 22% (n=326) of the them did not complete it as they did not return to the hospitals for further treatment. Importantly to note, 15% (n=220) of participants that commenced treatment sought out a? herbalist first. No articles commented on the MDT or therapy after medical treatment. Table 10 indicates the medical treatment received for each type of HNC.

Table 10

Medical Treatment Received

	HNC	OC/OPC	NPC	HPC/LC	Total
Surgery	296	187	0	56	539 (37%)
Chemotherapy	115	23	373	0	511 (35%)
Radiation	136	45	18	0	199 (14%)
Chemoradiation	184	0	0	0	184 (13%)
Surgery and radiation	0	0	0	15	15 (1%)
Surgery and chemoradiation	0	2	0	0	2 (0%)
Total	731 (50%)	257 (18%)	391 (27%)	71 (5%)	1450

The most prevalent medical intervention received was surgery (n=539, 37%). Thirty-eight percent of participants (n=556) received surgery, or a combination of surgery and radiation or chemoradiation.

Surgery was the primary means for OP/OPC cancer, and continues to remain the primary treatment for HNC in Africa. Thematic analysis of the HNC subcategory confirmed this, and stated that the primary reason for surgical intervention is a lack of radiation or chemotherapy services within their regions. There were five articles in the thematic analysis that commented on the medical intervention received. These studies were done in Tanzania (Gilyoma et al., 2015); South Africa (dos Passos et al., 2015); Nigeria (Okwar et al., 2017); and two in Uganda (Kakande et al., 2010; Nabukenya et al., 2018).

Majority of the patients from the thematic analysis had surgical intervention (n=300, 44%), followed by radiation (n= 115, 39%), and finally chemotherapy (n=184, 17%). There was only 24% of participants who received a combination of intervention, that being surgery and radiation, or chemoradiation. The one article in Uganda (Kakande et al., 2010) reported radiation being the primary intervention as the patients were not candidates for tumour removal, as the tumours were too widely spread and advanced, as well as some participants having co-morbidities of anaemia and malnutrition, making surgery impassable. Of the candidates that had surgery, reconstructive surgery was only provided in South Africa (dos Passos et al., 2015), whereas tumour excision was the primary surgery for all other articles.

Four of the five countries reported having access to radiotherapy, however three of the countries (Tanzania, Nigeria, and Uganda) reported only having access to one radiotherapy machine in the country. As a result, all concluded that the radiotherapy waiting times were long, and some patients had poor affordability due to a lack of health insurance (in Nigeria namely), and poor access since living far from the one hospital that provides radiotherapy.

Chemotherapy was a challenge mentioned in three of the studies in the thematic analysis, who stated that chemotherapy was limited, and there was a non-adherence to chemotherapy. Reasons for these challenges included a lack of medical oncologists proving chemotherapy; poor financial affordability of the chemotherapy medication; and the resorting to traditional medicine (Gilyoma et al., 2015; Kakande et al., 2010; Nabukenya et al., 2018). Chemotherapy services were documented predominantly for the NPC group, of which one study at one tertiary hospital in Morocco documented 91% (n=339) of NPC patients receiving chemotherapy.

In Uganda, traditional medicine was sought out first (Nabukenya et al., 2018) by 84.3% of the participants. Reasons for this that were that “Traditional herbalists in western Uganda are affordable and easy to access, and they understand cultural beliefs” (Nabukenya et al., 2018, p. 6).

The type of intervention provided and challenges around this supports the theme of poor access to healthcare. This has implications for STs in the manner in which therapy in provided in understanding

the complications that may arise from each treatment; and when therapy is indicated, particularly if some patients are not candidates for medical intervention in the later stage of the disease. It is crucial for the practicing ST to understand who is most at risk within each country or region, so as to target prevention and promotion programmes, and therapy to specific population groups.

4.9. Demographic Data

4.9.1. Gender

Gender was the most prevalent demographic documented in the articles. A total of 60/66 articles documented the gender of each participant, which included 33602 participants. Of this, 28% were female (n=9375), and 72% were male (n=24227). Within the subcategories of OC/OPC, NPC, and LCC, all had a higher percentage of males when compared to females. For the OC/OPC subgroup, 25% were females (n=6214), versus 75% being males (n=18879), which is a ratio of 1:3 (females to males). For the NPC group, there was a predominance of 66% (n=2287) males versus females, accounting for 34% (n=1156), resulting in a ratio of 1: 1,9. Finally, for the HPC/LC group, there was 78% males (n=188), to 12% females (n=52), which is a ratio of 1:3,6.

Thematic analysis of the subcategory of HNC conceded that males have a predominance for obtaining HNSCC and NPC. This is supported by the 62% (n=3015) of participants being male in comparison to the 38% being female (n=1811). Reasons could not be deduced as all of the studies were retrospective. The researchers, however suggested that one of the reasons for this is that men tend to be of being higher users of tobacco and alcohol. This is further expanded in the study done by Eriniso et al., (2016) stating that:

> The oral cavity was the most affected anatomical site in males from the present study. The authors are of the opinion that this may be due to the higher rate of exposure of the male folk to risk factors such as alcohol and smoking. In the Nigerian population, smoking and the use of tobacco products is more prevalent among males as compared to females. (p.6.)

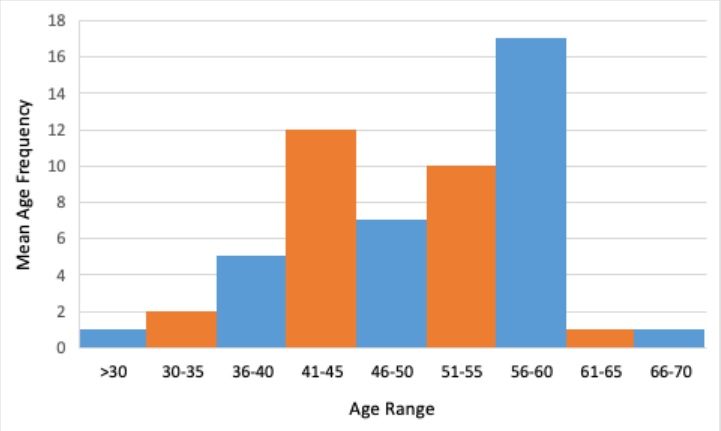
Two studies had a higher distribution of females to males (Akinshipo et al., 2017 and Erinoso et al., 2016). The reasons for this was that these studies documented all types of HNC's, not only SCCs in Nigeria. Both studies found a higher predominance of males to females when it isolated the SCC category, which is the primary HNC for alcohol and tobacco. Another reason, proposed by the authors stated that "this finding may be attributed to the better health-seeking behaviour of females, and presume the aesthetic challenges posed by HNCs will motivate females to seek treatment more often" (Eriniso et al., 2016).

4.9.2. Age

There were 56 articles that documented the mean age of the group, which comprised of 26818 participants. A frequency distribution of mean age ranges within 5-year intervals is depicted in Figure 17.

Figure 17

Frequency distribution of Mean Ages Across Studies



The overall age mean range was from 19 years to 69.9 years, with the largest distribution range being from 36 to 60 years. The largest mean age frequency range is between 56-60 years, accounting for 30% of the articles (n=17). There is also a peak noted from 41-45 years (n=12), and from 51-55 years (n=10).

Thematic analysis revealed that HNSCC/NPC is still most prevalent in populations over 50 years, however there has been a slight increase in risk factors, which is strongly related to the age of diagnosis. One reason for a younger diagnosis is that HPV-related HNSCC/NPC has increased, which has been found in younger females, bringing some mean ages down to between 40-50 years. Another reason for a slightly changing trend is that “there is increasing industrialization… leading to exposure of the working adult population to environmental risk factors” (Eriniso et al., 2016, pg 305). The current study however also included other types of HNC not just HNSCC/NPC, which lowered the overall average. This was documented in three other articles including all types of HNC (Akinshipo et al., 2017; Bassey et al., 2015; Kodiya et al., 2016).

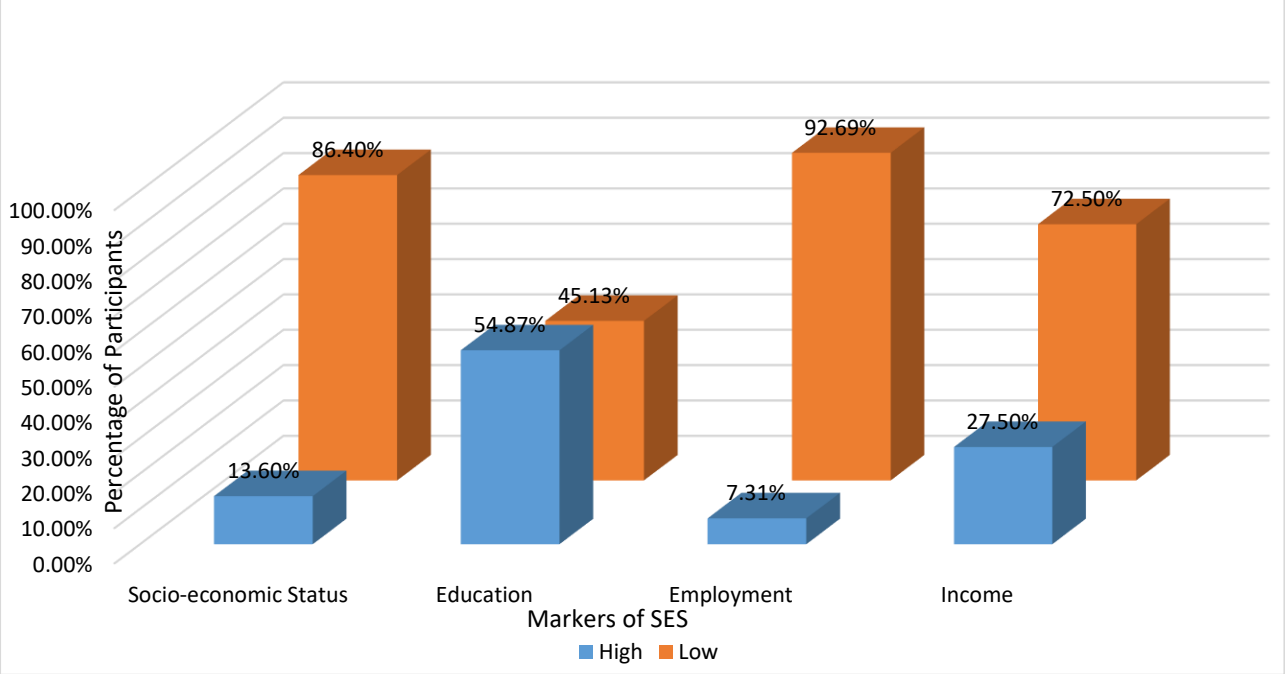
The results indicate a lower overall mean age of people with NPC and then OC/OPC, with the highest overall mean age for people with HPC/LC. A potential reason for a lower mean age for the NPV group could be that HIV was prevalent in two of the three studies in Ghana (Asante et al., 2017), Ethiopia (Douthit et al., 2016); and South Africa (Erasmus et al., 2013), indicating that people with HIV and NPC presented at a younger age. The thematic analysis cannot support this however, as participants in the study done by Kamulegey et al. (2017) sought out patients of a matching age.

4.9.3. Socio-economic Status

Socio-economic status (SES) was discussed in only 11 of the articles, with a total of 1468 participants across the four categories. That included four articles in the HNC category (n=979); four in the OC/OPC group (n=408); two in the NPC group (n=50); and two in the HPC/LC group (n=31). SES was described according to high versus low; level of education, income, and/or type of employment for each of the articles. Figure 18 indicates the SES into high versus low, according to how each article described these.

Figure 18

SES According to the Articles



As shown in Figure 18, majority of the participants had a low SES, characterised by either a low SES; low education level (primary level or no formal education); low employment level (labourers, peasants, artisans; unemployed or students); or a low income level. Low income was defined by each

article, according to the national breadline, which included earning less or more than R688 and R3000 in Uganda and Nigeria respectively. Both Nigeria and Uganda used their own currency, however this was converted into South African Rands for ease of comparison.

Education level was the only SES marker to be greater in the high SES group (54.87%), compared to the low SES group (45.13%). The higher percentage is because secondary level education was included in the high level group, which accounted for 68% of the high group. Only 32% of the participants had a high level of education, or tertiary level of education.

Overall the data is in keeping with the finding that a lower SES is a risk factor for HNSCC/NPC. Thematic analysis was done on four of the articles in the HNC category. Reasons as to why a lower SES was found in the participants with HNC was postulated in one study (Khlifi et al., 2014), and was attributed to labourers (being of a low SES) who had greater occupational exposure, causing them to be at a greater risk. The article by Gilyoma et al. (2015) suggested that the observation of people with a lower SES "has an implication on the accessibility of healthcare facilities and awareness of the disease."

Furthermore, Nabukenya et al. (2018, p.336) found that those of a lower SES tended to have more advanced stage HNC, and a potential reason for this was "because of their inability to afford treatment, ignorance, incorrect diagnosis and reliance on native medications." This is in keeping with the primary theme of poor access to healthcare, and resources, suggesting that those of a lower SES are at a greater disadvantage.

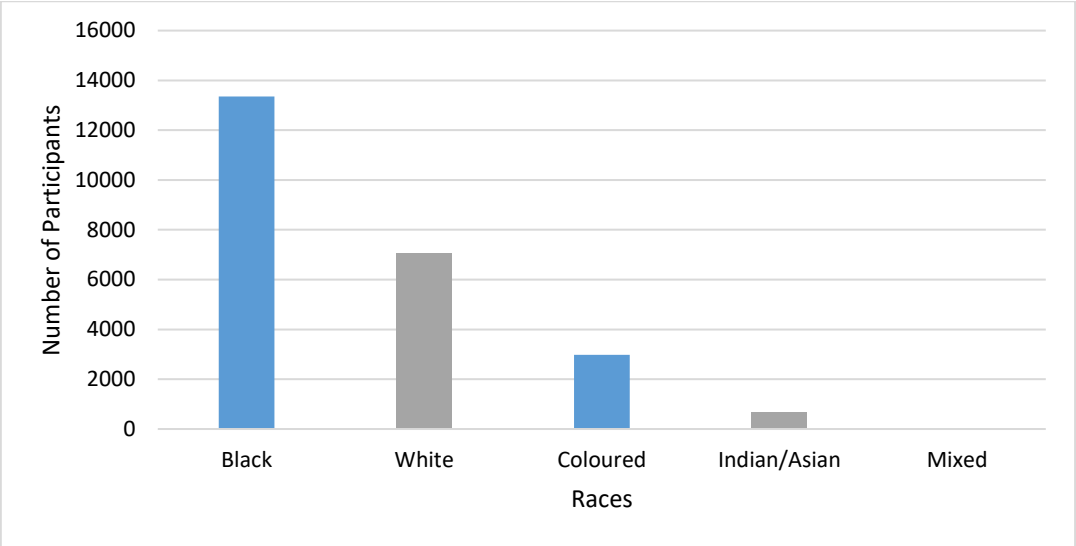
There was no significant difference of SES between the types of HNC noted. No comparison between regions could be made as SES was demonstrated differently between countries. Furthermore, limited associations could be made between SES and the risk factors, as the results within the articles did not include associations, and there was no access to the raw data.

4.9.4 Race

Race was mentioned in eight studies, comprising of 24462 participants. Three of the eight studies were case reports of single participants. There were six that were conducted in South Africa, of which three were done in the city of Johannesburg. The other two were conducted in Ethiopia (n=1) and Malawi (n=1). Of the articles mentioning race, seven were in the OC/OCP subcategory, and one case study for NPC. The distributions between race are depicted in Figure 19.

Figure 19

Distribution of Race Between Articles



Data pertaining to race was missing for 407 participants. A predominance of people who are black is shown, accounting for 56% (n=13355) of the participants. The Indian and Asian subcategory was presented together in one of the articles, and thus is presented together in Figure 19.

There were two studies (Abram et al., 2012, & Ayo-Yusuf et al., 2013) investigated the race with the highest prevalence when compared to the population distribution. It was found in both studies that coloured males are the most prevalent race with OC/OPC in South Africa, and are therefore most at risk, even though the coloured population only accounted for 12% of the participants (n=2984).

Possible reasons for an increased risk within a coloured population were not concluded, although both articles suggested an increase in smoking, in conjunction with high alcohol use (Abram et al., 2012, & Ayo-Yusuf et al., 2013). Race was not mentioned in any of the articles for thematic analysis, implying that it was not a large demographic factor in Africa.

4.10. Summary of Results

This section presented the results from the systematic review. There were 66 articles that met the inclusion criteria, and were used for analyses. There were 63 quantitative articles, and three qualitative articles. There were 19 countries that were studied, and most of the studies were done in Nigeria (30%). The primary focus of the articles was identifying risk factors within the HNC populations (47%). The data was collected over a 26-year timespan, ranging from 1990-2016.

The most studied cancer type, and highest participant number was OC/OPC, which accounted for 74% of participants. As the researcher sought out SCC, 73% of the participants were diagnosed with HNSCC, and 7% were NPC (WHO type III being the most prevalent histology). Most (74%) HNC's were diagnosed in the late stage (including stage III and IV), and this was seen across the types of HNC, however specifically for the OC/OPC group. The signs and symptoms related to the anatomic site affected, however the most reported sign/symptom was cervical lymph nodes (24%).

Substance abuse remains the highest reported risk factor in Africa, with tobacco use being the primary reported risk factor across HNC, and leaf chewing being prevalent in OC/OPC. There has been a rise in infectious diseases as a risk factor for HNC, namely HPV for OC/OPC and Epstein-Barr Virus for NPC. Surgical resection remains the primary medical intervention in Africa, accounting for 37%. Chemotherapy and radiation services remain limited.

The demographic distribution of people with HNC, and therefore those most at risk in Africa includes males, even though a slight increase in females obtaining HPV-related HNC has been noted. The primary mean age range reported was from 56-60 years, accounting for 30% of the articles. The overall mean age of participants ranged from 19-69.9 years. From the studies in this review, a low SES was associated with HNC, which was further defined as people having a low education level; being unemployed or being a labourer worker; and earning less than R3000 per month (Lawal et al., 2011). The primary country to observe race trends for HNC was South Africa, which reported a predominance of people who are black (56% of participants), however two studies mentioned that people who are coloured (particularly males) are more at risk when compared to the proportions against the total population in South Africa.

5. Discussion

This chapter provides a discussion of the results presented in chapter five, which are based on the objectives of the systematic review. The primary aim of the systematic review was to review the current epidemiological data on HNC in Africa. The specific objectives aimed at evaluating the quality, availability and type of data, and identifying the type of HNC, stage, signs and symptoms, risk factors, treatment protocols, and demographics related to HNC. Each of these areas will be discussed, along with how these have implications for STs in Africa.

5.1. Availability, Quality, and Type of Literature

There were only 66 articles that were included in the systematic review, which indicates a dearth of information in the field of epidemiology of HNC in Africa. Most countries had no information on HNC epidemiology, and data was only retrieved from 19 of the 54 African countries. The literature concedes the notion that there is limited clinical research across Africa generally, with only 1% of the world's research being done in Africa, even though it accounts for 12% of the world's population (Chu et al., 2014). Reasons for this have been a lack of funding and resources for research. More specifically, a lack of dedicated research teams, reliable internet access, skilled staff in research and team commitment (Conradie et al., 2018). Moreover, research on epidemiology on cancer is limited and unreliable. One of the reasons for this is that cancer registries collect data at tertiary institutions, and therefore those not accessing these institutions are not accounted for. Another reason is no prioritisation of research topics for cancer, and specifically HNC in Africa (Dalvie, 2019). This has implications for practicing STs as research on HNC would guide policies, practices and knowledge about the disease, that would be pertinent for STs to base their assessment and treatment on.

Most of the studies were conducted at tertiary hospitals, and all were affiliated with universities. This shows the significant role that universities are taking to document the epidemiology of HNC in Africa. Despite this effort by universities, it must be noted that the data may not be a true reflection of the epidemiological factors, since most sites studied were at tertiary hospitals, and excluded smaller and remote clinics. This contributes to the limitations of the study, and how the data is rather a hospital-based registry, opposed to a population-based registry.

Another limitation was the missing data. The thematic analysis supports this claim, as Akinshipo et al. (2017, p. 117) "It highlights the need for structured data collection of HNC epidemiology in Nigeria to get the true demographic pattern of cancer problem in Nigeria…"

The focus of the included articles was heterogeneous in nature. As a result, various aspects of epidemiology was included and reviewed according to the regions of study. The primary focus of the articles attempted to identify the risk factors of the region in Africa to HNC, rather than documenting the overall prevalence. This shows that researchers are attempting to find associations of HNC to that of substance abuse, infectious diseases and other contributing factors within their country. This allows for that region to identify populations most at risk, as well as assist in informing policy and practice of substance abuse and sexual practices. As majority of the studies are hospital-based rather than population-based, with missing data and small sample sizes, the identification of risk factors unfortunately is not being documented successfully. As a result, there is difficulty identifying risk factors that can be generalised to the whole population. If the results cannot translate to the entire population, it is difficult for practicing STs to provide effective education, and treatment programmes for those with HNC.

The articles included in the study were reviewed for their quality after the final articles were selected. The MMAT questionnaire was used, which appraises various study designs. It was found that overall the methodological quality of data was high, with 45/66 articles obtaining a full score of 100%. The primary concerns were missing participants, missing data, missing or inadequate biopsies, and/or incorrect values reported. This can perhaps be explained by the findings of Conradie et al. (2018) explaining a lack of resources and skilled staff to accurately record data. The MMAT was a useful tool for identifying various study designs. It only, however, allowed for appraisal of the methods implored by the researchers, and not the results and overall quality of the articles. Furthermore, the studies were retrospective in quality, and as a result most of the data was retrieved from patient files or biopsy results, and was not documented by the researchers themselves. This means that data could have been skewed or incorrect, thus making it difficult for the researchers to make causative conclusions. This further limits the researcher in this systematic review in making conclusions pertaining to the objectives. This is a further challenge for practicing STs wanting to provide effective education, and treatment to people with HNC, as the epidemiological factors recorded may be incorrect.

A high number of full-text articles were excluded from the study (n=203), predominantly on the basis that they were not specifically studying HNSCC or NPC (n=99). A high proportion also did not answer the objectives of the study (n=63), whilst 16 articles were not the primary source of information. This indicated that the anatomic sites and types of histology for HNC is vast, and complex. This is supported by Ridge et al. (2016), when stating that HNC encompasses a variety of sites and sub-sites, and that patients often develop a second primary tumour. Furthermore, the tumour sites each have their own

unique anatomy, epidemiology, and therapeutic approaches. Hence, each country or region will have its own more prevalent HNC, and risk factors associated.

Reviewing the studies with regards to sites and approaches also may not provide researchers or clinicians with information to direct research or service delivery because of the specificity of the epidemiological data for that geographical location. So while the articles may highlight statistics, use of the information would inadvertently be limited.

5.2. HNC presentation in Africa

5.2.1. Overall Prevalence and Type of HNC

In LMICs, HNC is on the rise, whilst some developed countries have declining numbers, particularly of OC (Joshi et al., 2014). In a study done by Simard et al (2014) reviewing HNC across five continents excluding Africa, overall OC incidence rates declined in many Asian countries, Canada and USA. OPC rates, however, increased in some European countries (Belarus, Czech Republic, Denmark, Finland, Iceland, Latvia, Norway and the United Kingdom) whereas they declined in some Asian countries. The reasons for this is the rise of HPV (Simard et al., 2014). The rise of HNC is similar to Africa, even though overall prevalence was not documented, however has been confirmed in other studies (Fagan, 2018). As a result, research and prioritisation of HNC as a field of research, policy-making and education programmes is indicated.

The most studied and reported sub-site of HNC in this review was OC/OPC. Of the articles that could be distinguished, it was noted that OPC was more reported than OC. This most prevalent sub-site coincides with international findings, that reported OC being high in countries where tobacco was still a large risk factor (Slovak Republic, Estonia, Finland, and Japan) and OPC being high in countries with decreasing tobacco use trends, but increasing HPV (Belarus, Czech Republic, Denmark, Finland, Iceland, Latvia, Norway and the United Kingdom) (Simard et al., 2014). This will have practice implications for STs assessing and treating these patients, specifically when identifying what aspects of the oral and oropharyngeal cavity have been affected, and how these impede the person's speech, and oral to oral transit phase of swallowing.

The histology that was found specifically by the researcher was SCCs, as these are the most common globally, and in Africa (Westra & Lewis, 2017). The histology of SCC is aggressive and fast-spreading in nature, which may have implications for the intensity and number of sessions STs provide to people

that have HNSCC. In other words, the initial speech therapy may be more sessions over a shorter period of time, as well as shorter treatment sessions due to potential fatigue (Westa & Lewis, 2017). The histology that is noteworthy is UNC, which is WHO type III of NPC. NPC is typically seen as a rare type of cancer, particularly in most parts of the world. In countries such as the USA and UK, the few cases of NPCs are typically SCC in nature (WHO type I) (Stelow & Wenig, 2017). In recent years, however, NPC type III (UNC) is of epidemic standards in Southeast Asia, Southern China, and North African countries, and is largely associated with EBV (Stelow & Wenig, 2017). The systematic review supports this notion, as most NPCs were found in Northern Africa, as well as some North-Eastern African countries (Sudan), and are mostly type III in histology. As NPC in Northern Africa is typically associated with a comorbidity, STs can expect a lower therapeutic outcome (Valderas et al., 2009). The systematic review also supports a worse outcome with the later stage diagnosis.

5.2.2. Stage of HNC

Late stage HNC was found to be highly predominant amongst the studies in Africa. When comparing these to international norms, it is interesting to note that most countries (developed and developing) have late stage diagnoses. Studies done in the USA (Thompson-Harvey et al., 2020), France (Guizard et al., 2017) and other countries around Europe (including Norway, Austria, Netherlands, Brandenburg, Mecklenburg-West Pomerania, Munich, Saarland, Saxony, Slovenia, Estonia, Cracow, Slovakia and Lithuania) (Gatta et al., 2015) found that most HNC is diagnosed at a late stage. One primary reason for this is that HNC is predominantly associated with lifestyle habits found in those of a lower SES, and also in males, regardless of country. Both those in a lower SES and males tend to have less health-seeking behaviours, and as a result are diagnosed at a later stage (Thompson et al., 2016 & Qasim et al., 2014). This correlates with the findings in the systematic review that males tend to have HNC, and are of a lower SES. Another reason proposed is that HNCs tend to have a high metastatic rate and are aggressive in nature, and can be difficult to diagnose as they mimic a common cold or flu (Wenig & Cohen, 2009). As presented in the results, the reported signs and symptoms correlate with flu-like symptoms. These include swollen lymph nodes; headaches; pain in the affected area (nose, mouth or throat); coughing; ulcer development; loss of taste or smell; nasal obstruction or congestion, and nasal discharge (Huang & Chuang, 2020).

Late stage diagnosis is more notable in developing countries and specifically in Africa (Faggons et al, 2015). One reason is due to a lack of knowledge from HCPs and general knowledge (Faggons et al., 2015). Poor knowledge and attitudes amongst dentists, and the general public on OC was found in studies done in Egypt (Amer et al., 2018); Sudan (Ahmed et al., 2019 & Eltayeb et al., 2017); and Nigeria

(Gbotolorun et al., 2014). Another reason for late stage diagnosis in Africa is the lack of population-based screening tools for early detection (Faggons et al., 2015). Furthermore, a systematic review done by Beaudoin et al. (2020) identified a late HNC presentation as a result of a misunderstanding of signs and symptoms of HNC, a preference towards alternative medicine, and the inability to access healthcare. This was supported in the research, which indicated that 15% of participants went to an herbalist first. The late stage diagnosis has implications for STs in Africa in the type and intensity of therapy, as well as the education and counselling provided to patients, carers, and family members. The therapy provided by STs may be less intense, and may have a focus on indirect therapy, to provide patients, carers etc. with compensatory strategies to optimise the person with HNCs' QOL. This is specifically the case with late stage HNC.

According to ASHA's guidelines (2019), the role of STs is to educate and advocate in the prevention of HNC, and educating others (general population, HCPs and policy-makers) for the need of STs in this population group. The consideration of cultural and alternative medical treatments is crucial in the African context, and this has implications for STs to work holistically. The guidelines provided by ASHA are therefore not specific to the African context, and context specific guidelines are required when working with African people with HNC. This education role for STs in Africa is pertinent, as a general lack of understanding about HNC risk factors, combined with the lack of training centre's for STs worsens this growing health problem. The lack of training centres further indicates a lack of knowledge from other HCPs, general public, policy makers, and government regarding the role of ST services, particularly with HNC. There is also a transdisciplinary approach of other HCPs adopting the role of the STs when treating people with HNC, as the number of STs in Africa is lacking. A study done in India, another LMIC, such as those in Africa, conceded poor awareness of the role of STs in treating HNC when questioning the general public (Divya et al., 2020). A secondary role to consider for STs in Africa is palliative and/or late-stage treatment. The role involves symptom management, and focusing on meeting the patients' evolving communication and swallowing abilities and needs to maintain QOL. With the lack of STs across the continent, and the lack of palliative care generally, this is near to impossible (WHO, 2013).

The findings of this systematic review identified several missing specimens. This can contribute to the late stage diagnosis, as once patients are being seen, they are incorrectly diagnosed. A study done in Nigeria found inadequate biopsy specimens and deficient documentation, which inevitably results in a misdiagnosis of HNC (Akinyamoju et al., 2017).

Stage III HNC was predominantly diagnosed in people with LC, versus stage IV being diagnosed in OC/OPC and NPC. One reason for this could be that early symptoms related to LC are more distinguishable and apparent to individuals, versus those with NPC or OC/OPC. That being more apparent to patients, as well as HCPs (Macfarlane et al., 2012). This has implications for STs in Africa, as some of their treatment may be remedial if the patient does not have end-stage HNC. This is crucial to ascertain for each patient, by working closely with the specialists treating these patients.

In conjunction with the late stage HNC, the signs and symptoms reported are more severe and most patients experienced more than one symptom, with cervical lymph nodes being the most reported symptom/sign. Cervical lymph nodes occur once the HNC has metastasised, and involvement of even a single lymph node is associated with a marked decline in survival (Furukawa & Anzai, 2013). Furthermore, a study done by Deng et al. (2016) found that patients with lymph nodes/lymphedema experienced increased symptom severity or prevalence. In particular, symptoms that were found to be worse included numbness, tightness, heaviness, warmth, pain, difficulty swallowing mashed or pureed food, difficulty breathing, and blurred vision. The cervical lymph nodes being the most reported sign/symptom has definite implications for STs. As these nodes are inflamed, patients can experience difficulty swallowing, breathing, and voicing, and these difficulties can become chronic (Jeans et al., 2018).

Although this was the most reported sign/symptom, few articles discussed swallowing, or voice concern. This may be as a result of a lack of knowledge related to secondary signs and symptoms related to cervical lymph nodes, and difficulties swallowing, voicing or breathing in patients. Since the stage of most cancers is late, the latter does not appear likely. This supports the finding that the importance of STs educating others on the role in HNC. The finding that most patients experienced more than one sign/symptom indicates the complexity and multifaceted nature of HNC in Africa, that STs must consider.

Other severe signs and symptoms included in the top 10 included pain, and neurological syndrome (Wenig & Cohen 2009). Symptoms such as dysphagia can lead to more severe signs, such as weight loss if not treated (Wenig & Cohen, 2009). As the signs and symptoms tended to be related to the anatomic site, oral symptoms were significant as a result of OC/OPC being the most prevalent site. This coincides with data reporting that signs and symptoms are related to the tumour site, however spreading of the disease causes a range of symptoms in the head and neck region (Macfarlane et al.,

2012). The ST must therefore consider all head and neck regions when treating these patients, as secondary sites may be affected.

As we understand the type of HNC being documented, it is important to note who is suffering from HNC in the African population.

5.3. Demographics of People with HNC in Africa

Of the primary demographic data detected, it was found that the population most at risk in Africa are males, people within the age group of over 40 years, and those that are of a lower SES. This is pertinent for practicing STs in targeting prevention and promotion programmes for these populations most at risk. Race differences were not common in the studies, but was documented in articles done in South Africa. The results from the study done in Johannesburg, South Africa (Zwane et al., 2018) revealed that 70.4% of people diagnosed with HNC were black (that being 1131 out of 1605 files).

Similar to international studies, HNC is predominantly diagnosed in males, rather than females as a result of tobacco and alcohol use being abused by males (Bray et al., 2018). The study done by Simard et al. (2014) found that rates of OC were high among men versus women in some European and Asian countries (Czech Republic, Slovak Republic, Denmark, Estonia, Finland, the UK and Japan). Despite a predominance of HNC in males, France and Italy rates declined slightly among men and increased among women as a result of HPV. The largest increase in OPC rates was among Brazilian men, which is a LMIC country, similar to that in Africa (Simard et al., 2014). The systematic review supports this finding that males tend to have a higher risk, with the highest male to female ratio in the HPC/LC group.

The highest proportion of females found in the systematic review was in the NPC group, accounting for 34% of the NPCs. None of the articles could explain this higher number of females, and no articles to date have documented why there is a higher proportion of NPC in women in Africa, versus other HNC's. One reason for this could be the association of EBV and a genetic predisposition causing females to have NPC (Shah & Johnson, 2018). This, however, needs further research to substantiate these claims. The OC/OPC group, on the other hand, had a higher proportion of women when compared to other HNC's, and when compared to OC/OPC in previous years due to the growing rate of HPV. The effect of HIV on gender differences for HNC still needs to be explored.

The systematic review revealed that the average age of HNC effects was from 56-60 years. This is similar to the findings of the study done in South Africa by Zwane et al (2018), who documented an age range of 56-65 years. This is slightly less than the average age in developed countries, such an USA, that documented an average age range of 50-70 years (Vigneswaran & Williams, 2014). This same study in the USA, however, found that the average age of HNC, particularly OC/OPC, is declining due to the increase of HPV, as well as those infected with HIV. A study in Australia (also a developed country) indicated that men tended to get OC/OPC between 45-59 years, which correlates with the findings in Africa (Azimi et al., 2017). This perhaps indicates that age in Africa is not a significant demographic factor for developing OC/OPC when compared to the rest of the world. Rather, that HPV and HIV have an impact on the age of OC/OPC diagnoses, of which Africa is at a high risk (Bruni et al., 2019; & WHO, 2018a).

As HPV and EBV is typically diagnosed with younger people with OPC and NPC respectively, the systematic review supports the notion that HPC/LC is rather diagnosed at an older age. The average mean age of diagnosis of HPC/LC in USA is over 65 years, which is seven years older than the mean age found in the systematic review (Steuer et al., 2017). This indicates that people in Africa with HPC/LC tend to be younger when compared to other developed countries, but are still the oldest subcategory in Africa. Although precise reasons for this have not been revealed in the review of articles, this supports the finding that HNC in Africa is diagnosed at a younger age, whilst HPC/LC does not have the secondary burden of infectious diseases such as EBV and HPV (Bruni et al., 2019).

Age has implications for STs practicing. Typically, people with HNC that are younger tend to have better outcomes. However, this may not be the case in Africa, when considering this population group tends to have more comorbidities, such as HIV, EBV, and occupational exposure, which results in a worse outcome (Valderas, 2009). These comorbidities as well as age need to be considered during treatment by STs, and will have implications on compensatory versus remedial therapy.

Although all countries in Africa are LMICs, SES between participants was recorded in a few articles. The majority of people with HNC had a low SES, characterised by low income, being unemployed or labourers, and/or having no formal education or only primary education. No associations could be made between the SES to various regions, and to the associated risk factors, and this needs to be further explored in Africa. No studies to date document the SES between countries in Africa, and the associations between countries that are LMICs, as well as identifying risk factors associated with high

versus low SES within countries in Africa. Rather, studies have focused on Africa versus other countries that are generally of a higher SES (Adeola & Hille, 2018; & Faggons et al., 2015).

One study done in the UK found a strong link between smoking and a lower SES, showing an increase in HNC risk (Al-Dakkak, 2010). One can postulate that the increase of alcohol, tobacco and infectious diseases can be associated with a lower SES in Africa, however research attempting to find exact associations in African countries needs to be done. It is, as a result, difficult to determine the precise differences and target populations for STs working within a region. The role of the ST is also affected in screening those with HNC. The limited number of STs working in Africa are primarily situated and working in more populated and urban contexts, which could affect the diagnosis of those in rural, less populated areas of the country, who tend to have a lower SES (Mulwafu et al., 2018). This further deepens the late stage diagnosis of these people as they are not diagnosed or screened at an early stage due to inaccessibility. Similar to SES, the research on race differences in Africa is scarce.

Race was documented in South Africa only, even though many countries across Africa have racial and ethnic disparities, due to colonisation and invasion of other countries to most African nations. As a result, there are hundreds of various ethnic groups across Africa (Obadina, 2014). When describing these disparities in Africa, limited resources identify the numbers of specific race groups between countries. Rather, Africa is described according to the ethnic disparities. This notion is supported by the literature exclaiming that HNC is not particularly race related, but rather associated with social and cultural practices within various ethnic groups (Warnakulasuriya, 2009).

Of the documented race disparities in South Africa, it was found that most people with HNC were black (56%), however this disparity was explained by the population proportions. The latest census in South Africa done in 2011 revealed 76.4% of the population is black; 9.1% is white; 8.9% is coloured, 2.5% is Asian, and 0.5% is other/unspecified (STATSSA, 2012). These statistics were compared to race in two articles, and it was found that people who are coloured have an increased prevalence of HNC (Abram et al.,2012; & Ayo-Yusuf et al., 2013). Both postulated that this may be as a result of the coloured population having possible increased tobacco use, comparable to the white population in South Africa, that has the highest use of tobacco reported (Ayo-Yusuf et al., 2013). The increased alcohol use, according to the article by Ayo-Yusuf et al. (2013) was suggested to be related to the history of the “tot” system, whereby farm workers, historically people that are coloured, received their monthly wages in alcohol. This was only enforced in the 1990’s, and as such, has put this population group more at risk for alcohol abuse, and therefore HNC.

Both articles by Ayo-Yusuf et al. (2013) and Abram et al. (2012) concluded the need for further associations to be made between races. The current review highlights the need for more research to be done to find potential associations between HNC and race groups more at risk. As such, STs need to advocate for education, as well as more ST services to be provided in areas with a predominance of people that are more at risk. This needs to happen at an individual level, as well as at a governmental level.

Although NPC was found predominantly in Northern Africa, no studies in the review documented the risk between ethnicities, or cultural/social practices, apart from the general use of tobacco and leaf chewing.

Other ethnicities and/or races across Africa have not been explored in relation to HNC. The lack of data on identifying the cultural and social practices related to race has implications for STs in targeting education and prevention programmes for HNC. Much of the research Africa has focused on who is most at risk, however this systematic review revealed the recent research has attempted to identify risk factors.

5.4. Risk Factors of HNC

The identification of risk factors for HNC in Africa was the most studied area in the last 10 years. Understanding the risk factors related to HNC assists STs in prevention and promotion programmes. Tobacco use continues to be the most reported risk factor for obtaining all types of HNC.

Tobacco use is declining gradually around the world, and particularly in English-speaking and developed countries as a result of tobacco control being implemented (Ng et al., 2014). Although this is the case, tobacco use is increasing annually in developing countries, and specifically in the African and Mediterranean regions (WHO, 2018b). Importantly to note, shisha smoking was found to be more practiced, and therefore more of a risk factor in Northern Africa. The studies done identifying leaf chewing as a risk factor (Toombak, Neffa and tobacco) was also done in Northern African countries. This is supported by research done by Khattab et al. (2012), who found that smoking and leaf chewing is on the rise in Northern African countries, and is predominantly practiced by males, with no difference of practice across the ages. Reasons for the increase in tobacco use in Africa can be explained by the fast growth of the population in Africa, as well as an increase in larger and more accessible target markets in Africa. In addition to that there have been rigorous efforts by the tobacco

industry to expand into African markets (WHO, 2018b). The tobacco industry is not the only one to target Africa. The alcohol beverage industry and market researchers have identified Africa as the top region for alcohol market growth (Jernigan & Babor, 2015).

Targeted marketing and a culture of "binge drinking" are the reasons for increasing alcohol consumption in SSA (Jernigan & Babor, 2015). The systematic review supports this notion of high alcohol use, as alcohol practice was found to be a common risk factor in SSA. This is not the case in Northern African countries, and some SSA countries, including Niger, Senegal and New Guinea. The reason for this is that these countries are practicing the Islam faith, and as a result abstain from alcohol use (WHO, 2018b).

Of the infectious diseases identified, it was found that HPV was the largest risk factor for OC/OPC, and EBV for NPC. HPV prevalence is gradually increasing. A study that was conducted globally aimed to identify the prevalence of HPV in women with normal cytology (Bruni et al., 2019). The results revealed an 11% prevalence of HPV globally. When comparing these statistics to regions of Africa, three of the four regions were significantly greater than the global prevalence. East Africa had a 33.6% prevalence, Western Africa had a 19.6% prevalence, and Southern Africa had a 17.4% prevalence. Northern Africa had lower than the global norm, being at 9.2% prevalence (Bruni et al., 2019). This supports the findings of the systematic review, which identified HPV in SSA mainly, versus Northern Africa.

The rise of HPV-related HNC was only noted in five countries, whilst six noted that it was not a significant risk factor. All studies that did not find it to be a risk factor concluded that a small sample size and analysis of one location only were limitations to the studies. One study revealed that a possible reason for no association of HPV-related HNC in that region was that perhaps it was more prevalent in developed countries versus developing. This is supported by the findings of Chaturvedi et al. (2013) and Gillison et al. (2015). Three of the studies concluded that more studies would need to be done to evaluate the discrepancy in the high level of HPV-related cervical cancer versus a low level of HPV-related HNC (Blumberg et al., 2018; Faggons et al., 2017; and Oga et al., 2016). One of the studies done by Faggons et al. (2017) postulated that the discrepancy could be as a result of varying sexual practices, which is a major cause of HPV-related cancer. This can be supported by one study done in Malawi indicating that oral intercourse is uncommon in both rural and urban settings (Kerwin et al., 2014). Furthermore, these sexual practices are performed at a younger age and since being more aggressive, put younger populations at a greater risk for developing HNC (Faggons et al., 2017).

EBV was seen to be associated predominantly with NPC (specifically type III) from studies done in Ghana, Sudan and Morocco (Asante et al., 2017; Edreis et al., 2016; & El-Amran et al., 2018). Whilst

the countries in North and North-East Africa identified a significant level of EBV-related NPC, Ghana (West Africa), only found a minority of people with NPC having EBV. One study also reviewed the prevalence of OSCC in EBV in Sudan, and found that 75% of people with OSCC had EBV (n=15), which was significantly higher than the remaining three developing countries, and four industrialised countries outside of Africa (Jalouli et al., 2012). The association of EBV and NPC in Africa is supported by the literature, particularly when there is an interaction between the EBV infection and environmental/genetic factors (Lung et al., 2014). The rise of EBV is only increasing, and over 90% of the world's population is/has been infected with EBV (Smatti et al., 2018). EBV is particularly high in developing countries, including North African countries, as a result of low sanitation, and crowdedness, and tends to affect younger populations (Smatti et al., 2018). The risk of EBV, as well as environmental factors including diet have led to an increase of EBV-related NPC. A study that reviewed the risk of NPC in Northern Africa found that the increased consumption of butyric acid (which is found in rancid butter, sheep fat and dried mutton stored in oil) significantly increased the risk of NPC, which tended to activate the EBV (Belbaraka et al., 2013).

HIV as a risk factor for developing HNC was only studied in six articles, of which 35% of the participants were HIV positive. All of the studies could not definitively conclude an association between HIV and HNC. This is supported in the research, that states that even though HIV is a predominant disease in Africa (WHO, 2018a), the associations between HIV and HNC have yet to be studied. One study done in the USA aimed to identify an association between HIV and HNSCC. It was found that the risk factors for developing HNC were the same between those infected with HIV versus those who were not, which included HPV, tobacco and alcohol (D'souza et al., 2014). More research therefore needs to be done, specifically in Africa.

The risk factors, in conjunction with the types of people and severity of illness and comorbidities have implications for the medical practices within Africa.

5.5. Medical Practice Challenges within Africa for HNC Treatment

5.5.1. Surgical Treatment

Few articles demonstrated what medical intervention practices are taking place. The medical practices in Africa that were documented favoured surgery over chemotherapy or radiation, however the need for a combination of surgical, chemotherapy and radiation is required, as most of the patients are at more advanced or end-stages of the disease (Dalvie, 2019). Reasons for surgical intervention being more prevalent revealed that chemotherapy and radiation services were not offered in the respective

countries, or that their machine was not working. This supports that findings of the lack of radiotherapy services in Africa (Mulwafu et al., 2017). This is contrary to high-income countries, such as the UK, where there are 202 radiological centres across the four countries (England, Ireland, Scotland and Wales) (Independent Cancer Task Workforce, 2016).

Challenges of radiation in Africa are vast, as there are limited, if any radiation services within each country. There is an absence of radiotherapy in 29 out of 52 countries, with a predominance of services in the northern and southern parts of Africa (Abdel-Wahab et al., 2013). Secondly, there is limited staff, as well as inadequate training and skills related to administering radiation (Kigula Mugambe & Kavumba, 2017). As a result of inadequate or non-existent radiation services, surgery remains the primary treatment modality in Africa (Abdel-Wahab et al., 2013). Surgical treatment, however, has its own limitations in Africa, with less than 5% of the population across the continent having safe, timely and affordable surgery (Alkire et al., 2015).

Another reason for surgery taking precedence could be that surgery continues to be the primary treatment modality for cancer worldwide, in conjunction with other treatment modalities (Galloway, 2019). As ENT specialists are few, other surgeons are taking on the role of surgical treatment for HNC (Fagan, 2018). Surgical resection over other treatment modalities means that STs must consider strategies to compensate for the "missing" anatomy to aim to provide the highest level of QOL for communication and swallowing.

5.5.2. Medical Challenges

As these patients with HNC tended to have comorbidities (HPV, HIV and EBV), this poses a challenge for HCPs working with these patients. The disease, over and above the stage IV disease, will be more severe and difficult to treat (Abdel-Wahab et al., 2013). This is a consideration for STs, as patients will be more prone to severe symptoms and fatigue (emotional, physical, and cognitive) (Bower, 2014). This has implications for the intensity and amount of therapy, the need to treat the patient holistically and with the inclusion of the patient and family-members in decision-making, and a consideration for referring to other HCPs (Bower, 2014).

As the data could not be distinguished, the review could not find associations between the stage of HNC to the type of medical intervention received. Only one article revealed that the late stage cancer was treated palliatively, however did not describe what that entailed. Furthermore, none of the articles identified other MDT members involved in HNC treatment in Africa. A reason for this could be

that this data was not available, since all articles were retrospective. Another reason could be that there is a limited number of skilled MDT members working with HNC in Africa (Kingham et al., 2013).

5.5.3. Access, Education, and Infrastructure Challenges

The systematic review also indicated a lack of follow-up with patients, or patients not completing treatment. Although specific reasons for this could not be concluded in the study, Kingham et al. (2013) reviewed that all cancer treatment in SSA is lacking, with a high drop-out rate of patients. Reasons for this include an insufficient number of HCPs that are skilled in cancer care, and few available surgeons tend to become transdisciplinary in the diagnosis, treatment and palliative care of cancer patients. This means that the few HCPs available tend to take on other roles in all aspects of treatment and cancer care. There is also a lack of skilled surgeons in complex oncological treatment for HNC in SSA (Kingham et al., 2013). The doctor to patient ratio is therefore burdened.

Patients not completing treatment relates to the general lack of knowledge and education for signs and symptoms related to HNC in Africa, which is brought on by the general lack of HCPs who provide counselling, education and early screening programmes to patients and population groups at risk, as well as highlighting the ramifications of poor adherence to treatment which may affect overall QOL and functioning. As the number of STs is low, a transdisciplinary approach between allied health professionals may be indicated, and therefore educating other HCPs on the role of STs in pertinent. This relates to the transdisciplinary model, where one member of the MDT is trained by the others, and provides the primary intervention. In a transdisciplinary approach, the team working with the patient has a common goal, as well as a common treatment plan, regardless of the discipline (King et al., 2009). The transdisciplinary approach may be required due to the low number of HCPs, in that members of the team tend to take on roles of other disciplines in order to lessen the load on HCP's at an individual level, but also because the specific HCP's required are working at other hospitals, or are inaccessible (Fagan, 2018). While this approach may be required, it may have undesirable effects in terms of a lack of HCPs providing the initial training; high workload for the HCPs available, and surface level treatment, as those HCPs attempt to cover all aspects of HNC treatment.

Currently, it is unclear if the transdisciplinary approach is being used for cancer care across Africa. A study conducted in 2013 assessed cancer treatment in sub-Saharan Africa. It concluded that surgeons tend to have a pivotal role, as they can be the only physician a patient will see for diagnosis, treatment, and palliative care (Kingham et al., 2013). There is limited research pertaining to therapists as part of an MDT working in Africa with HNC, and there is no mention of this in any of the articles retrieved in

this research. This highlights a gap in our knowledge and understanding about therapy provided for people with HNC. It is unclear if African therapists are treating people with HNC; at what stage from diagnosis; and the extent and role provided by therapists. This is contrary to high-income counties. In the UK, there is a standard that has been met that patients are seen within two weeks of an urgent GP referral for a suspected cancer (Paleri & Roland, 2016). Furthermore, the national cancer strategy in UK has provided specific guidelines and standards of care that highlight the role of SLT's prior to, during, and post treatment (Paleri & Roland, 2016).

Prior to treatment, a primary role of SLT's is to provide pre-operative or pre-treatment education, including what patients can expect with regards to changes in their swallow, speech, or voice functions relating to surgical or oncological intervention (radiotherapy, chemotherapy, or chemo-radiation) (Clarke et al., 2016). That includes various resections, as well as toxicities related to oncological treatment. The role also includes obtaining the baseline swallowing function, and noting if there is a pre-treatment dysphagia, as well as providing prophylactic swallowing exercises, which has been found to reduce impairments, maintain function, and enable a faster recovery (Mortensen et al., 2015). During oncological treatment, the dietician, SLT, dentist, and specialist nurse monitor the patient's closely with regards to their nutrition, odynophagia, dysphagia, voice and speech changes that are related to oncological toxicities (Clarke et al., 2016). Furthermore, post-surgical, and post-oncological SLT follow ups are required, in order to establish how the swallow, voice and speech changes, and to provide appropriate therapy. Throughout the pathway, SLT's work closely with the oncologists and surgeons to understand the prognosis, and expected outcome of medical treatment, which guides the information-giving sessions with patients, as well as the type and intensity of therapy provided (Clarke et al., 2016). Although this is the standard of care in the UK, this is not the case in Africa, where there is limited professionals, and access of patients to these healthcare centres.

Another challenge that is faced is a lack of healthcare infrastructure, with more focus of governments prioritising other high burden diseases across Africa (Beaudoin et al., 2019). The few hospitals that do offer cancer care tend to be in the main cities of each African country (Abdel-Wahab et al., 2013). Similarly, cancer centres in the UK tend to be within the main cities, however cancer care is still accessible to those in more rural regions of the UK (Independent Cancer Task Workforce, 2016). As a result of these difficulties in Africa, waiting times to receive HNC treatment is long and treatment for those living outside of the main cities is inaccessible. This needs to be considered by STs working in Africa to provide community-based therapy over hospital-based therapy, in order to access the

patients, and improve follow up services, prior to, during, and after medical treatment. In this way, STs can also better understand the context in which the patient lives, communicates, and eats in.

Community-based therapy has been found to be more beneficial, even in high-income countries. Reasons for this include better adherence to therapy; more effective for both patients and setting up of clinics/hospitals; and reduces the existing over-reliance of patients on hospital-based care (Independent Cancer Task Workforce, 2016). In the UK, the Cancer Strategy has aimed at providing community-based follow ups after treatment, which includes follow ups with specialist nurses, GP support, and home-based or community-based therapy provided by speech therapists, physiotherapists, and occupational therapists. This is to further assist with re-integration of people with cancer back into their community (Independent Cancer Task Workforce, 2016).

A study done by Larki and Roudsari (2020) sought to compare home-based care to that of hospital-based care for HIV patients. Results conceded that patients adherence to therapy, and overall satisfaction was improved at home; as well as more family members were included in therapy, which enabled better carryover of techniques taught. As a result, community and home-based therapy can be applied to STs working in Africa with HNC patients, in order to access those in more remote areas, as well as establishing better therapy outcomes.

6. Conclusion

This chapter will discuss the overall research question, implications of the data, identify limitations of the systematic review, and provide future recommendations.

6.1. The Epidemiology of HNC in Africa

The systematic review aimed to identify the epidemiology of HNC, based on the current literature. The results indicated a general lack of research in this field, with a primary focus on identifying associated risk factors within each region. The objectives aimed to identifying the locations of where studies were done; the type of HNC; stage of HNC; reported signs and symptoms; risk factors and treatment protocols, as well as identifying the MDT involved. Finally, the researcher aimed to identify who was most at risk, based on the demographics from each study.

The epidemiology, according to the objectives is the following:

- The most studied country is Nigeria, and most studies were done in tertiary hospitals, affiliated with universities.
- The most prevalent type of HNC is OSCC/OPSCC, with a rise of NPC (Type III) in Northern Africa.
- Majority of HNC's are diagnosed at a later stage (stage IV)
- Signs and symptoms are severe in nature, and relate to the anatomic region affected.
- The most prevalent risk factor is substance abuse, namely tobacco use. There is also rise of HPV-related HNC, and EBV-related NPC.
- Surgery remains the primary treatment modality
- MDT is not mentioned in any of the articles, and the role of the ST is lacking
- The people most at risk includes males, and those of a lower SES.

6.2. Implications of the Study

Based on the objectives, the researcher can conclude the practice implications for STs in Africa. The systematic review found that HNC in Africa is characterised as late stage with severe signs and symptoms, and is gradually on the rise, particularly with OC/OPC. The primary histology is SCC, which is aggressive in nature. Primary risk factors associated with HNC continues to be tobacco, alcohol, and an increase in infectious diseases, namely HPV for OC/OPC, and EBV for NPC. People who appear to be most at risk include those of a lower SES, males, and a wide-spread age range depending on the type of HNC and associated risk factor. In terms of treatment protocols, there are multiple challenges facing people with HNC. There is poor access to the appropriate healthcare and insufficient, and/or skilled staff to care for patients with HNC, including STs.

1.2.1. Practice Implications

Speech therapy may be focused on palliative care including compensatory strategies, educating the patient and families on managing communication and eating progression and difficulties, both at present and in future.

- The rapid and aggressive nature of HNC, as well as severity of the disease has implications on the shorter duration of therapy sessions, and succession of them may need to be closer together, rather than a few sessions over a longer period of time.
- Prevention and promotion programmes within the community need to be a focus for practicing STs, due to the growing prevalence, late stage HNC, and severe signs and symptoms.
- The risk factors associated within each region, and population group educates STs practicing in Africa on which is more prevalent in the region they are working. As a result, prevention and education programmes implemented by STs will focus on the specific risk factors, particularly for those most at risk, including males, and those of a lower SES.
- STs in Africa may need to consider taking on a transdisciplinary approach due to limited HCPs and a high number of patients, as well as educating other HCPs on the STs role for them to take on, although this may not be optimal.
- The poor access to healthcare has implications for STs considering a bottom-up approach, whereby STs must consider community-based therapy, rather than hospital-based.
- The need for ST training and a focus on STs role in HNC is required across Africa, and therefore practicing STs in Africa have a role in advocate for more training, and development in the field of HNC at an undergraduate level, and clinical level.

1.2.2. Research Implications

With regards to research, this systematic review has implications with a better understanding on the availability of research; it confirms that that research in this field remains scarce, particularly with a focus on some countries in Africa, whilst others have not been studied at all. Whilst the systematic review focused on identifying risk factors, the need for future research on this topic is indicated. Future research topics that are implied by the systematic review include:

- Identifying cultural practice, ethnic, or race differences of people with HNC within regions in Africa, and reasons why these people are more at risk.
- The review specifically highlighted women with NPC being at risk. This needs to be explored in future research.

- The intervention protocols need to be identified, and associations between the stage of HNC and intervention needs to be explored.
- Identifying which MDT members and HCPs are available, and what their role is in Africa pertaining to HNC.
- Exploring what kinds of patients are being seen in the clinical practice of STs, and/or African STs attitudes, and knowledge around HNC.
- Research is also recommended within specific countries, as each country in Africa has its own challenges, demographic traits, and experience of HNC.

6.2.3. Theoretical Implications

The theoretical implications of the current study give researchers, HCPs and STs a better understanding of HNC in Africa. It confirms the hypothesis that health conditions in Africa are more severe, and are causing a high burden of disease. It also confirms the idea that HNC is a growing disease in Africa, and that has implications for practice. There are theoretical implications for educational institutions training students on HNC. The need to treat patients holistically, within an MDT and to perhaps consider a transdisciplinary approach due to the lack of HCPs. Also considerations of the comorbidities, risk factors and the need for education and treatment within the community should be highlighted within the curriculum.

6.2.4. Clinical Implications

The clinical implications of this systemic review are pertinent to all HCPs and STs alike. HCPs need to understand their role currently, and their role for the future. STs currently have a more remedial and palliative role in treatment, since most HNC's are diagnosed at a late stage, with severe symptoms, and need to consider all anatomic regions, since the disease and signs and symptoms have spread. It is proposed that STs must rather work within the community versus hospital-based care, particularly if they have been discharged home, but require outpatient therapy. A reason for this is the challenge of patients accessing hospitals, particularly when treatment is only received in main cities within the countries. A secondary role of STs is education in the prevention and promotion of HNC and the role of STs.

As this disease continues to be diagnosed at a late stage and is severe in nature, it becomes the responsibility of HCPs to educate other HCPs, policy makers, and people within their community on risk factors associated, early signs symptoms, the pathway for diagnosis and treatment. This education needs to occur in communities that appear more at risk. As this systematic review revealed, that

includes males, people with a lower SES, people that abuse substances, or practice unsafe intercourse, as most infectious diseases associated with HNC are STI's. As older people tend to be getting HNC from substance abuse, all generations need to be educated on stopping substance abuse for future prevention of disease. Furthermore, all ages need to educated on HPV and EBV prevention and treatment. Furthermore, a need for specialist service training is pertinent. That includes ENT's, specialist nurses, maxillofacial surgeon; oral surgeon; and dentists. Allied health, particularly STs working with HNC also needs specific training on working with this population.

6.2.5. Policy Implications

Since the number of HCPs and training centres are scare, this has implications at the level of policy makers at a government level, as well as educational institutions. The first policy is the need for more training and training centres of specialist services, and in this case, STs across Africa. HNC needs to focused on within this training, and this systematic review supports this. Furthermore, policy changes to substance use and HPV and EBV prevention needs to be considered, as well as the implementation of prevention, promotion and education programmes for HNC. Once these have been achieved, facilities for these patients needs to be considered. In particular, skilled and educated staff, radiation and chemotherapy facilitation and support, and rehabilitation from allied healthcare. This is indicated at all levels of healthcare, however a specific focus is recommended at the clinic level, where prevention and promotion programmes are the primary target for the implementation of NHI (National Health Insurance) (Department of Health (DoH, 2017). The NHI is a government health initiative to pool national funds together in order for health services to be affordable and accessible to all South Africans. It was initially introduced in 2012, and is being implemented over stages a 12-year period.

6.3. Limitations of the Study

This systematic review has limitations. The first is the limitations to data. In the data, no raw data could be obtained, therefore it is a summary and analysis of other researcher's data collection. The data was all retrospective in nature, and therefore the primary data retrieved and subsequent analysis was not done by the researchers themselves. As a result, some variables cannot be differentiated and/or associated. There was also missing data in some of the articles, and as a result sample sizes were small. Causal relationships are therefore difficult to make. This was particularly seen when identifying the association of HNC and HIV. The data was also retrieved in select hospitals around Africa. As such, the data is a hospital-based registry rather than a population-based registry, which is the limitation of cancer registries generally (Dalvie, 2019).

Another challenge was the various foci across the epidemiological studies, across a large space. As a result, it was difficult to generalise findings, as each country had a unique epidemiological pattern. Additionally, the data was only retrieved for 19 of the 54 countries, and therefore cannot be generalised across Africa.

As the studies did not have statistical heterogeneity, a meta-analysis could not be done. This could be a limitation when observing the statistics in this review. Although this can be seen as a limitation, the analysed data provided pertinent findings on the current research, and epidemiology of HNC in Africa. Although this systematic review has limitations, the findings are rich and would be useful in guiding further research in this area.

6.4. Contribution of the Study and Future Recommendations

The current study highlighted the overall epidemiology of HNC across Africa, specifically pertaining to the type of HNC, stage of HNC, signs and symptoms, risk factors, treatment protocols, and demographics of people with HNC. This provided invaluable information for HCPs, including STs, educational institutions, government and policy-makers. It highlighted the need for future research and barriers in the health system for treating people with HNC. That included a lack of prevention programmes, trained staff, radiotherapy and/or chemotherapy resources, and access to medical intervention. This highlighted the specific challenges of STs in Africa, including a severe lack of STs, as well as the clinical implications for those that are practicing. That being, a focus on education for prevention and promotion, as well as treating patients with severe disease.

The current study highlighted the need for more research within countries in Africa to highlight the unique risk factors associated with HNC, as well as the intervention and other MDT members involved in HNC treatment. The systematic review also highlighted which countries are in need of study, as only 19 of the 54 African countries were reviewed, with a predominance of studies in some countries versus others. It is recommended that future research highlight the MDT members included, the roles of STs in HNC in Africa, and also to propose practice guidelines for STs working in Africa.

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8. Appendices

Appendix 1

Keys Concepts for the Database Search

	Concept 1	Concept 2	Concept 3
Key concepts	**Epidemiology**	**Head and Neck Cancer**	**Africa**
Free text terms / natural language terms	• Incidence • Prevalence • Morbidity • Determinants • Epidemiologic factors - Risk factors - Causes - Associated risks - Etiology - Aetiology • Distribution - Presentation - Patterns - Trends - Signs - Symptoms - Anatomic site - Demographic - Age - Race	• Head and neck squamous cell carcinoma • Head and neck carcinoma • Head and neck neoplasm • Oral cancer • Oral squamous cell carcinoma • Pharyngeal cancer • Pharyngeal squamous cell carcinoma • Laryngeal cancer • Laryngeal squamous cell carcinoma • Cancer of oropharynx • Oropharyngeal cancer • Oropharyngeal carcinoma • Nasopharyngeal cancer • Hypopharyngeal cancer • Salivary gland cancer • Neoplasm • Neck neoplasm • Neck cancer	• North Africa • Northern Africa • East Africa • Eastern Africa • Southern Africa • South Africa • Sub-Saharan Africa • West Africa • Western African

	- Socio-economic status - Sex/gender - Treatment - Intervention - Medical treatment - Therapy	• Neck carcinoma • Head neoplasm • Head cancer • Head carcinoma • Upper aerodigestive tract neoplasm/carcinoma/cancer	
Controlled vocabulary terms / Subject terms	• Classification + [PM] [ML] • Diagnosis [PM] • Statistics and numerical data + [PM] [ML] • Age of Onset [CINAHL] • Comorbidity [CINAHL] • Risk factors + [CINAHL] • Trends [ML] Risk factors expands to: • Population characteristics [CINAHL] • Demography [CINAHL] • Birth place [CINAHL] • Age factors [CINAHL] • Family characteristics + [CINAHL] Family expands to: • Geographic factors [CINAHL]	- Head and neck neoplasms + (MAJR) [PM], [CINAHL], [ML], [CL] - Neoplasms by site + [PM] [CINAHL] [CL] - Esophageal Neoplasms + [PM] [CINAHL] [ML] - Mouth Neoplasms + [PM] [CINAHL] [ML] - Otorhinolaryngologic Neoplasms (MAJR) + [PM] [CINAHL] [ML] - Parathyroid Neoplasms [PM] [CINAHL] [ML] [CL] - Squamous Cell Carcinoma of Head and Neck [PM] [CINAHL] [ML] [CL] - Thyroid Neoplasms + [PM] [CINAHL] [ML] [CL] - Tracheal Neoplasms [PM] [CINAHL] [ML] [CL] Mouth neoplasms expands to: - Gingival Neoplasms [PM] [CINAHL] [ML] [CL]	- Geographical locations [PM] [CL] - Africa South of the Sahara + [PM] [CINAHL] [ML] [CL] - Africa, Central + [PM] [CINAHL] [ML] [CL] - Africa, Eastern + [PM] [CINAHL] [ML] [CL] - Africa, Southern + [PM] [CINAHL] [ML] [CL] - Africa, Western + [PM] [CINAHL] [ML] [CL] - Africa, Northern + [PM] [CINAHL] [ML] [CL] Northern Africa expands to, on all databases: - Algeria

- Population + [CINAHL]

Population expands to:

- Race factors [CINAHL]
- Sex factors [CINAHL]
- Disease surveillance [CINAHL]
- Health impact assessment [CINAHL]
- Injury pattern [CINAHL]
- Registries, disease [CINAHL]
- Morbidity [CINAHL]
- Mortality [CINAHL]

- Epidemiology factors + [CL]

Epidemiology factors expands to [CL]:

- Age Factors
- Bias
- Causality
- Comorbidity

- Leukoplakia, Oral + [PM] [CINAHL] [ML]
- Lip Neoplasms [PM][CINAHL], [ML]
- Palatal Neoplasms [PM][CINAHL] [ML]
- Salivary Gland Neoplasms + [PM]][CINAHL] [ML]
- Tongue Neoplasms [PM]][CINAHL] [ML]

Otorhinolaryngologic Neoplasms expands to:

- Ear Neoplasms [PM] [CINAHL] [CL]
- Laryngeal Neoplasms [PM] [CINAHL] [CL]
- Nose Neoplasms + [PM] [CINAHL] [ML] [CL]
- Pharyngeal Neoplasms + [PM] [CINAHL] [ML] [CL]

- Egypt
- Libya
- Morocco
- Tunisia

Eastern Africa expands to, on all databases:

- Burundi
- Djibouti
- Eritrea
- Ethiopia
- Kenya
- Rwanda
- Somalia
- Sudan
- South Sudan (ML and CL only)
- Tanzania
- Uganda

Central Africa expands to, on all databases:

- Cameroon
- Central African Republic
- Chad
- Congo
- Democratic Republic of Congo
- Equatorial Guinea

	• Confounding Factors, Epidemiologic • Effect Modifier, Epidemiologic + • Race Factors • Age Factors • Bias • Causality • Comorbidity • Confounding Factors, Epidemiologic • Effect Modifier, Epidemiologic • Race Factors	- Gabon - Sao Tome and Principe (ML and CL only) Southern Africa expands to, on all databases: - Angola - Botswana - Eswatini (CL only] - Lesotho - Malawi - Mozambique - Namibia - South Africa - Swaziland [CINAHL only] - Zambia - Zimbabwe Western Africa expands to, on all databases - Benin - Burkina Faso - Cape Verde/Cabo Verde - Cote d'Ivoire - Gambia - Ghana - Guinea

	- Guinea-Bissau - Liberia - Mali - Mauritania - Niger - Nigeria - Senegal - Sierra Leon - Togo

Note. [PB] is for PubMed database; [CINAHL] is for the CINAHL database; [ML] is Medline database; [CL] is CENTRAL; + is subject heading to be exploded; MAJR- major concept

Appendix 2

Order of Terminology for Each Database

PubMed Search

1. Epidemiolog* + (tw) (includes epidemiology, epidemiological, epidemiology's and epidemiologist/s)
2. Head and neck cancer (tw)
3. Africa + (tw)
4. And/1-3
5. Or/1-3
6. 1-3 [tiab]
7. 1-3 [All Fields]
8. Trials
9. 1-3 and 8
10. 1-3 and 8 [tiab]
11. Incidence [tw]
12. Prevalence [tw]
13. Determinants [tw]
14. Risk factors [tw]
15. Causes [tw]
16. Associated risks [tw]
17. #Etiology [tw] (will look for aetiology and etiology)
18. Distribution [tw]
19. Presentation[tw]
20. Patterns [tw]
21. Trends [tw]
22. Signs [tw]
23. Symptoms [tw]
24. Anatomic site [tw]
25. Demographic [tw]
26. Age [tw]
27. Race [tw]
28. Socio-economic status [tw]
29. Sex/gender [tw]
30. 25-29 [tiab]
31. Treatment [tw]
32. Intervention [tw]
33. Medical treatment [tw]
34. 31-33 [tiab]
35. And/ 11-33
36. Or/ 11-33
37. 1-3 and/or 11-33
38. Public health + [tw]
39. Medicine + [tw]
40. Classification + [tw]

41. Diagnosis [tw]
42. Statistics and numerical data + [tw]
43. 1-3 and/or 38-42
44. Or/ 38-42
45. Cancer + [tw]
46. Neoplasm + [tw]
47. Carcinoma + [tw]
48. Squamous cell carcinoma + [tw]
49. Head and/or neck and 45-48
50. Oral and 45-48
51. Pharyn* (includes pharynx and pharyngeal) and 45-48
52. Laryng* (includes larynx and laryngeal) and 45-48
53. Oropharyng* (includes oropharynx and oropharyngeal) and 45-48
54. Upper aerodigestive tract and 45-48
55. "Head and neck neoplasms"+ (tw) (MAJR)
56. Neoplasm by site + [tw]
57. Mouth neoplasms + [tw]
58. Esophageal Neoplasms + [tw]
59. Otorhinolaryngologic Neoplasms (MAJR) + [tw]
60. Parathyroid Neoplasms [tw]
61. Squamous Cell Carcinoma of Head and Neck [tw]
62. Thyroid Neoplasms + [tw]
63. Tracheal Neoplasms [tw]
64. Or/ 49-63
65. 1-3 and/or 49-63
66. North* Africa + (includes northern and north) [tw]
67. East* Africa + (includes east and eastern) [tw]
68. South* Africa + (includes south and southern) [tw]
69. West* Africa + (includes western and west) [tw]
70. Geographical locations + [tw]
71. Africa, South of the Sahara + [tw]
72. Africa, Central + [tw]
73. And/ 66-72
74. Or/ 66-72
75. 1-3 and/or 66-72

CINAHL database includes the following:

1. Epidemiolog* + (includes epidemiology, epidemiological, epidemiology's and epidemiologist/s)
2. Head and neck cancer
3. Africa +
4. And/1-3
5. Or/1-3
6. Trials
7. 1-3 and 6

8. 1-3 or 6
9. Incidence
10. Prevalence
11. Determinants
12. Risk factors
13. Causes
14. Associated risks
15. #Etiology (will look for aetiology and etiology)
16. Distribution
17. Presentation
18. Patterns
19. Trends
20. Signs
21. Symptoms
22. Anatomic site
23. Demographic
24. Age
25. Race
26. Socio-economic status
27. Sex/gender
28. Or/23-27
29. And/23-27
30. Treatment
31. Intervention
32. Medical treatment
33. And/30-32
34. Or/30-32
35. Public health +
36. Age of onset
37. Comorbidity
38. Risk factors +
39. Population characteristics +
40. Family characteristics +
41. And/9-40
42. Or/9-40
43. 1-3 and/or 9-40
44. Cancer + [tw]
45. Neoplasm + [tw]
46. Carcinoma + [tw]
47. Squamous cell carcinoma + [tw]
48. Head and/or neck and 44-47
49. Oral and 44-47
50. Pharyn* (includes pharynx and pharyngeal) and 44-47
51. Laryng* (includes larynx and laryngeal) and 44-47
52. Oropharyng* (includes oropharynx and oropharyngeal) and 44-47

53. Upper aerodigestive tract and 44-47
54. “Head and neck neoplasms”+ (MAJR)
55. Neoplasm by site +
56. Esophageal Neoplasms +
57. Mouth Neoplasms +
58. Otorhinolaryngologic Neoplasms (MAJR) +
59. Parathyroid Neoplasms
60. Squamous Cell Carcinoma of Head and Neck
61. Thyroid Neoplasms +
62. Tracheal Neoplasms
63. And/ 49-62
64. Or/ 49-62
65. 1-3 and/or 49-62
66. North* Africa + (includes northern and north)
67. East* Africa + (includes east and eastern)
68. South* Africa + (includes south and southern)
69. West* Africa + (includes western and west)
70. Geographical locations +
71. Africa, South of the Sahara +
72. Africa, Central +
73. And/ 66-72
74. Or/ 66-72
75. 1-3 and/or 66-72

MEDLINE (via EBSCO) will use the following keywords:

1. Epidemiolog* + (includes epidemiology, epidemiological, epidemiology’s and epidemiologist/s)
2. Head and neck cancer
3. Africa
4. And/1-3
5. Or/1-3
6. Trials
7. 1-3 and 6
8. 1-3 or 6
9. Incidence
10. Prevalence
11. Determinants
12. Risk factors
13. Causes
14. Associated risks
15. #Etiology (will look for aetiology and etiology)
16. Distribution
17. Presentation
18. Patterns
19. Signs

20. Symptoms
21. Anatomic site
22. Demographic
23. Age
24. Race
25. Socio-economic status
26. Sex or gender
27. And/ 22-26
28. Or/ 22-26
29. Treatment
30. Intervention
31. Medical treatment
32. Or/29-31
33. Public health +
34. Health occupations +
35. Epidemiology + (MAJR)
36. Classification +
37. Statistics and numerical data +
38. Trends
39. And/ 9-38
40. Or/ 9-38
41. 1-3 and/or 9-38
42. Cancer
43. Neoplasm
44. Carcinoma
45. Squamous cell carcinoma
46. Head and/or neck and 42-45
47. Oral and 42-45
48. Pharyn* (includes pharynx and pharyngeal) and 42-45
49. Laryng* (includes larynx and laryngeal) and 42-45
50. Oropharyng* (includes oropharynx and oropharyngeal) and 42-45
51. Upper aerodigestive tract and 42-45
52. “Head and neck neoplasms”+ (MAJR)
53. Neoplasms by site +
54. Esophageal Neoplasms +
55. Mouth Neoplasms +
56. Otorhinolaryngologic Neoplasms (MAJR) +
57. Parathyroid Neoplasms
58. Squamous Cell Carcinoma of Head and Neck
59. Thyroid Neoplasms +
60. Tracheal Neoplasms
61. And/ 46-60
62. Or/ 46-60
63. 1-3 and/or 46-60
64. North* Africa + (includes northern and north)
65. East* Africa + (includes east and eastern)

66. South* Africa + (includes south and southern)
67. West* Africa + (includes western and west)
68. Geographical locations +
69. Africa, South of the Sahara +
70. Africa, Central +
71. And/ 64-70
72. Or/ 64-70
73. 1-3 and/or 64-70

The following keywords were for databases not using subject headings including Embase (via Scopus), and Web of Science. For Google Scholar, the same order was used, but full words were used as truncation is not indicated.

1. Epidemiolog* (includes epidemiology, epidemiological, epidemiology's and epidemiologist/s)
2. Head and neck cancer
3. Africa
4. And/1-3
5. Or/1-3
6. Trials
7. 1-3 and 6
8. 1-3 or 6
9. Incidence
10. Prevalence
11. Determinants
12. Risk factors
13. Causes
14. Associated risks
15. #Etiology (will look for aetiology and etiology)
16. Distribution
17. Presentation
18. Patterns
19. Signs
20. Symptoms
21. Anatomic site
22. Demographic
23. Age
24. Race
25. Socio-economic status
26. Sex or gender
27. And/ 22-26
28. Or/ 22-26
29. Treatment
30. Intervention
31. Medical treatment
32. Or/29-31

33. Epidemiology + (MAJR)
34. Trends
35. And/ 9-34
36. Or/ 9-34
37. 1-3 and/or 9-34
38. Cancer
39. Neoplasm
40. Carcinoma
41. Squamous cell carcinoma
42. Head and/or neck and 38-41
43. Oral and 38-41
44. Pharyn* (includes pharynx and pharyngeal) and 38-41
45. Laryng* (includes larynx and laryngeal) and 38-41
46. Oropharyng* (includes oropharynx and oropharyngeal) and 38-41
47. Upper aerodigestive tract and 38-41
48. "Head and neck neoplasms" (MAJR)
49. Esophageal Neoplasms
50. Mouth Neoplasms
51. Otorhinolaryngologic Neoplasms (MAJR)
52. Parathyroid Neoplasms
53. Squamous Cell Carcinoma of Head and Neck
54. Thyroid Neoplasms
55. Tracheal Neoplasms
56. And/ 42-55
57. Or/ 42-55
58. 1-3 and/or 42-55
59. North* Africa + (includes northern and north)
60. East* Africa + (includes east and eastern)
61. South* Africa + (includes south and southern)
62. Africa, South of the Sahara +
63. West* Africa + (includes western and west)
64. Africa, Central +
65. And/ 59-64
66. Or/ 59-64
67. 1-3 and/or 59-64

CENTRAL was used to search for trials.

1. Epidemiolog* + (includes epidemiology, epidemiological, epidemiology's and epidemiologist/s)
2. Head and neck cancer
3. Africa
4. And/1-3
5. Or/1-3
6. Incidence
7. Prevalence

8. Determinants
9. Risk factors
10. Causes
11. Associated risks
12. #Etiology (will look for aetiology and etiology)
13. Distribution
14. Presentation
15. Patterns
16. Signs
17. Symptoms
18. Anatomic site
19. Demographic
20. Age
21. Race
22. Socio-economic status
23. Sex or gender
24. And/ 19-23
25. Or/ 19-23
26. Treatment
27. Intervention
28. Medical treatment
29. Or/26-28
30. Public health +
31. Health occupations +
32. Epidemiology + (MAJR)
33. Epidemiology factors + (MAJR)
34. And/ 9-33
35. Or/ 9-33
36. 1-3 and/or 9-33
37. Cancer
38. Neoplasm
39. Carcinoma
40. Squamous cell carcinoma
41. Head and/or neck and 37-40
42. Oral and 37-40
43. Pharyn* (includes pharynx and pharyngeal) and 37-40
44. Laryng* (includes larynx and laryngeal) and 37-40
45. Oropharyng* (includes oropharynx and oropharyngeal) and 37-40
46. Upper aerodigestive tract and 37-40
47. “Head and neck neoplasms”+ (MAJR)
48. Neoplasms by site +
49. Esophageal Neoplasms +
50. Otorhinolaryngologic Neoplasms (MAJR) +
51. Parathyroid Neoplasms
52. Squamous Cell Carcinoma of Head and Neck

53. Thyroid Neoplasms +
54. Tracheal Neoplasms
55. And/ 41-54
56. Or/ 41-54
57. 1-3 and/or 41-54
58. North* Africa + (includes northern and north)
59. East* Africa + (includes east and eastern)
60. South* Africa + (includes south and southern)
61. West* Africa + (includes western and west)
62. Geographical locations +
63. Africa, South of the Sahara +
64. Africa, Central +
65. And/58-64
66. Or/ 58-64
67. 1-3 and/or 58-64

Appendix 3

Search terms, Filters and Results Yielded for the Pilot Study

Database searched	Date	Search terms used	Filters applied	No. of records retrieved, excluded and comments:
Pubmed	02/06	((epidemiology[MeSH Terms]) AND (cancer of head and neck[MeSH Terms])) AND (africa[MeSH Terms])	Last 10 years	Before filter: 27 After filter: 2
		((((((((((((((((((epidemiology[MeSH Terms]) OR (epidemiolog*[MeSH Terms])) OR (determinants, epidemiologic[MeSH Terms])) OR (incidence*[MeSH Terms])) OR (prevalence[MeSH Terms])) OR (analyses, demographic[MeSH Terms])) OR (demograph*[MeSH Terms])) OR (causes[MeSH Terms])) OR (risk factor*[MeSH Terms])) OR (symptom*[MeSH Terms])) OR (anatomic site[MeSH Terms])) OR (treatment*[MeSH Terms])) OR (intervention*[MeSH Terms])) OR (gender[MeSH Terms])) OR (age*[MeSH Terms])) OR (socioeconomic status[MeSH Terms])) OR (medical intervention[MeSH Terms])) OR (race relations[MeSH Terms])) OR (race*[MeSH Terms])	None	7,270,850 results For epidemiology builder
		((((((((((((((((((((head and neck cancer[MeSH Terms]) OR (cancer of the head and neck[MeSH Terms])) OR (head and neck neoplasms[MeSH Terms])) OR (neoplasms, head and neck[MeSH Terms])) OR (oral cancer*[MeSH Terms])) OR (oral squamous cell carcinoma[MeSH Terms])) OR (cancer, pharyngeal[MeSH Terms])) OR (cancers, pharyngeal[MeSH Terms])) OR (cancer of pharynx[MeSH Terms])) OR (cancer of the pharynx[MeSH Terms])) OR (laryngeal cancer*[MeSH Terms])) OR (cancer of larynx[MeSH Terms])) OR (cancer of the oropharynx[MeSH Terms])) OR (cancer, oropharyngeal[MeSH Terms])) OR (cancer, oropharynx[MeSH Terms])) OR (otolaryngologic cancer[MeSH Terms])) OR (mouth neoplasm*[MeSH Terms])) OR (cancer of nasopharynx[MeSH Terms])) OR (cancer of the	None	310,215 results For cancer builder

	nasopharynx[MeSH Terms])) OR (cancer, nasopharyngeal[MeSH Terms])) OR (cancers, nasopharyngeal[MeSH Terms])) OR (cancer, nasopharynx[MeSH Terms])		
	((((((((((((africa[MeSH Terms]) OR (africa south of the sahara[MeSH Terms])) OR (africa, central[MeSH Terms])) OR (africa, eastern[MeSH Terms])) OR (north africa[MeSH Terms])) OR (north* africa[MeSH Terms])) OR (africa, southern[MeSH Terms])) OR (south* africa[MeSH Terms])) OR (central african republic[MeSH Terms])) OR (east* africa[MeSH Terms])) OR (africa, western[MeSH Terms])) OR (west* africa[MeSH Terms])) OR (south west africa[MeSH Terms]))	None	264,253 results For Africa builder
	Combined three builders from above: ((((((((((((((africa[MeSH Terms]) OR (africa south of the sahara[MeSH Terms])) OR (africa, central[MeSH Terms])) OR (africa, eastern[MeSH Terms])) OR (north africa[MeSH Terms])) OR (north* africa[MeSH Terms])) OR (africa, southern[MeSH Terms])) OR (south* africa[MeSH Terms])) OR (central african republic[MeSH Terms])) OR (east* africa[MeSH Terms])) OR (africa, western[MeSH Terms])) OR (west* africa[MeSH Terms])) OR (south west africa[MeSH Terms]))) AND ((((((((((((((((((((head and neck cancer[MeSH Terms]) OR (cancer of the head and neck[MeSH Terms])) OR (head and neck neoplasms[MeSH Terms])) OR (neoplasms, head and neck[MeSH Terms])) OR (oral cancer*[MeSH Terms])) OR (oral squamous cell carcinoma[MeSH Terms])) OR (cancer, pharyngeal[MeSH Terms])) OR (cancers, pharyngeal[MeSH Terms])) OR (cancer of pharynx[MeSH Terms])) OR (cancer of the pharynx[MeSH Terms])) OR (laryngeal cancer*[MeSH Terms])) OR (cancer of larynx[MeSH Terms])) OR (cancer of the oropharynx[MeSH Terms])) OR (cancer, oropharyngeal[MeSH Terms])) OR (cancer, oropharynx[MeSH Terms])) OR (otolaryngologic cancer[MeSH Terms])) OR (mouth neoplasm*[MeSH Terms])) OR (cancer of nasopharynx[MeSH Terms])) OR (cancer of the nasopharynx[MeSH Terms])) OR (cancer, nasopharyngeal[MeSH Terms])) OR (cancers, nasopharyngeal[MeSH Terms])) OR (cancer, nasopharynx[MeSH Terms]))))	None	901 results Comments: The asterisk in the search was ignored by the database. The following terms were not found in PubMed: site, intervention*, age, distribution Therefore, to remove asterix from intervention and “age”. Comments from researcher: Oesophageal cancer showing. Keep in search for now. Also add to search:

	AND ((((((((((((((((((epidemiology[MeSH Terms]) OR (epidemiolog*[MeSH Terms])) OR (determinants, epidemiologic[MeSH Terms])) OR (incidence*[MeSH Terms])) OR (prevalence[MeSH Terms])) OR (analyses, demographic[MeSH Terms])) OR (demograph*[MeSH Terms])) OR (causes[MeSH Terms])) OR (risk factor*[MeSH Terms])) OR (symptom*[MeSH Terms])) OR (anatomic site[MeSH Terms])) OR (treatment*[MeSH Terms])) OR (intervention*[MeSH Terms])) OR (gender[MeSH Terms])) OR (age*[MeSH Terms])) OR (socioeconomic status[MeSH Terms])) OR (medical intervention[MeSH Terms])) OR (race relations[MeSH Terms])) OR (race*[MeSH Terms]))		- Hypopharyngeal cancer - Salivary gland cancer - Paranasal sinus cancer - Nasal cancer - Age distribution
	((((((((((((((africa[MeSH Terms]) OR (africa south of the sahara[MeSH Terms])) OR (africa, central[MeSH Terms])) OR (africa, eastern[MeSH Terms])) OR (north africa[MeSH Terms])) OR (north* africa[MeSH Terms])) OR (africa, southern[MeSH Terms])) OR (south* africa[MeSH Terms])) OR (central african republic[MeSH Terms])) OR (east* africa[MeSH Terms])) OR (africa, western[MeSH Terms])) OR (west* africa[MeSH Terms])) OR (south west africa[MeSH Terms]))) AND ((((((((((((((((((((head and neck cancer[MeSH Terms]) OR (cancer of the head and neck[MeSH Terms])) OR (head and neck neoplasms[MeSH Terms])) OR (neoplasms, head and neck[MeSH Terms])) OR (oral cancer*[MeSH Terms])) OR (oral squamous cell carcinoma[MeSH Terms])) OR (cancer, pharyngeal[MeSH Terms])) OR (cancers, pharyngeal[MeSH Terms])) OR (cancer of pharynx[MeSH Terms])) OR (cancer of the pharynx[MeSH Terms])) OR (laryngeal cancer*[MeSH Terms])) OR (cancer of larynx[MeSH Terms])) OR (cancer of the oropharynx[MeSH Terms])) OR (cancer, oropharyngeal[MeSH Terms])) OR (cancer, oropharynx[MeSH Terms])) OR (otolaryngologic cancer[MeSH Terms])) OR (mouth neoplasm*[MeSH Terms])) OR (cancer of nasopharynx[MeSH Terms])) OR (cancer of the nasopharynx[MeSH Terms])) OR (cancer, nasopharyngeal[MeSH Terms])) OR (cancers, nasopharyngeal[MeSH Terms])) OR (cancer, nasopharynx[MeSH Terms])))))	None	13,310 results The following terms were ignored:),),),),),),),),),)The following terms were not found in PubMed: site, distribution, age Comments: - Remove “distribution” and “site” - Too many results yielded. Something wrong with input. To go back and look

	OR (cancer, hypopharyngeal[MeSH Terms])) OR (cancers, hypopharyngeal[MeSH Terms])) OR (hypopharyngeal neoplasm[MeSH Terms])) OR (cancer of the hypopharynx[MeSH Terms])) OR (cancer of salivary gland[MeSH Terms])) OR (cancer of paranasal sinus[MeSH Terms])) OR (nasal cancer[MeSH Terms]))) AND ((((((((((((((((((epidemiology[MeSH Terms]) OR (epidemiolog*[MeSH Terms])) OR (determinants, epidemiologic[MeSH Terms])) OR (incidence*[MeSH Terms])) OR (prevalence[MeSH Terms])) OR (analyses, demographic[MeSH Terms])) OR (demograph*[MeSH Terms])) OR (causes[MeSH Terms])) OR (risk factor*[MeSH Terms])) OR (symptom*[MeSH Terms])) OR (anatomic site[MeSH Terms])) OR (treatment*[MeSH Terms])) OR (intervention[MeSH Terms])) OR (gender[MeSH Terms])) OR (age[MeSH Terms])) OR (socioeconomic status[MeSH Terms])) OR (medical intervention[MeSH Terms])) OR (race relations[MeSH Terms])) OR (race*[MeSH Terms]))) OR (distribution[MeSH Terms])	how to search using MeSH terms
05/06	Build MeSH terms again via MeSH database Epidemiology inserted: Epidemiology as major topic with following terms below tree: - Molecular epidemiology - Pharma ((((("Epidemiology"[Mesh]) OR "Epidemiology/classification"[Mesh]) OR ("Epidemiology/diagnosis"[Mesh])) OR ("Epidemiology/methods"[Mesh])) OR ("Epidemiology/statistics and numerical data"[Mesh])	71,673 results
05/06	Head and neck cancer inserted: Head and neck neoplasms as major topic with the following terms ender tree hierarchy: Definition:	307,796 results

	Soft tissue tumours or cancer arising from the mucosal surfaces of the LIP; oral cavity; PHARYNX; LARYNX; and cervical esophagus. Other sites included are the NOSE and PARANASAL SINUSES; SALIVARY GLANDS; THYROID GLAND and PARATHYROID GLANDS; and MELANOMA and non-melanoma skin cancers of the head and neck. (from Holland et al., Cancer Medicine, 4th ed, p1651) Head and Neck Neoplasms Esophageal Neoplasms Esophageal Squamous Cell Carcinoma Facial Neoplasms Eyelid Neoplasms Mouth Neoplasms Gingival Neoplasms Leukoplakia, Oral + Lip Neoplasms Palatal Neoplasms Salivary Gland Neoplasms + Tongue Neoplasms Otorhinolaryngologic Neoplasms Ear Neoplasms Laryngeal Neoplasms Nose Neoplasms +	Comments: Too many results that are not answering objectives

	Pharyngeal Neoplasms + Parathyroid Neoplasms Squamous Cell Carcinoma of Head and Neck Thyroid Neoplasms Thyroid Cancer, Papillary Thyroid Nodule Tracheal Neoplasms Therefore, to include all the terms below. Subheadings included: ((((((("Head and Neck Neoplasms"[Mesh]) OR "Head and Neck Neoplasms/diagnosis"[Mesh]) OR ("Head and Neck Neoplasms/classification"[Mesh] OR)) OR ("Head and Neck Neoplasms/epidemiology"[Mesh])) OR ("Head and Neck Neoplasms/etiology"[Mesh])) OR ("Head and Neck Neoplasms/radiotherapy"[Mesh] OR "Head and Neck Neoplasms/surgery"[Mesh])) OR ("Head and Neck Neoplasms/statistics and numerical data"[Mesh]	
05/06	Insert “Africa”. Tree hierarchy includes: Africa South of the Sahara Africa, Central + Africa, Eastern + Africa, Southern +	264,402 results

	Africa, Western + Africa, Northern Algeria Egypt Libya Morocco Tunisia Therefore, to include all items below “Africa” Subheadings include: (("Africa"[Mesh]) OR "Africa/epidemiology"[Mesh]) OR ("Africa/statistics and numerical data"[Mesh])	
	Now: Add three together: ((((("Africa"[Mesh]) OR "Africa/epidemiology"[Mesh]) OR ("Africa/statistics and numerical data"[Mesh])) AND (((((((("Head and Neck Neoplasms"[Mesh]) OR "Head and Neck Neoplasms/diagnosis"[Mesh]) OR ("Head and Neck Neoplasms/classification"[Mesh] OR)) OR ("Head and Neck Neoplasms/epidemiology"[Mesh])) OR ("Head and Neck Neoplasms/etiology"[Mesh])) OR ("Head and Neck Neoplasms/radiotherapy"[Mesh] OR "Head and Neck Neoplasms/surgery"[Mesh])) OR ("Head and Neck Neoplasms/statistics and numerical data"[Mesh])) AND (((((("Epidemiology"[Mesh]) OR "Epidemiology/classification"[Mesh]) OR ("Epidemiology/diagnosis"[Mesh])) OR ("Epidemiology/methods"[Mesh])) OR ("Epidemiology/statistics and numerical data"[Mesh]))	13 results Filter added” English only yields 13 results Filter added: Last 10 years yields 2 results Comments: Results are more relevant than search results on 03/06 however too specific

	All Fields search: Epidemiology of head and neck cancer in Africa Yields same results if: ((epidemiology) AND (head and neck cancer)) AND (africa) (with and without filters) Translations in PubMed: epidemiology: "epidemiologies"[All Fields] OR "epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "epidemiology"[MeSH Terms] OR "epidemiology's"[All Fields] head and neck cancer: "head and neck neoplasms"[MeSH Terms] OR ("head"[All Fields] AND "neck"[All Fields] AND "neoplasms"[All Fields]) OR "head and neck neoplasms"[All Fields] OR ("head"[All Fields] AND "neck"[All Fields] AND "cancer"[All Fields]) OR "head and neck cancer"[All Fields] africa: "africa"[MeSH Terms] OR "africa"[All Fields] OR "africa's"[All Fields] OR "africas"[All Fields]		1,144 results Last 10 years: 328 results Add English filer: 299 results Comments - Yields more specific results and appropriate results - To try with different Boolean operators
08/06	Trialling with more Boolean operators ((((epidemiology) AND (head and neck cancer)) OR (head and neck neoplasm)) OR (head and neck carcinoma)) AND (africa)	Last 10 years and English	627 results. Comments: - Shows more global studies which can be included - Too many random results not pertaining to HNC or to epidemiology

	08/06	(((((((epidemiology) AND (head and neck cancer)) OR ("head and neck cancer")) OR ("head and neck neoplasm") OR (head and neck cancer[MeSH Terms])) OR (head and neck neoplasms[MeSH Terms])) AND (africa[MeSH Terms])) OR (africa) Overall comment for PubMed: Best match is searching for All Fields and the terms: (head and neck cancer)) AND (africa) (with filter English only and last 10 years), then to systematically review each result.		171201 results with filters (English and last 10 years) Comments: too many results yielded. Not including Africa necessarily.
EBSCO	11/06	TI(head and neck cancer or oral cancer or oropharyngeal cancer or hnc) AND TI (africa or African country)	none	16 results
	11/06	(head and neck cancer or oral cancer or oropharyngeal cancer or hnc) AND (africa or African countries)	none	1341. Comments: Not specific enough
	17/06	Same as above	Last 10 years & English	776 results. Comments: Results not specific enough
	17/06	Duplicates removed from search automatically (head and neck cancer or oral cancer or oropharyngeal cancer or hnc) AND (africa or african countries)	English and last 10 years	267 results Comments: Specific results obtained
Scopus	17/06	(ALL (africa OR african AND countr*)) AND (ALL ("head and neck cancer" OR (head AND neck AND neoplasm) OR "head and neck squamous cell carcinoma")) Also: ALL("head and neck cancer" AND africa)	none	2128 documents. Comment: Not applicable results retrieved. 2048 results. Irrelevant data
	17/06	TITLE-ABS-KEY ("head and neck cancer" AND africa)		96 documents

		TITLE-ABS-KEY ((africa OR "african country") AND ("head and neck cancer" OR "head and neck neoplasm" OR "head and neck squamous cell carcinoma"))		142 documents More applicable results obtained
		As above	Last 10 years & English	89 documents
Web of Science	17/06	(TS=(epidemiolog* OR presentation OR determinants OR risk factor* OR treatment* OR demographic* OR age OR race OR socio-economic status OR trend* OR distribution*)) AND (TS=(Africa OR African countr*)) AND (TS=("head and neck cancer" OR head and neck neoplasm OR "head and neck squamous cell carcinoma"))	Last 10 years and English	23 results Applicable results obtained
Sabinet	17/06	“head and neck cancer” [all fields] AND “Africa” [all fields]	2010-2020 and English	380 results Applicable results obtained
Google scholar	17/06	(epidemiolog* OR presentation OR "determinants" OR "risk factor" OR treatment* OR "demographic" OR "demography" OR "age" OR "race" OR "socio-economic status" OR trend* OR distribution*) AND ("africa" OR "african country") AND ("head and neck cancer" OR "head and neck neoplasm" OR "head and neck squamous cell carcinoma")	2010-2020 and English	5020 results Comments: try with all quotation marks. NB Google Scholar automatically adds “and” between words
	17/06	"africa" "head and neck cancer" in advanced search, first line “with all the words”		6510 results Stop after first 200 results, as recommended

Appendix 4

Template for Documenting the Results

Database searched:	Date of search	Search terms used	Filters applied	No. of records retrieved	No. of records excluded after screening	No. of records included
Bibliographic databases:						
Grey literature:						
Other sources:						
Records after duplicates removed						
Studies after full-text assessed						

Appendix 5

Data Record Form of Articles Appraised Using Mixed Methods Appraisal Tool (MMAT)

Responses for each:

- 'Yes' response: Provide 20%
- 'No; or 'can't tell' response: Provide 0

MMAT Criteria for Qualitative Studies:

1. Is the qualitative approach appropriate to answer the research question?
2. Are the qualitative data collection methods adequate to address the research question?
3. Are the findings adequately derived from the data?
4. Is the interpretation of results sufficiently substantiated by data?
5. Is there coherence between qualitative data sources, collection, analysis and interpretation?

Author	Article Title	Q1	Q2	Q3	Q4	Q5	Score (%)	Comment
Douthit et al., 2016	Social determinants of health: Poverty, national infrastructure and investment.	Yes	Yes	Yes	Yes	Yes	100	N/A
Masamba et al., 2013	Case Report: Down-staging locally advanced head and neck cancer in an HIV infected patient in a limited resource setting.	Yes	Yes	Yes	Yes	Yes	100	N/A
Molomo et al., 2015	Discoid lupus erythematosus-related squamous cell carcinoma of the lip in an HIV-seropositive black male.	Yes	Yes	Yes	Yes	Yes	100	N/A

MMAT Criteria for Quantitative Non-Randomized Studies

1. Are the participant's representative of the target population?
2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?
3. Are there complete outcome data?
4. Are the confounders accounted for in the design and analysis? (In explanation in MMAT: Confounders are factors that predict both the outcome of interest and the intervention received/exposure at baseline)
5. During the study period, is the intervention administered (or exposure occurred) as intended

Author	Article Title	Q1	Q2	Q3	Q4	Q5	Score (%)	Comment
HNC sub-group								
Aboagye et al., 2019	Human Papillomavirus Detection in Head and Neck Squamous Cell Carcinomas at a Tertiary Hospital in Sub-Saharan Africa.	Yes	Yes	Yes	Yes	Yes	100	N/A
Ahmed et al., 2012	Human papilloma virus attributable head and neck cancer in the Sudan assessed by p16ink4a immunostaining.	Yes	Yes	Yes	Yes	Yes	100	N/A
Faggons et al., 2017	Human papilloma virus in head and neck squamous cell carcinoma: A descriptive study of histologically confirmed cases at Kamuzu Central Hospital in Lilongwe, Malawi	Yes	Yes	Yes	No	Yes	80	Article does not state any other risk factors that the participants could have been exposed to prior to or in conjunction with the studied risk factor. This could not be concluded as the article mentioned that other risk factors may have been included, but did not specify numeric values.
Ilboudo et al., 2019	Characterization of high-risk oncogenic human papillomavirus genotypes in histologically	Yes	No	Yes	No	Yes	60	Did not measure as intended, as missing data, and Incorrect documented values. Therefore, confounders could not be

	confirmed ear, nose and throat (Ent) cancers in Burkina Faso.							accounted for, and measurements not appropriate/correct.
Kamulegey et al., 2017	Head and Neck Cancers Case Control Study of HIV Positive Compared to Negative Patients in a Ugandan Population Sample.	Yes	Yes	Yes	Yes	Yes	100	N/A
Khlifi et al., 2014	Risk of laryngeal and nasopharyngeal cancer associated with arsenic and cadmium in the Tunisian population.	Yes	Yes	Yes	Yes	Yes	100	N/A
Khlifi et al., 2013	Arsenic, cadmium, chromium and nickel in cancerous and healthy tissues from patients with head and neck cancer.	Yes	Yes	Yes	Yes	Yes	100	N/A
Kofi et al., 2019	Infrequent detection of human papillomavirus infection in head and neck cancers in the Central African Republic: A retrospective study.	Yes	Yes	Yes	Yes	Yes	100	N/A
Makni et al., 2019	Association of common il-10 promoter gene variants with the susceptibility to head and neck cancer in Tunisia.	Yes	Yes	Yes	Yes	Yes	100	N/A
Ndiaye et al., 2013	The role of human papillomavirus in head and neck cancer in Senegal.	Yes	Yes	Yes	Yes	Yes	100	N/A
Oga et al., 2016	Paucity of HPV-Related Head and Neck Cancers (HNC) in Nigeria	No	Yes	No	Yes	Cannot tell	40	Small sample, missing data, and incorrect clinical records. Therefore, confounders could not be accounted for, and measurements not appropriate/correct. Not

								representative of Nigerian population.
Rettig et al., 2019	Oral Human Papillomavirus Infection and Head and Neck Squamous Cell Carcinoma in Rural Northwest Cameroon.	No	Yes	Yes	Yes	Yes	80	Not representative of target population, as study only completed at 1 tertiary hospital.
Sekee et al., 2018	Human papillomavirus in head and neck squamous cell carcinomas in a South African cohort.	Cannot Tell	Yes	Yes	Yes	Yes	80	Did not state target population within South Africa.
Oral/Oropharyngeal SCC subgroup								
Alex-Okoro et al., 2016	The comparison of the pathological data of oropharyngeal masses between HIV and non-HIV patients.	Yes	Yes	Yes	Yes	Yes	100	N/A
Blumberg et al., 2015	Investigation of the presence of HPV related oropharyngeal and oral tongue squamous cell carcinoma in Mozambique.	Yes	Yes	Yes	Yes	Yes	100	N/A
Jalouli et al., 2010	Presence of human papilloma virus, herpes simplex virus and Epstein-Barr virus DNA in oral biopsies from Sudanese patients with regard to toombak use.	Yes	Yes	Yes	Yes	Yes	100	N/A
Jalouli et al., 2012	Human papilloma virus, herpes simplex virus and Epstein Barr virus in oral squamous cell carcinoma from eight different countries.	Yes	Yes	Yes	Yes	Yes	100	N/A
Lawal et al., 2011	Social profile and habits of oral cancer patients in Ibadan.	Yes	Yes	Yes	Yes	Yes	100	N/A

Paquette et al., 2013	Evidence That Alpha-9 Human Papillomavirus Infections are a Major Etiologic Factor for Oropharyngeal Carcinoma in Black South Africans.	Yes	Yes	Yes	Yes	Yes	100	N/A
Tealab et al., 2013	Prevalence of human papilloma virus in oropharyngeal, tongue and lip squamous cell carcinoma: An experience from the Egyptian National Cancer Institute.	Yes	Yes	Yes	Yes	Yes	100	N/A
NPC Subgroup								
Asante et al., 2017	Detection of Human Papillomavirus Genotypes and Epstein-Barr Virus in Nasopharyngeal Carcinomas at the Korle-Bu Teaching Hospital, Ghana.	Yes	Yes	Yes	Cannot Tell	Yes	80	Did not discuss potential confounders in article therefore do not know if accounted for.
Edreis et al., 2016	Molecular Detection of Epstein - Barr virus in Nasopharyngeal Carcinoma among Sudanese population.	Cannot Tell	Yes	Yes	Yes	Yes	80	Did not state target population if for representation of entire Sudanese population, or within particular area.
El-Amrani-Joutey ET AL., 2018	Infection by Epstein–Barr virus in Fes (Morocco). Prevalence and predictors of positivity in nasopharyngeal cancer.	Yes	Yes	Yes	Yes	Yes	100	N/A
Erasmus et al., 2013	The histology of nasopharyngeal masses: A comparison between HIV positive and HIV negative patients.	Cannot Tell	Yes	Yes	Yes	Yes	80	Did not state target population – only HIV positive and negative. Cannot tell if targeted.
Khaali et al., 2016	No association between TGF-β1 polymorphisms and risk of nasopharyngeal carcinoma in a	Yes	Yes	Yes	Yes	Yes	100	N/A

	large North African case-control study.							
Laantri et al., 2011	XRCC1 and hOGG1 genes and risk of nasopharyngeal carcinoma in North African countries.	Yes	Yes	Yes	Yes	Yes	100	N/A
Mokni-Baizig et al., 2013	HLA-A*26-A*30 and HLA-DRB1*10 could be predictors of nasopharyngeal carcinoma risk in high-risk Tunisian families.	Yes	Yes	Yes	Yes	Yes	100	N/A
Moumad et al., 2018	Joint effect of smoking and NQO1 C609T polymorphism on undifferentiated nasopharyngeal carcinoma risk in a North African population.	Yes	Yes	Yes	Yes	Yes	100	N/A
Moumad et al., 2013	Genetic polymorphisms in host innate immune sensor genes and the risk of nasopharyngeal carcinoma in North Africa.	Yes	Yes	Yes	Yes	Yes	100	N/A
Raissouni et al., 2013	Clinical prognostic factors in locally advanced nasopharyngeal carcinoma in Moroccan population.	Yes	Yes	Cannot Tell	Yes	No	60	Small sample, missing data, and incorrect clinical records. Therefore, confounders could not be accounted for, and measurements not appropriate/correct.
Laryngeal/Hypopharyngeal SCC								
Kariche et al., 2018	Comparative assessment of HPV, alcohol and tobacco etiological fractions in Algerian patients with laryngeal squamous cell carcinoma.	Yes	Yes	Yes	Yes	Yes	100	N/A
Milad et al., 2018	Prevalence of human papillomavirus in benign and	Yes	Yes	Yes	Yes	Yes	100	N/A

	malignant laryngeal lesions in Egyptian patients: Cross-sectional study.							

MMAT Criteria for Quantitative Descriptive Studies:

1. Is the sampling strategy relevant to address the research question?
2. Is the sample representative of the target population?
3. Are the measurements appropriate?
4. Is the risk of nonresponse bias low? Explanation: Nonresponse bias consists of "an error of non-observation reflecting an unsuccessful attempt to obtain the desired information from an eligible unit." (Federal Committee on Statistical Methodology, 2001, p. 6). To judge this criterion, consider whether the respondents and non- respondents are different on the variable of interest. This information might not always be reported in a paper. Some indicators of low nonresponse bias can be considered such as a low nonresponse rate, reasons for nonresponse (e.g., noncontacts vs. refusals), and statistical compensation for nonresponse (e.g., imputation). The nonresponse bias is might not be pertinent for case series and case report. This criterion could be adapted. For instance, complete data on the cases might be important to consider in these designs.
5. Is the statistical analysis appropriate to answer the research question?

Author	Document title	Q 1	Q 2	Q 3	Q 4	Q 5	Score (%)	Comment
HNC subgroup								
Akinshipo et al., 2017	Head and neck cancers: An histopathologic review of cases seen in three tertiary hospitals in Northwestern Nigeria.	Yes	Yes	Yes	Yes	Yes	100	N/A
Dos Passos et al., 2015	Loupe magnification for head and neck free flap reconstruction in a developing country.	Yes	Yes	Yes	Yes	Yes	100	N/A
Erinoso et al., 2016	Emerging trends in the epidemiological pattern of head and neck cancers in Lagos, Nigeria.	Yes	Yes	Yes	Yes	Yes	100	N/A

Gilyoma et al., 2015	Head and neck cancers: A clinico-pathological profile and management challenges in a resource-limited setting.	Yes	Yes	Yes	No	Yes	80	Nonresponse bias high. Small sample, and did not indicate the number of people that were excluded or did not participate in the study.
Hounkpatin et al., 2020	Histo-Epidemiological Profile of Head and Neck Cancers in Benin.	Yes	Yes	Yes	Yes	Yes	100	N/A
Kakande et al., 2010	Head and neck squamous cell carcinoma in a Ugandan population: A descriptive epidemiological study.	Yes	Yes	Yes	Cannot tell	Yes	80	Nonresponse bias not low. Small sample, and did not indicate the number of people that were excluded or did not participate in the study.
Kodiya et al., 2015	Epidemiology of Head and Neck Cancers in Maiduguri-Northeastern Nigeria.	Yes	No	Yes	Cannot tell	Yes	60	Sample not representative, as small sample size. Nonresponse bias not low. Did not indicate the number of people that were excluded or did not participate in the study.
Mwansasu et al., 2015	Pattern of head and neck cancers among patients attending Muhimbili National Hospital Tanzania.	Yes	Yes	Yes	Cannot tell	Yes	80	Nonresponse bias not low. Small sample, and did not indicate the number of people that were excluded or did not participate in the study.
Nabukenya et al., 2018	Head and Neck Squamous Cell Carcinoma in Western Uganda: Disease of Uncertainty and Poor Prognosis.	Yes	Yes	Yes	Yes	Yes	100	N/A
Okwor et al., 2017	Survivorship of patients with head and neck cancer receiving care in	Yes	Yes	Yes	Yes	Yes	100	N/A

	a tertiary health facility in Nigeria.							
Sabageh et al., 2015	Malignant tumors of the upper aerodigestive tract as seen in a Nigerian tertiary health institution.	Yes	Cannot Tell	Yes	Yes	Yes	80	Did not mention target population.
Oral/Oropharyngeal SCC Subgroup								
Abram et al., 2012	Epidemiology of oral squamous cell carcinoma.	Yes	Cannot Tell	Yes	Yes	Yes	100	Did not mention target population.
Adesina et al., 2018	Review of 109 Cases of Primary Malignant Orofacial Lesions Seen at a Nigerian Tertiary Hospital.	Yes	Yes	Yes	Yes	Yes	100	N/A
Adeyemi et al., 2013	Clinical presentation of oral squamous cell carcinoma.	Yes	Yes	Yes	Cannot Tell	No	60	Reported missing data and small sample size, however did not adjust statistics to this. Also unable to tell if accounted for risk bias, as did not indicate the number of people that were excluded or did not participate in the study.
Adeyemi et al., 2011a	A retrospective histopathological review of oral squamous cell carcinoma in a Nigerian teaching hospital.	Yes	Yes	Yes	Cannot Tell	Yes	80	Unable to tell if accounted for risk bias, as did not indicate the number of people that were excluded or did not participate in the study
Adeyemi et al., 2011b	Oral squamous cell carcinoma, socioeconomic status and history of exposure to alcohol and tobacco.	Yes	Yes	Yes	Cannot Tell	Yes	80	Unable to tell if accounted for risk bias, as did not indicate the number of people that were excluded or did not participate in the study

Adoga et al., 2010	Clinicopathological profile of malignant tumors of the oropharynx: a case series.	Yes	Yes	Yes	Yes	Yes	100	N/A
Ayo-Yusuf et al., 2013	Trends and ethnic disparities in oral and oro-pharyngeal cancers in South Africa, 1992-2001.	Yes	Yes	Yes	Cannot Tell	Yes	80	Unable to tell if accounted for risk bias, as did not indicate the number of people that were excluded or did not participate in the study
Bassey et al., 2015	Trends and ethnic disparities in oral and oro-pharyngeal cancers in South Africa, 1992-2001.	Yes	Yes	Yes	Yes	Yes	100	N/A
Butt et al., 2015	Oral squamous cell carcinoma in human immunodeficiency virus positive patients: Clinicopathological audit	Yes	Yes	Yes	Cannot Tell	Yes	80	Unable to tell if accounted for risk bias, as did not indicate the number of people that were excluded or did not participate in the study
Garrana et al., 2018	Oral Squamous Cell Carcinoma, a growing problem.	Yes	Yes	Yes	Yes	Yes	100	N/A
Khammissa et al., 2014	Oral squamous cell carcinoma in a South African sample: Race/ethnicity, age, gender, and degree of histopathological differentiation	Yes	Yes	Yes	Yes	Yes	100	N/A

Lasisi et al., 2012	Oro-facial squamous cell carcinoma--a twenty-year retrospective clinicopathological study.	Yes	Yes	Yes	Cannot Tell	Yes	80	Unable to tell if accounted for risk bias, as did not indicate the number of people that were excluded or did not participate in the study
Omitola et al., 2017	A multi-centre evaluation of oral cancer in southern and Western Nigeria: An African oral pathology research consortium initiative.	Yes	Yes	Yes	Yes	Yes	100	N/A
Osman et al., 2010	Pattern of malignant tumors registered at a referral oral and maxillofacial hospital in Sudan during 2006 and 2007	Yes	Yes	Yes	Yes	Yes	100	N/A
NPC Subgroup								
Adewuyi et al., 2013	Clinicopathologic characterization of nasopharyngeal carcinoma seen in the radiotherapy and oncology department, ahmadu bello university teaching hospital, Zaria, Nigeria: 2006-2010.	Yes	Yes	Yes	Yes	Yes	100	N/A
Alabi et al., 2010	Clinico-pathological pattern of nasopharyngeal	Yes	Yes	Yes	Yes	Yes	100	N/A

	carcinoma in Ilorin, Nigeria.							
Wided et al., 2015	Nasopharyngeal carcinoma incidence in North Tunisia: Negative trends in adults but not adolescents, 1994-2006.	Yes	Yes	Yes	Yes	Yes	100	N/A
Laryngeal Hypopharyngeal SCC Subgroup								
Amusa et al., 2011	Laryngeal carcinoma: Experience in Ile-Ife, Nigeria.	Yes	Yes	Yes	Yes	Yes	100	N/A
Elfeky et al., 2015	Hypopharyngeal reconstruction: a comparison of three alternatives	Yes	Yes	Yes	Yes	Yes	100	N/A
Iseh, 2011	Total laryngectomy for laryngeal cancer in a Nigerian tertiary health center: Prognosis and outcome.	Yes	Yes	Yes	Yes	Yes	100	N/A

Appendix 6

Data Extraction Form Template

Data about the article								
Name of article	Author(s)	Year of publication	Focus of article	Study limits	No. of locations	location	Type of location	Type of article
No. of participants	Control group?	Study time frame	Sampling strategy	Conclusion of article				
Demographics:								
Age	Race	Gender	SES					
Cancer								
Type of HNC (histologically)	Anatomic site	Stage	Signs/ symptoms	Medical Intervention	Risk factors			

Appendix 7

Articles within Each HNC Sub-category

HNC Sub-category	Article Authors	Article Title
OC/OPC	Aboagye et al., 2019	Human Papillomavirus Detection in Head and Neck Squamous Cell Carcinomas at a Tertiary Hospital in Sub-Saharan Africa
	Ahmed et al., 2012	Human papilloma virus attributable head and neck cancer in the sudan assessed by p16ink4a immunostaining
	Akinshipo et al., 2017	Head and neck cancers: An histopathologic review of cases seen in three tertiary hospitals in Northwestern Nigeria
	dos Passos et al., 2015	Loupe magnification for head and neck free flap reconstruction in a developing country
	Erinoso et al., 2016	Emerging trends in the epidemiological pattern of head and neck cancers in Lagos, Nigeria
	Faggons et al., 2017	Human papilloma virus in head and neck squamous cell carcinoma: A descriptive study of histologically confirmed cases at Kamuzu Central Hospital in Lilongwe, Malawi
	Gilyoma et al., 2015	Head and neck cancers: A clinico-pathological profile and management challenges in a resource-limited setting
	Hounkpatin et al., 2020	Histo-Epidemiological Profile of Head and Neck Cancers in Benin
	Ilboudo et al., 2019	Characterization of high-risk oncogenic human papillomavirus genotypes in histologically confirmed ear, nose and throat (Ent) cancers in burkina faso
	Kakande et al., 2010	Head and neck squamous cell carcinoma in a Ugandan population: A descriptive epidemiological study
	Kamulegey et al., 2017	Head and Neck Cancers Case Control Study of HIV Positive Compared to Negative Patients in a Ugandan Population Sample
	Khlifi et al., 2014	Risk of laryngeal and nasopharyngeal cancer associated with arsenic and cadmium in the Tunisian population
	Khlifi et al., 2013	Arsenic, cadmium, chromium and nickel in cancerous and healthy tissues from patients with head and neck cancer
	Kodiya et al., 2016	Epidemiology of Head and Neck Cancers in Maiduguri-Northeastern Nigeria
	Kofi et al., 2019	Infrequent detection of human papillomavirus infection in head and neck cancers in the Central African Republic: A retrospective study

	Makni et al., 2019	Association of common il-10 promoter gene variants with the susceptibility to head and neck cancer in tunisia
	Mwansasu et al., 2015	Pattern of head and neck cancers among patients attending muhimbili national hospital tanzania
	Nabukenya et al., 2018	Head and Neck Squamous Cell Carcinoma in Western Uganda: Disease of Uncertainty and Poor Prognosis
	Ndiaye et al., 2013	The role of human papillomavirus in head and neck cancer in Senegal
	Oga et al., 2016	Paucity of HPV-Related Head and Neck Cancers (HNC) in Nigeria
	Okwor et al., 2017	Survivorship of patients with head and neck cancer receiving care in a tertiary health facility in Nigeria
	Rettig et al., 2019	Oral Human Papillomavirus Infection and Head and Neck Squamous Cell Carcinoma in Rural Northwest Cameroon
	Sabageh et al., 2015	Malignant tumors of the upper aerodigestive tract as seen in a Nigerian tertiary health institution
	Sekee et al., 2018	Human papillomavirus in head and neck squamous cell carcinomas in a South African cohort
OC/OPC	Abram et al., 2012	Epidemiology of oral squamous cell carcinoma.
	Adesina et al., 2018	Review of 109 Cases of Primary Malignant Orofacial Lesions Seen at a Nigerian Tertiary Hospital
	Adeyemi et al., 2013	Clinical presentation of oral squamous cell carcinoma
	Adeyemi et al., 2011	A retrospective histopathological review of oral squamous cell carcinoma in a Nigerian teaching hospital.
	Adeyemi et al., 2011	Oral squamous cell carcinoma, socioeconomic status and history of exposure to alcohol and tobacco
	Adoga et al., 2010	Clinicopathological profile of malignant tumors of the oropharynx: a case series.
	Alex-Okoro et al., 2016	The comparison of the pathological data of oropharyngeal masses between HIV and non-HIV patients
	Ayo-Yusuf et al., 2013	Trends and ethnic disparities in oral and oro-pharyngeal cancers in South Africa, 1992-2001.
	Bassey et al., 2015	Analysis of 46 cases of malignant jaw tumours in Calabar, Nigeria
	Blumberg et al., 2015	Investigation of the presence of HPV related oropharyngeal and oral tongue squamous cell carcinoma in Mozambique.
	Butt et al., 2012	Oral squamous cell carcinoma in human immunodeficiency virus positive patients: Clinicopathological audit

	Garrana et al., 2018	Oral Squamous Cell Carcinoma, a growing problem.
	Jalouli et al., 2010	Presence of human papilloma virus, herpes simplex virus and Epstein-Barr virus DNA in oral biopsies from Sudanese patients with regard to toombak use
	Jalouli et al., 2012	Human papilloma virus, herpes simplex virus and Epstein Barr virus in oral squamous cell carcinoma from eight different countries
	Khammissa et al., 2014	Oral squamous cell carcinoma in a South African sample: Race/ethnicity, age, gender, and degree of histopathological differentiation
	Lasisi et al., 2012	Oro-facial squamous cell carcinoma--a twenty-year retrospective clinicopathological study.
	Lawal et al., 2011	Social profile and habits of oral cancer patients in Ibadan.
	Masamba et al., 2013	Case Report: Down-staging locally advanced head and neck cancer in an HIV infected patient in a limited resource setting
	Molomo et al., 2015	Discoid lupus erythematosus-related squamous cell carcinoma of the lip in an HIV-seropositive black male
	Omitola et al., 2017	A multi-centre evaluation of oral cancer in southern and Western Nigeria: An African oral pathology research consortium initiative
	Osman et al., 2010	Pattern of malignant tumors registered at a referral oral and maxillofacial hospital in Sudan during 2006 and 2007
	Paquette et al., 2013	Evidence That Alpha-9 Human Papillomavirus Infections are a Major Etiologic Factor for Oropharyngeal Carcinoma in Black South Africans
	Tealab et al., 2019	Prevalence of human papilloma virus in oropharyngeal, tongue and lip squamous cell carcinoma: An experience from the Egyptian National Cancer Institute
NPC	Adewuyi et al., 2013	Clinicopathologic characterization of nasopharyngeal carcinoma seen in the radiotherapy and oncology department, ahmadu bello university teaching hospital, Zaria, Nigeria: 2006-2010
	Alabi et al., 2010	Clinico-pathological pattern of nasopharyngeal carcinoma in ilorin, Nigeria
	Asante et al., 2017	Detection of Human Papillomavirus Genotypes and Epstein-Barr Virus in Nasopharyngeal Carcinomas at the Korle-Bu Teaching Hospital, Ghana
	Douthit et al., 2016	Social determinants of health: Poverty, national infrastructure and investment
	Edreis et al., 2016	Molecular Detection of Epstein - Barr virus in Nasopharyngeal Carcinoma among Sudanese population
	El-Amrani-Joutey et al., 2018	Infection by Epstein–Barr virus in Fes (Morocco). Prevalence and predictors of positivity in nasopharyngeal cancer

	Erasmus et al., 2013	The histology of nasopharyngeal masses: A comparison between HIV positive and HIV negative patients
	Khaali et al., 2016	No association between TGF-β1 polymorphisms and risk of nasopharyngeal carcinoma in a large North African case-control study
	Laantri et al., 2011	XRCC1 and hOGG1 genes and risk of nasopharyngeal carcinoma in North African countries
	Mokni-Baizig et al., 2017	HLA-A*26-A*30 and HLA-DRB1*10 could be predictors of nasopharyngeal carcinoma risk in high-risk tunisian families
	Moumad et al., 2018	Joint effect of smoking and NQO1 C609T polymorphism on undifferentiated nasopharyngeal carcinoma risk in a North African population
	Moumad et al., 2013	Genetic polymorphisms in host innate immune sensor genes and the risk of nasopharyngeal carcinoma in North Africa
	Raissouni et al., 2013	Clinical prognostic factors in locally advanced nasopharyngeal carcinoma in Moroccan population
	Wided et al., 2015	Nasopharyngeal carcinoma incidence in North Tunisia: Negative trends in adults but not adolescents, 1994-2006
LCC/HPC	Amusa et al., 2011	Laryngeal carcinoma: Experience in Ile-Ife, Nigeria
	Elfeky et al., 2015	*Hypopharyngeal reconstruction: a comparison of three alternatives*
	Iseh, 2011	Total laryngectomy for laryngeal cancer in a Nigerian tertiary health center: Prognosis and outcome
	Kariche et al., 2018	Comparative assessment of HPV, alcohol and tobacco etiological fractions in Algerian patients with laryngeal squamous cell carcinoma
	Milad et al., 2018	Prevalence of human papillomavirus in benign and malignant laryngeal lesions in Egyptian patients: Cross-sectional study

Appendix 8

Ethics Waiver Form

- ***FORM HREC (MEDICAL) Waiver from ethics clearance application form for 2020***

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

APPLICATION TO THE HUMAN RESEARCH ETHICS COMMITTEE: (MEDICAL) FOR A WAIVER FROM ETHICS CLEARANCE OF RESEARCH

A waiver from ethics approval may be granted under the following circumstances: Select study category

A waiver from ethics approval may be granted under the following circumstances: Select study category

1. ☒ **A review of information in the public domain**. Provide the title of the review, a motivation regarding the review in the section on the form and confirming there are no human participants.

2. ☐ **For an *in vitro* laboratory study for non-degree purposes**. If using cell lines, bacterial cultures, materials or whatever confirming that no humans, human data or human tissues will be used. Provide a motivation and research protocol.

3. ☐ **For an *in vitro* laboratory study for MSc or PhD students, not part of a project that already has ethics approval.** If using cell lines, bacterial cultures, materials or whatever confirming that no humans, human data or human tissues will be used.

4. ☐ **For an in vitro laboratory study for MSc or PhD students, within a bigger study for which an ethics waiver has already been obtained by the principal investigator.** If using cell lines, bacterial cultures, materials or whatever confirming that no humans, human data or human tissues will be used.

PLEASE read the NOTE section at page 4 before completing this application form

Also please note that no data may be collected before issue of an ethics clearance.

This application <u>MUST BE TYPED</u> in sentence case & 2 copies of protocol must be submitted.

Please complete ALL sections of this application form; the Committee Chairperson's need the information to make a decision. If this is not done, clearance is unlikely - you may have to resubmit a fully complete application.

SECTION 1

PRINCIPAL INVESTIGATOR/S PER SITE (graduate or student)

NAME: **Ellen** SURNAME: **Vlok**

Prof/Dr/Mr/**Miss**/Ms)

WITS STAFF NUMBER **OR WITS STUDENT NUMBER** 540622 **(if applicable)**

PROFESSIONAL STATUS OR STUDENT YEAR OF STUDY AND DEGREE (state which below)

Masters degree for speech and hearing therapy. Currently in second year

UNIVERSITY DEPARTMENT / DIVISION

Humanities- Speech and Hearing Department

NON-WITS SITE / INSTITUTION ***(if no association of any type with the University)***

N/A

DETAILS OF WHERE STUDY WILL BE DONE

N/A

WHERE WILL THE RESEARCH BE CARRIED OUT?

***(Please furnish name of hospital/institution and department*)**

N/A

HOSPITAL/INSTITUTION WHERE EMPLOYED (if applicable)

N/A

FULL-TIME OR PART-TIME EMPLOYEE: **HPCSA NO:**

N/A

SECTION 2

CONTACT PERSON'S DETAILS FOR ALL CORRESPONDENCE:

NAME: Ellen Vlok

TELEPHONE NO:N/A **FAX NO:** N/A

CELL: 0724488005 **EMAIL:**
ellenvlok@gmail.com

SUPERVISOR'S NAME: **SUPERVISOR'S EMAIL:**

Dr Jaishika Seedat Jaishika.Seedat@wits.ac.za

Dr Kim Coutts kim.coutts@wits.ac.za

(if applicable)

CO-INVESTIGATORS' NAMES:

None

All the following sections must be completed [3]. **Please tick all relevant boxes.**

SECTION 3

3. TITLE OF RESEARCH PROJECT: *(Use no abbreviations)*

The current research on the epidemiology of head and neck cancer in Africa: practice implications for African speech therapists

3.1 PURPOSE OF THE RESEARCH:

Postgraduate: degree/diploma (state which) ☒ degree

Undergraduate: degree/diploma (state which) ☐

Not for degree purposes

☐

3.2 OBJECTIVES OF THE RESEARCH (please list): *(Do not say see attached!*)

1. To identify the presentation of HNC in Africa in terms of:

a) Types of HNC and most common anatomic sites

b) Signs/symptoms experienced by patients

c) Stages of HNC when diagnosed

d) Risk factors and/or comorbidities associated with people obtaining HNC

e) Treatment protocols currently being used

f) Various locations where studies have been conducted (areas of Africa, as well as clinics vs hospitals)

g) Multidisciplinary team (MDT), including reason for speech therapy intervention

2. To capture the demographic information pertaining to HNC presentation according to

a) Race
b) Gender
c) Age
d) Socioeconomic status

3.3 MOTIVATION FOR A WAIVER.

Dear Ethics Committee Members,

I am requesting for a waiver as I have modified my original study titled “presentation of head and neck cancer in government hospitals in Gauteng, South Africa: implications for the SLP”. and changed it to a systematic review. The original study was designed to conduct a record review of hospital files of people diagnosed with head and neck cancer (HNC). This was to be done at four hospitals around Gauteng. Due to the coronavirus pandemic however, my original research study is no longer feasible due to time constraints and difficulty accessing hospitals.

The systematic review is titled: The current research on the epidemiology of head and neck cancer in Africa: practice implications for African speech therapists. My research, while now utilising a different framework, still aims to identify the presentation of HNC, with now a wider focus on Africa and the current research. A systematic review will aim to identify the demographic information, and presentation of people with HNC, which will in turn have practice implications for speech therapists in an African context. The data will be extrapolated from various published articles, and grey literature. Since it is a review, it will not include any human participants and no interviews/questionnaires/surveys will be conducted as part of the study.

3.4 PLEASE ATTACH A FULL PROTOCOL

Please find attached:

4. Signatures:

I understand that no data may be collected until I have received the full ethics clearance certificate.

Title of the Research Project:

The current research on the epidemiology of head and neck cancer in Africa: practice implications for African speech therapists

Date: 27/05/2020 **Applicant's Signature:**

WHO WILL SUPERVISE THE PROJECT? (Where applicable)

Name *Department:* ***Speech and Hearing***

Dr Jaishika Seedat

Dr Kim Coutts

Telephone No: **Email:**

011 717 4576

Jaishika.seedat@wits.ac.za

kim.coutts@wits.ac.za

Signature:

Date: 1 June 2020

HEAD / RESEARCH COORDINATOR OF DEPARTMENT / ENTITY IN WHICH STUDY WILL BE CONDUCTED (Where applicable) (Wits Students Academic HOD must sign)

Name: Joanne Neille **Department / Entity Speech Pathology**

Tel No: **011 7174574** **Email:** **joanne.neille@wits.ac.za**

Signature:  **Date:** **1 June 2019**

A review of information in the public domain. Provide the title of the review, a motivation regarding the review in the section on the form and confirming there are no human participants.

For an *in vitro* laboratory study for non-degree purposes. If using cell lines, bacterial cultures, materials or whatever confirming that no humans, human data or human tissues will be used. Provide a motivation and research protocol.

For an *in vitro* laboratory study for MSc or PhD students, not part of a project that already has ethics approval. If using cell lines, bacterial cultures, materials or whatever confirming that no humans, human data or human tissues will be used.

For an in vitro laboratory study for MSc or PhD students, within a bigger study for which an ethics waiver has already been obtained by the principal investigator. If using cell lines, bacterial cultures, materials or whatever confirming that no humans, human data or human tissues will be used.