

MINI DISSERTATION

**PREVALENCE OF EAR PATHOLOGIES AND ASSOCIATED RISK FACTORS IN
CHILDREN AGED 0-7 YEARS ATTENDING VOORTREKKER HOSPITAL IN
MOKOPANE, SOUTH AFRICA**

By

MABASA HLAMARISA VADANILE

MINI-DISSERTATION

Submitted in partial-fulfilment of the requirements for the degree of

MASTER OF PUBLIC HEALTH

in the

FACULTY OF HEALTH SCIENCES

(School of Healthcare Sciences)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: Prof. Maimela E

CO-SUPERVISOR: Mr. Mashala D.G

2022

DECLARATION

I, Hlamarisa Vadanile Mabasa declare that the mini-dissertation titled “PREVALENCE OF EAR PATHOLOGIES AND ASSOCIATED RISK FACTORS IN CHILDREN AGED 0-7 YEARS ATTENDING VOORTREKKER HOSPITAL IN MOKOPANE, SOUTH AFRICA”, hereby submitted to the University of Limpopo, for the degree of Master of Public Health has not previously been submitted for a degree at this or any other university; that it is my work and that all sources that were used or quoted for this research were acknowledged through references.

Mabasa H.V

01 August 2022

DEDICATION

I dedicate this mini-dissertation in memory of my late father, Willie Mhlengwe Mabasa. You made education a priority to us, Thank you for continuing to live in us and through us. A special dedication to my unborn child, Kagoentle, you are our beautiful and God founded creation. This is for you.

ACKNOWLEDGEMENTS

This degree was not obtained alone. There has been major contributions that I am grateful for and will hold close to my heart as an individual and a professional. I want to thank the following persons and/or organisations for their respective contributions to this dissertation:

- First and foremost, God Almighty for the Wisdom and the Strength to complete this degree.
- A special thank you to my supervisor Prof Eric Maimela for his patience, guidance and support.
- A special thank you to my co-supervisor, Mr D.G Mashala for his constant guidance and support.
- The Provincial Health Research and Ethics Committee, and Voortrekker Hospital CEO for granting me permission to collect data from Voortrekker Hospital.
- Records and admissions personnel, Mogadime M.J, Langa M. & Ranku T. and for taking time off their work to help me with locating the hospital files that were used for this study, thank you.
- My mother, Mrs Julia Mabasa, and my siblings, Tumisho & Musa Mabasa who encouraged me and prayed for me throughout this process.
- My Partner, Dr Tlhame Alfred Raseroka for the endless support and understanding the importance of this degree to me and my professional life.
- To my colleague, Mrs Matlou M.L, thank you for allowing me time off work to complete this study.
- Last but not least, thank you for all the patients' whose hospital records/files were used for this study. You are the core foundation of this study.

ABSTRACT

Background: Ear pathologies such as middle ear infections are most common in children (Einhorn, 2017) and if remain untreated they can result in hearing loss which is the most common sensory deficit in the human population (Dawood, Klop, Oliver, Elliott, & Pillay, 2017). Globally, an estimated 34 million children have hearing loss and 60% percent of these childhood hearing loss cases can be prevented or cured, however, the inability to put intervention measures in place can result in apparently more than 900 million people living with hearing loss by the year 2050 (WHO, 2020). There is paucity of literature on factors contributing to ear pathologies in rural areas and therefore, the current study aimed to investigate the prevalence and associated factors for ear pathologies amongst children in a rural area of Limpopo Province.

Methods: A retrospective descriptive study was conducted which followed a quantitative approach. This study used secondary data from patient clinical records from a hospital in Limpopo Province. Patients' records of children 7 years and below that were seen in the audiology department and were registered in the year 2018 January and December 2019 were reviewed. STATA statistical software version 12 for windows was used to analyse. Comparison between groups for continuous and categorical variables was performed using student t-test, and chi-square test, respectively. P-value less than 0.05 at 95% confidence level was regarded as significant.

Findings:

There was no statistical significant difference between gender ($p=0.978$) and majority of patients files were in the age group 4 – 7 years at 54.4% followed by those in age group 1 – 3 years and less than 1 year at 37.9% and 7.6% respectively. Majority of the patients were diagnosed with impacted wax 40.6% and males were mostly diagnosed with impacted wax at 43.9% as compared to females at 37.3%. The prevalence of outer ear pathologies was 48.3% followed by prevalence of middle ear at 28.5% while inner ear had only 0.9% and the combined had 4.6%. The

prevalence of outer ear pathologies was high in females at 51.2% while the highest prevalence in males was in middle ear pathologies at 32.3%. In overall, for this study, more females than males presented with ear pathologies. Outer ear pathologies were found to be significantly associated with older children, lower respiratory tract infections (LRTI) and those having Moderate Acute Malnutrition (MAM), Severe Acute Malnutrition (SAM), upper respiratory tract infections (URTI) and retroviral diseases (RVD). Middle ear pathologies were found to be significantly associated with older children, parotitis, MAM/SAM, LRTI and RVD. Inner ear pathologies were found to be significantly associated with congenital disorders.

Conclusion: More males presented with ear pathologies as compared to females and the prevalence of ear pathologies was high in the current study with outer ear pathologies leading followed by middle era pathologies. The risk factors for ear pathologies were LRTI, URTI, MAM/SAM, RVD, parotitis and congenital disorders. Impacted wax was the most typical diagnosis in both genders while Otitis Media was the least and this could be due to a lack of accessibility and availability of resources for early identification of inner ear disorders.

Key words: Ear pathologies, risk factors, children, prevalence, hearing loss

Table of Contents

| | |
|--|-----|
| DECLARATION | ii |
| DEDICATION | iii |
| ABSTRACT | v |
| ACRONYMS/ ABBREVIATION | x |
| DEFINITION OF KEY CONCEPTS | xi |
| 1 CHAPTER ONE: OVERVIEW OF THE STUDY | 1 |
| 1.1 INTRODUCTION AND BACKGROUND OF THE STUDY | 1 |
| 1.2 RESEARCH PROBLEM | 2 |
| 1.3 Purpose of the study | 3 |
| 1.3.1 <i>Aim of the study</i> | 3 |
| 1.3.2 <i>Objectives of the study were:</i> | 3 |
| 1.4 Research questions | 3 |
| 1.5 Literature review | 4 |
| 1.6 Methodology | 4 |
| 1.7 Ethical consideration | 4 |
| 1.8 Significance of the study | 4 |
| 1.9 Outline of chapters | 5 |
| 2 CHAPTER 2: LITERATURE REVIEW | 6 |
| 2.1 Introduction | 6 |
| 2.2 Types and classifications of Ear pathologies | 7 |
| 2.2.1 <i>Outer ear</i> | 7 |
| 2.2.2 <i>Middle Ear</i> | 7 |
| 2.2.3 <i>The inner Ear</i> | 8 |
| 2.3 Prevalence of ear pathologies | 8 |
| 2.3.1 <i>Prevalence of ear pathologies in children globally</i> | 8 |
| 2.3.2 <i>Prevalence of ear pathologies in children SSA</i> | 9 |
| 2.3.3 <i>Prevalence of ear pathologies in children in South Africa</i> | 10 |
| 2.4 Factors associated with ear pathologies in children | 11 |
| 2.4.1 <i>Socio-economic attributes of children presenting with ear pathologies</i> | 11 |
| 2.4.2 <i>Paediatric Human Immunodeficiency Virus /Acquired Immunodeficiency Syndrome</i> | 11 |
| 2.4.3 <i>Malnutrition/ Poor Nutrition</i> | 12 |
| 2.4.4 <i>Upper Respiratory Tract Infections (URTI) and Lower Respiratory Tract Infections (LRTI)</i> | 13 |
| 2.4.5 <i>Common-age groups of children presenting with ear pathologies</i> | 13 |

| | | |
|---------|--|-----------|
| 2.5 | Interventions to prevent and control ear pathologies in children | 14 |
| 2.6 | Conclusion..... | 15 |
| 3 | CHAPTER 3: RESEARCH METHODOLOGY | 16 |
| 3.1 | Introduction | 16 |
| 3.2 | Research method..... | 16 |
| 3.3 | Research design..... | 16 |
| 3.4 | Study sites | 16 |
| 3.5 | Study Population and sampling..... | 17 |
| 3.5.1 | Population..... | 17 |
| 3.5.2 | Sampling..... | 18 |
| 3.5.3 | Sample Size | 18 |
| 3.5.4 | Sample | 19 |
| 3.5.4.1 | Inclusion and exclusion criteria | 19 |
| 3.6 | Data collection | 20 |
| 3.6.1 | Data collection procedure | 20 |
| 3.6.2 | Measuring equipment and instruments..... | 20 |
| 3.7 | Data management and analysis | 23 |
| 3.8 | Reliability and validity of the study..... | 24 |
| 3.8.1 | Reliability of the study..... | 24 |
| 3.8.2 | Validity of the study..... | 24 |
| 3.9 | Bias | 25 |
| 3.9.1 | Measures to reduce selection and sampling bias:..... | 25 |
| 3.9.2 | Measures to reduce Reporting Bias..... | 25 |
| 3.10 | Ethical considerations..... | 26 |
| 3.10.1 | Ethical considerations related to the study..... | 26 |
| 3.11 | Conclusion: | 27 |
| 4 | CHAPTER FOUR: RESULTS..... | 28 |
| 5 | CHAPTER 5: DISCUSSION AND RECOMMENDATIONS | 37 |
| 5.1 | Introduction..... | 37 |
| 5.2 | Characteristics of study population..... | 37 |
| 5.3 | Prevalence of ear pathologies..... | 38 |
| 5.4 | Factors associated with ear pathologies | 40 |
| 5.5 | Limitations of the study | 41 |
| 5.6 | Conclusions and Relevance | 41 |
| 5.7 | RECOMMENDATIONS..... | 41 |
| 5.7.1 | Policies..... | 41 |

| | | |
|--|--------------------------------|----|
| 5.7.2 | <i>Health facilities</i> | 42 |
| 5.7.3 | <i>Research</i> | 42 |
| REFERENCES | | 43 |
| Annexure A: FILE REVIEW FORM A | | 51 |
| <i>Derived and adapted from WHO ear and hearing Survey form</i> | | 53 |
| APPENDIX A: PERMISSION LETTER TO THE DEPARTMENT OF HEALTH | | 55 |
| APPENDIX B: PERMISSION LETTER TO VOORTREKKER HOSPITAL | | 56 |
| APPENDIX C: Faculty Approval | | 57 |
| APPENDIX D: Ethical Clearance..... | | 58 |
| APPENDIX E: Department of Health Approval..... | | 59 |
| APPENDIX F: Certificate from language editor | | 60 |

ACRONYMS/ ABBREVIATION

The acronyms/abbreviations that the researcher included in the research proposal follow below:

dB: Decibels

H.L.: Hearing Loss

HIV/AIDS: Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome

ICF: International Classification of Functioning

ME: Middle Ear

NAD: No abnormality detected

NIDCD: National institute on deafness and other communication disorders

SSA: Sub-Saharan Africa

VTH: Voortrekker hospital

WHO: World Health Organization

URTI: Upper Respiratory Tract Infection

LRTI: Lower Respiratory Tract infection

T.B.: Tuberculosis

SAM: Severe Acute Malnutrition

MAM: Moderate Acute Malnutrition

LMICs: Lower-Middle Income Countries

DEFINITION OF KEY CONCEPTS

Children: a child is any person who is between 0-19 years of age unless national law defined the person to be an adult at an earlier age (WHO, 2013). For this study, however, a 'child' is considered as individuals of age seven (7) years and under who have been a patient in Voortrekker hospital between the years 2018 to 2019.

Ear pathologies: Ear pathologies are diseases or disorders that occur in any part of the ear resulting in malfunction of the ear (Martin, 2014). Ear pathologies can occur at various parts of the ear and for various reasons. For this study, the terms ear pathologies, ear disorders and ear diseases are used interchangeably to describe the presence of an abnormality or disease in any part of the ear. Audiologists usually describe ear pathologies based on the location of the pathology in the ear.

Prevalence: This refers to the number of cases of a disease that are present in a particular population at a given time (Baek, 2019). For this study, prevalence refers to the number of ear pathologies that were present among patients seen in Voortrekker between the years January 2018 to December 2019. This time frame is selected due to the fact that these are the latest years where a lot of patients were seen as Covid lockdown started in early 2020 impacting the number of patients that were able to consult.

Risk factor: This refers to a variable that increases one's chances of developing a disease (Fathalla, 2004). For this study, risk factors refer to any specific characteristic associated with the participants that increases their chances of developing ear pathologies.

1 CHAPTER ONE: OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND OF THE STUDY

Ear pathologies such as middle ear diseases are one of the most common occurring infections in children (Einhorn, 2017). Untreated ear infections can result in hearing loss which is the most common sensory deficit in the human population (Dawood, Klop, Oliver, Elliott, & Pillay, 2020). Globally, an estimated 466 million people are living with disabling hearing loss (H.L.), including 34 million children aged below 15 years (REFERENCE). More than 60% of this childhood H.L. is due to preventable or curable causes such as Otitis Media (WHO, 2020).

There is paucity of literature on factors contributing to ear pathologies. Sub-Saharan Africa (SSA) does not have much literature on factors contributing to ear pathologies. However, the National Institute on Deafness and Other Communication Disorders (NIDCD) argues that there is a relationship between hearing impairment and ear diseases such as middle ear infection and wax impaction (Joubert, Sebothoma, & Kgare, 2017). A study by Mukara, Sebothoma, and Kgare (2017) indicate that complications of middle ear pathologies, such as Chronic Serous Otitis Media (CSOM), have led to the deaths of many children in SSA (Mukara, Waiswa, Lilford, & Tucci, 2017).

World Health Organization (2017) has shown that almost 90% of people living with ear pathologies and hearing loss live in low- and middle-income countries (LMIC) such as South Africa (WHO, 2017). Untreated ear pathologies can lead to delays in speech-language and cognitive development, which translates to poor scholastic performance and overall academic achievement, socio-emotional problems including bullying, social isolation, and an overall poor quality of life (Phanguphangu, 2017).

Literature on the prevalence and the impact of ear pathologies, particularly addressing the different districts of Limpopo Province, South Africa is limited. However, a study by Phanguphangu (2017) found that more than fifty-one percent (51%) of children aged below 7 years have some type of ear pathology (Phanguphangu, 2017).

Failure to identify the risk factors associated with the development of ear pathologies can result in a lack of development of early identification programmes. This can lead to non-medical complications of ear pathologies such as hearing loss, psychological complications, educational complications, communication disorders and medical complications such as tympanic membrane perforations, meningitis, mastoiditis and petrositis amongst others (Einhorn, 2017). Therefore, this study determines the prevalence as well as the risk factors associated with developing ear pathologies in children around Mokopane, Limpopo Province South Africa.

1.2 RESEARCH PROBLEM

The ear pathologies have a negative impact on a child's development. They can result in the children acquiring hearing loss which is often associated with delayed speech-language development. In addition, this delay in speech-language development often leads to poor reading and writing abilities and consequently, poor scholastic performance and academic achievement (WHO, 2017). This is likely to have a negative effect on educational outcomes, thus increasing the chances of school dropouts and unemployment later in one's life (Scholes, Biddulph, Davis, & Mindell, 2017). As an audiologist, the researcher has observed that a high number of children at Voortrekker District Hospital that present with existing ear pathology or have a history of ear pathologies. Considering this observation and given these negative impacts associated with ear pathologies, it is therefore important to determine the risk factors that could be contributing towards the development of these ear pathologies to reduce the incidence of these ear pathologies in children at Voortrekker hospital. No study has been done in Limpopo Province, Mokopane area to determine risk factors contributing towards the development of ear pathologies. However, according to previous research done by Phanguphangu (2017), there is a high prevalence (fifty-one percent) of middle and outer ear pathologies in children in Limpopo Province; but the risk factors associated with the development of these ear pathologies have not been investigated.

1.3 Purpose of the study

1.3.1 Aim of the study

The aims of this study is to determine the prevalence and risk factors associated with developing ear pathologies in children seven (7) years and below at Voortrekker District Hospital, in Mokopane.

1.3.2 Objectives of the study were:

- To determine the prevalence of ear pathologies in children seven (7) years and below at Voortrekker District Hospital, in Mokopane.
- To identify the risk factors associated with developing ear pathologies in children seven (7) years and below at Voortrekker district hospital, Mokopane.
- To determine the association between ear pathologies and the identified risk factors amongst children of 7 years and below at Voortrekker District Hospital, Mokopane.

1.4 Research questions

- What is the prevalence of ear pathologies in children seen at Voortrekker Hospital?
- Which risk factors are associated with developing ear pathologies in children of seven years and below at Voortrekker Hospital?
- What is the association between ear pathologies and the identified risk factors amongst children of 7 years and below at Voortrekker Hospital?

1.5 Literature review

This review provides an overview of the literature on the following areas of study: the prevalence of ear pathologies in children globally; the prevalence of ear pathologies in children Africa, the prevalence of ear pathologies in South Africa, factors associated with ear pathologies in children, intervention and control of ear pathologies in children. This review was informed by literature published from 2016 to date retrieved from the following databases: Google Scholar and Pub-Med. A detailed literature review is presented in detail in chapter 2.

1.6 Methodology

The purpose of this section was to provide a detailed description of systems and theoretical analysis of methods applied to a field of study (Igwenagu, 2016). This section has provided a detailed description of the research design, data collection procedures, data analysis, and data collection tools. Lastly, validity, reliability and ethical considerations were also described. A detailed methodology is presented in detail in chapter 3.

1.7 Ethical consideration

Ethics are rules or laws that regulate behaviour (Collins, et al., 2000). Ethical considerations in research consist of guidelines or rules that manage acceptable behaviours between the researcher and participants. The World Medical Association (WMA) published principles to protect human participants in human research (Bošnjak, 2001). These are known as the declaration of Helsinki. The researcher is aware of this declaration and will ensure that the proposed study is in line with the principles that are documented by the WMA to protect the rights of the participants/patients. Ethical clearance to conduct the study was granted by the Turfloop Research and Ethics committee. Ethical considerations will be discussed in depth in chapter 3.

1.8 Significance of the study

The significance of this study is to determine and describe the characteristics or factors that contribute towards ear pathologies in children previously seen at Voortrekker hospital from the year 2018 to 2019; this includes non-medical factors such as age, gender, socio-economic factors and other factors such as underlying medical conditions

such as HIV/AIDS. It was also recommended by Phanguphangu (2017) that it is crucial to establish what risk factors could be contributing to the development of ear pathologies in children so that we can be able to reduce the increasing prevalence of ear pathologies and hearing loss in children (Phanguphangu, 2017). It was stated by the Seventieth World Health Assembly (2017) that public health should take action to prevent hearing loss by controlling the risk that are associated with hearing loss and ear pathologies (World & Assembly, 2017).

This research aims to provide policy-makers with context-specific literature regarding ear pathologies in children in order to develop appropriate early detection and intervention programs for children at risk for developing ear pathologies. This will assist in the proper pre-planning and implementation of sound policies. Determining the prevalence and the risk factors associated with ear pathologies can enable us to limit the impact of ear pathologies from a young age, resulting in a positive future for children around in Mogalakwena area, Mokopane.

1.9 Outline of chapters

Chapter 1: This Chapter consists of a summary and introduction of the chapters ahead.

Chapter 2: This chapter consists of the literature review in-depth, including new information on the new literature that was obtained during data collection.

Chapter 3: This chapter consists of methodology on how data was collected and how the population was sampled, this includes ethical considerations that were observed to protect participants that were used in this study.

Chapter 4: This chapter discusses findings from the data collected and analysis

Chapter 5: The researcher will discuss the results of the study and discuss how it relates to other studies that were published. This chapter will also discuss the limitations, strengths and the recommendations of the current study.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

An overview of this chapter was briefly discussed in the previous chapter. This chapter will provide an in-depth literature on the following areas of study: the prevalence of ear pathologies in children globally, Africa in South Africa, factors putting children at risk of developing ear pathologies and possible intervention and control measures of ear pathologies in children. Literature review refers to an overview of data that was published previously on a specific topic in order to reduce duplications and replications of studies (Cresswell & Cresswell, 2014). In light to the above, factors that can greatly contribute to the development of ear pathologies in children include; lower respiratory tract infections (LRTI), upper respiratory tract infections (URTI), and immune status of the child as a result of medical and nutritional reasons (Park & Lee, 2015; Renne, 2017). The factors mentioned above are unpacked and discussed in detail in this chapter. Global estimates suggest that approximately 76% to 95% of children will have at least one ear infection before age 6 (Rowland, 2018). Preventable ear pathologies are an international health crisis as they contribute to hearing loss and deafness in children (Scholes, Biddulph, Davis, & Mindell, 2017). According to WHO (2020), hearing loss and deafness in children are caused by several preventable factors, such as middle ear diseases (WHO, 2020). Further, WHO revealed that increment in the nation's income and the parents' literacy positively impact the prevalence of ear pathologies and disabling hearing loss as this improves the parents' knowledge and accessibility to health resources (The joint committee on infant hearing, 2019).

Literature on the prevalence of ear pathologies in children in Limpopo Province is limited; however, Phanguphangu (2017) concludes that most children in Limpopo Province will experience a form of ear pathology and experience complications thereof if the risk factors are not determined and reduced. As a result of the above, more research needs to be done on this topic of study.

This study will focus mainly on paediatric patients in the audiology department at Voortrekker hospital. Ear pathologies are one of the leading causes of hospital visits in paediatric patients, as research has stated that some of the most common infections in

children is ear infections such as Otitis Media (O.M) (Mohammad & Mohammad, 2020). However, the burden of ear pathologies varies from individual to individual. Ear pathologies can result in hearing loss and speech disorders, particularly in areas like Mokopane situated in developing countries such as South Africa where accessibility to ear and hearing services is limited and the socio-economic status is regarded as low-middle. This section will critically discuss current literature on-ear pathologies relevant to the proposed study in a global context, Sub-Saharan Africa national and provincial context.

2.2 Types and classifications of Ear pathologies

The ear is divided into three parts: the outer, middle ear and inner (Martin, 2014). Ear pathologies are classified based on where the pathology presents in the ear. Any abnormality in these parts of the ear is classified as ear pathology/disease/disorder. Classification of ear pathologies will be further discussed below.

2.2.1 Outer ear

The Outer ear comprises cartilage and skin (Martin, 2014). It consists of the auricle, the outermost part of the ear and the ear canal, the pathway leading to the eardrum's outer part (Melloui, Bouattane & Bakkoury, 2020). Outer ear pathology refers to an abnormality or disease of the auricle/pinna such as absent or misshaped Pinna or abnormalities of the ear canal such as wax impaction, foreign material inserted in the ear such as peanuts and insects (Radlinsky, 2016).

2.2.2 Middle Ear

The middle ear refers to the eardrum, a thin layer of tissue that separates the middle ear from the outer ear (Marchioni, Rubini & Soloperto, 2021). The middle ear further consists of the middle ear space filled with air and is made up of small bones called the malleus, incus and stapes, which help transmit sound from the ear drum through the middle ear to the inner part of the ear (Pickles, 2015). Middle ear pathology refers to an abnormality or disease in the middle ear that affect the functioning of the middle ear,

such as fluid in the middle ear space due to middle ear infections, also known as Otitis Media (O.M) or perforated eardrums as a result of constantly discharging ears or trauma and abnormalities of the middle ear bones such as ossicular dislocations (Luers & Hüttenbrink, 2016).

2.2.3 The inner Ear

The inner ear consists of the cochlea, the auditory nerve and the semi-circular canals. The inner ear help transmit sound to the brain, making it able to hear, and the semi-circular canals help us balance (Ruben, 2020). Any pathology to these structures is known as Inner ear pathology, which can include abnormality or disease in the cochlear and the auditory nerve resulting in hearing loss, while semi-circular canals result in balance disorders (Wiener-Vacher, Quarez & Le Priol, 2018).

These three parts of the ear work together in order for one to be able to hear and balance properly. Abnormalities in these areas can result in hearing difficulties and balance problems. Thus negatively affecting an individual's speech and language development (Seikel, Drumright & King, 2015). A retrospective study conducted in Senegal, West of Africa by Ndadi et al. (2021) found that different risk factors result in children being deaf or developing ear problems later in life. The most common causes of ear pathologies were acquired than congenital, such as ear wax and ear infections, which also happen to be the most common ear pathologies in children (Ndadi et al., 2021).

2.3 Prevalence of ear pathologies

2.3.1 Prevalence of ear pathologies in children globally

Hearing loss and impairment are the most prevalent sensory disabilities globally (WHO, 2018). The increment of ear pathologies in children and the associated risk factors contribute vastly to the increment in the prevalence of hearing loss. Globally, an estimated 34 million children have hearing loss, and 60 % of these childhood hearing loss cases can be prevented or cured. However, the inability to put intervention measures in place will result in more than 900 million people living with hearing loss by the year 2050 (WHO ear and hearing disorders survey, 2020).

A study in Saudi Arabia by Céspedes and Putz (2019) on the epidemiology of acute Otitis Media shows that the prevalence of ear pathologies in children from different provinces vary, with those from southern regions (mid-low income area) higher than those in central regions (high-income area) amongst Saudi children (Céspedes & Putz, 2019).

2.3.2 Prevalence of ear pathologies in children SSA

According to WHO (2018), 20 % of the world's population has some degree of hearing loss with 90 % of this population living in countries with Lower-middle income economies (LMICs) (WHO, 2017c). Sub-Saharan African regions are one of the main areas in the world that are mainly affected by disabling ear pathologies such as hearing loss and ear infections due to poor access and poor quality of health care services (WHO, 2018). It was established that 60 % of hearing loss in children in these LMICs is as a result of preventable or treatable causes (WHO, 2018). Inability to provide treatment or preventative measures in Africa can result an expected increment in the prevalence of persons living with hearing loss by 2050 (WHO, 2017c).

It has been established by Mukara & Tucci (2017) that there is a high prevalence of middle ear pathologies in children in low-middle income Sub-Saharan countries such as Rwanda. Recurrent and untreated ear infections can result in complications of ear pathologies such as communication and vocational problems later in these children's lives. An estimated 34 million children live with ear pathologies resulting in hearing loss in SSA (WHO, 2018). In Zimbabwe, children from rural schools are more likely to present with a high prevalence of ear pathologies (Pedersen, Zimani, Frenndø, Spindler, Chidziva, von Buchwald, et al., 2022). This data concurs with the study of Mukara and Tucci (2017) and WHO (2018), stating that low-income areas are most likely to have a high prevalence of ear pathologies compared to high-income areas with a rising prevalence projected at 2.5 billion persons affected by 2050 (WHO,2018) if left untreated.

Available reports indicate an estimated prevalence of 1.2 to 3.0% for children (5 – 14 years) in SSA compared to 0.3 to 0.6% (children 5 – 14 years) in high-income countries (Stevens, Flaxman, Brunskill, Mascarenhas, Mathers, Finucane et al., 2013). The

aforementioned could be a result of a lack of resources to treat children presenting with ear problems at early stages due to poverty, resulting in a suppressed immune system, thus making the children susceptible to opportunistic infections that can later cause ear pathologies in children.

2.3.3 Prevalence of ear pathologies in children in South Africa

South Africa is a middle-income country as compared to Canada, which is a high-income country. Hearing loss is considered a major public health problem, affecting 1.33 billion people in 2015 globally (Vos, Allen, Arora, Barber, Bhutta, Brown et al., 2015). Ear pathologies such as infections is associated with the increasing number of hearing loss cases (WHO, 2018). It was established by the Canadian Youth that 50% of Canadian children will have at least one ear infection by the age of 2 and 3 since birth with this number of ear infections declining over the years due to improvement of the environmental factors such as living conditions of these children and accessibility to health care services (Karunanayake, Albritton, Rennie, Lawson, McCallum, Gardipy, et al, 2016). There is limited data on the prevalence of hearing loss in South Africa, However a study conducted in 2013 in the Cape Town Metropolitan indicated a disabling hearing impairment of 4.57% amongst individuals ≥ 4 years old (Ramma &Sebothoma, 2016). Some of this disabling hearing loss could have been prevented with early identification and management. Literature states that factors contributing to ear pathologies in children will have to be specific to the area for the findings to be regarded as generalisable to the population at large (Joubert, Sebothoma, & Kgare, 2017).

The provinces of South Africa have a wide range of socioeconomic conditions. 6.6% of middle ear pathologies among children were found in a study by de Jager, Leigh, Swanepoel, DeWet, Laurent, Claude, Lundberg, and Thorbjörn (2014) to assess the prevalence of middle ear infections in children at a primary health clinic in Johannesburg, Gauteng, this prevalence is regarded as high by the World Health Organization (de Jager, Leigh, Swanepoel, DeWet, Laurent & Claude et al., 2014). The plausible reasons for the above prevalence was found to be the lack of early intervention and contributing risk factors such as age.

Although Limpopo Province has limited data on ear pathologies, Phanguphangu (2017) found a high prevalence of outer and middle ear pathologies in children below 7 years.

In this study, 43% of the ear pathologies observed were localised to the outer ear, while 8% were middle ear pathologies (Phanguphangu, 2017). The findings mentioned above are attributable to the lack of early identification and management services available to children in Limpopo.

2.4 Factors associated with ear pathologies in children

Ear pathologies including ear infections are influenced by a variety of variables, including allergies, age, gender, and URTI (Ahmed, Labibi, Taj, Muhammad, Ali, Syeda et al., 2020). According to Ahmed and his team, children are most likely to develop ear infections between the ages of 6 and 24 months, with the risk declining with advancing age if appropriate treatment and management have been given. Individuals with allergies are more likely to develop ear infections when pollen counts are high. As a result, the following section will cover the most prevalent risk factors.

2.4.1 Socio-economic attributes of children presenting with ear pathologies

Socioeconomic position is a risk factor for ear diseases, according to research published in the journal of otorhinolaryngology on children in Chile (Céspedes & Putz, 2019). Based on this case study of Chilean children that was conducted again 14 years later, it was discovered that the socioeconomic level improvements that were implemented 14 years later led to a decrease in the number of cases of ear pathologies and resulted in a significant change in the incidence of ear pathologies from the initial study that was conducted. Additionally, according to an article by Bickenbach (2018), children under the age of fifteen (15) in high-income nations present with fewer preventable causes of ear diseases with a prevalence of 49% than children in middle-low income countries, where the prevalence is 75%. (Bickenbach, 2018). This demonstrates a dramatic change in ear disorders as the socioeconomic situation of the area improves.

2.4.2 Paediatric Human Immunodeficiency Virus /Acquired Immunodeficiency Syndrome.

A study which consisted of various research published by different researchers on various electronic databases such as Pub-med, Web of science and EBSCOhost research platforms between Jan 2000 to June 2019 on ear pathologies was collected

and reviewed by Dawood and his team of researchers, It was found that more than half of the studies indicated that there is a relationship between ear pathologies and immune suppressing diseases such as Human Immunodeficiency Virus (Dawood, Klop, Oliver, Elliott, & Pillay, 2020). The Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) pandemic is one of Africa's most prominent health challenges, according to the World Health Organization (2013). HIV is a disease that affects the immune system, and as a result, it can cause problems in the outer ear, the middle and the inner ear (Khoza-Shangase & Anastasiou, 2020). In Sub-Saharan Africa, children living with HIV present with middle ear pathologies compared to those not living with HIV (David et al., 2017) & (Ianacone et al., 2017).

The joint United Nations Programme on HIV/AIDS (UNAIDS) statistics in 2019 showed that there is an estimated 20.8 million South Africans living with HIV, with 84000 of them aged between 0-14 years (UNAIDS, 2019). Human Immunodeficiency Virus puts one at risk of developing upper respiratory tract infections, tonsillitis and meningitis, which are risk factors for ear pathologies, making children living with HIV/AIDS susceptible to ear pathologies (WHO, 2020).

According to a Gauteng hospital study, ear pathologies were present in 43 percent of the 100 medical records taken from a pediatric HIV/AIDS clinic; this means that nearly half of the children who attended the clinic had an ear pathology (Khoza-Shangase & Anastasiou, 2020). The aforementioned findings were caused by opportunistic infections brought on by HIV/AIDS, a lack of early detection and treatment, and poor treatment compliance.

2.4.3 Malnutrition/ Poor Nutrition

Severe Acute Malnutrition (SAM) and Moderate Acute Malnutrition (MAM) can compromise a child's immune system, resulting in the child being more susceptible to opportunistic infection and diseases such as ear diseases (Saxena, Bhargava & Srivastava, 2016). A lack of vitamin B12 and folic acid can impair hearing by 39 %, while an increment in these nutrients can improve a child's hearing ability by 20% (Gopinath, Flood, McMahon, Blurlutsky, Brand-Miller & Paul 2010). Also, a lack of Vitamin A, C, E, Zinc and iron results in poor healing status as a result of ear pathologies such as middle ear infection; this results in children experiencing complications of ear infection such as

hearing loss and speech and language delays in children (SuYoung Jung, Sang Hoon Kim & Seung Geun Yeo, 2019). Saxena, Bhargava & Srivastava (2016) found that ear pathologies such as Otitis Media have a strong positive association with malnutrition.

Children are prone to have lifestyle diseases such as severe acute malnutrition (SAM) because they depend on Adults for feeding and nurturing. A report by Mayo Clinic based on the Government Communication and Information System (GCIS) indicates that Limpopo is one of the provinces with high cases of malnutrition in children, and 8.7% of them die as a result of SAM (GCIS, 2018). Furthermore, a lot of young children are diagnosed with SAM due to the high number of children in households living in poverty resulting in malnutrition and weaker immune system, thus putting them at risk of developing chronic ear diseases as a result (Lee & Park, 2015).

2.4.4 Upper Respiratory Tract Infections (URTI) and Lower Respiratory Tract Infections (LRTI)

According to Meek (2022), URTI and Lower Respiratory Tract Infections (LRTIs) are common infections in children (Meek, 2022). These infections can affect one's sinuses, throat, lungs or airways (Thomas & Bomar, 2021). Upper respiratory tract infections such as flu and tonsillitis can result in a dysfunction or an infection of the Eustachian Tube (Thomas & Bomar, 2021). The Eustachian Tube is a structure found in the middle ear that connects our throat to the middle ear (Tysome & Sudhoff, 2018). A Eustachian tube dysfunction can result in aural fullness, red and inflamed ear drum, and sharp ear pain and infections such as Otitis Media (Meek, 2022). There is a strong association between acute ear infections such as Otitis Media and URTI. Therefore, to reduce the number of cases of Acute Otitis Media in children, URTI incidence should be treated on time or prevented (Nokso-Koivisto, Marom, & Chonmaitree, 2015).

2.4.5 Common-age groups of children presenting with ear pathologies

Age is one of the most common risk factors for ear diseases in children, with children between 0-6 months more susceptible to ear infections. This is because of the size and shape of their Eustachian tubes (Ellen, Mandel, Casselbrant, William, & Doyle, 2016). Mayo Clinic states that children's immune systems are still developing, which puts them at risk of developing ear pathologies due to viral and bacterial infections (Mayo, 2019). A study conducted in Limpopo by Louw, Swanepoel, Eikelboom, & Hugo (2018) also

indicated a high prevalence of 70 % bilateral hearing loss in children across two Primary health Facilities in South Africa. These findings concur with the study by Ahmed and his team that indicated that age is a contributing factor in the development of ear pathologies such as Otitis Media Ahmed, Lalbib, Taj, Muhammad, Ali, Syeda et al., 2020).

2.5 Interventions to prevent and control ear pathologies in children

Over 50% of childhood ear pathologies can be treated and prevented if intervention is provided early in a child's life (WHO, 2020). Early diagnosis and treatment of ear pathologies can reduce the effects of ear pathologies such as hearing loss, speech delays and cognitive developmental delays (Vanneste, & Page, 2019). Programmes such as Neonatal hearing screening campaigns and early childhood hearing screening campaigns help with the early identification and treatment of ear pathologies, providing positive outcomes for children born with ear pathologies and those who acquire ear pathologies in their early ages (Yoshinaga-Itano, Sedey, Wiggin, & Chung, 2017). These intervention strategies help avoid the impact of ear pathologies later in the children's life.

Educating parents and improving knowledge on care-seeking practices concerning ear pathologies play a vital role in the prevention and intervention of ear pathologies (Mukara & Tucci, 2017). Thus one of the first weapons of intervention and prevention should be education to equip the parents with knowledge of on-ear pathologies. Educating parents on their children's medical condition not only improve the parents' knowledge of the child's medical condition but also improves the parent's involvement in the child's treatment sessions, thus improving the overall health outcomes of the child as they are the primary caretakers (Brady, Lowe, & Olin Lauritzen, 2015).

According to WHO (2006), prevention can be divided into primary, secondary and tertiary prevention. Primary prevention includes the disease that can result in ear pathologies such as hearing loss. Primary prevention can be obtained through immunisations against infections causing hearing loss, such as rubella, health promotion and education programmes. Secondary prevention consists of actions taken to avoid the impacts of ear pathologies resulting in a disability such as deafness or lack of balance. Secondary Prevention can include early identification and treatment, early

identification and treatment of acute Otitis Media, and removal of foreign bodies in the ear. Tertiary prevention includes managing a disability by improving one's quality of life by reducing the disability and improving function. Tertiary prevention can include assisting patients who are already deaf with hearing aids to hear environmental sounds, providing special education, social integration (Baumann & Ylinen, 2020).

2.6 Conclusion

From the above literature, one can conclude that children have a high prevalence of treatable ear pathologies. Therefore, the risk factors contributing to ear pathologies should be researched more as the times and generations evolve. Research has been proven from the literature above that there is an increased prevalence of outer, middle and inner ear pathologies in children globally, including in the Limpopo Province. Many risk factors contribute to ear pathologies. However, the most common risk factors across the globe were age, immune-suppressing agents such as diseases (i.e. HIV & AIDS) and malnutrition and respiratory tract infections in children. By identifying the risk factors associated with ear pathologies for all the contextualised areas, the implementation of preventative action can take place as early as possible in the children's lives reversing the drastic effects of ear pathologies seen in previous generations. It will also help reduce the prevalence of ear pathologies and their impact on these children later in life.

3 CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This section will provide a detailed description of the following concepts in line with the research that was conducted: research design, data collection procedures, data analysis, and data collection tools. Bias, validity, reliability and ethical considerations are also explained in depth below.

3.2 Research method

A quantitative approach which followed a retrospective descriptive study design was conducted. This study used secondary data from patient clinical records at the hospital in Limpopo Province. The first objective for this study was to determine how the measurable variables are distributed and how they relate to each other, which was the prevalence of ear pathologies amongst children at Voortrekker hospital during years 2018 to 2019. The data that is used for the quantitative research is numerical (Hunter, 2003). Thus the researcher converted the obtained data into numeric form and analyse this using Statistics and Data Analysis (STATA) version 15 software for windows.

3.3 Research design

Retrospective, cross-sectional, descriptive research approach was used to conduct the current research. According to Cresswell & Cresswell (2014), descriptive research gives specific details of a situation, social environment or relationship (Cresswell & Cresswell, 2014). The selected design for this study is cross-sectional retrospective medical charts review. A cross-sectional study is type of the observational study used to collect data from a population at a specific point in time (Cresswell & Cresswell, 2014). Secondary data was used for this study thus making it a retrospective study. The selected study design was appropriate for this study because it allowed the researcher to collect once-off secondary data that was obtained from the patient's medical records from year 2018 Jan to Dec 2019 using questions derived from the adapted ear and hearing survey handbook questions from WHO(2020).

3.4 Study sites

The current study was conducted at Voortrekker Hospital (VTH) which is located in Mokopane, Mogalakwena Municipality, under the Waterberg District, Limpopo Province, South Africa. Voortrekker Hospital is a district hospital that consists of 92 health

professionals, including two dually qualified Speech Therapists and Audiologists. Voortrekker hospital is a 90 bedded hospital that consists of the Out-Patients Department (OPD) inclusive of allied sections, dental and pharmaceutical departments, Casualty and In-patient wards which includes: (i) male medical, female medical, Maternity and Paediatrics. The research setting map for the study is displayed below (figure 1).

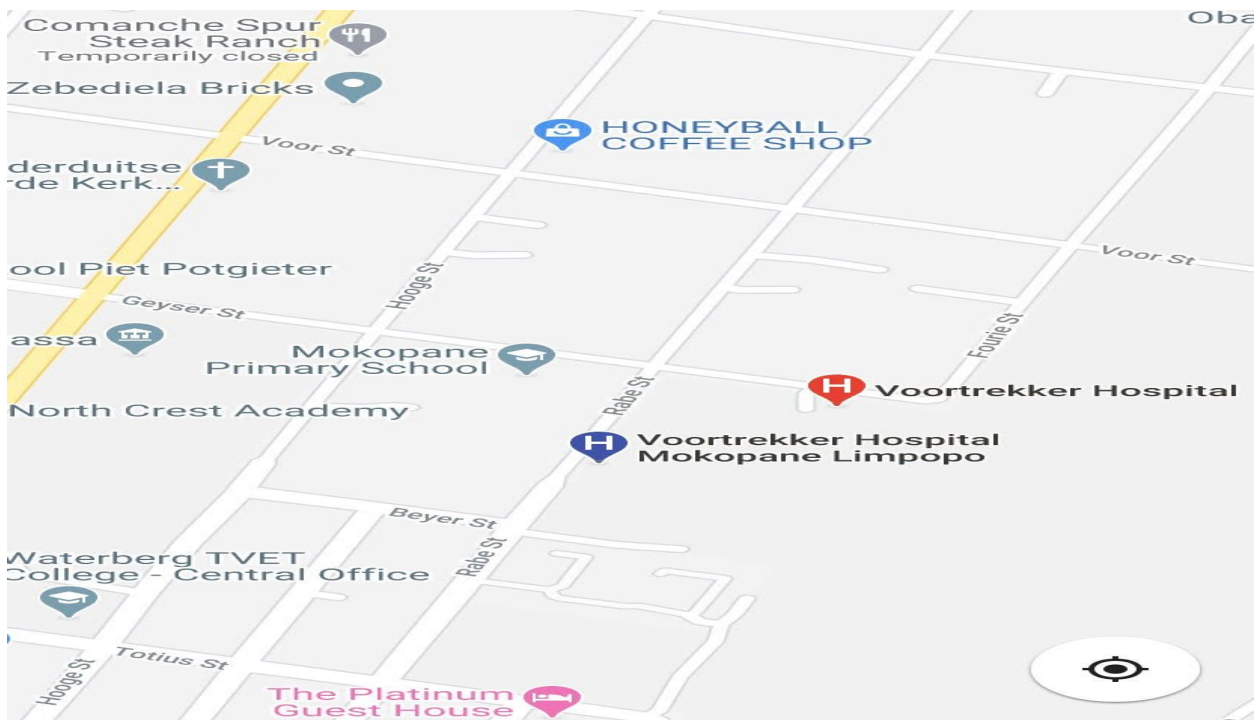


Figure 1: Map for the study setting.

3.5 Study Population and sampling

3.5.1 Population

The study population refers to the group from which the sample of participants are selected (Botma, 2010). For this proposed study, the study population consisted of the patients' records for both male and female children who were seven years and below who were seen at VTH for the year 2018 January to December 2019. These children were seen by an Audiologist in the hospital. This population was selected because there is a national policy for medical data to be collected for this age group to allow for better management and prevention of early childhood diseases and their effects thereof.

3.5.2 Sampling

The researcher made use of the probability sampling method which is the type of sampling method whereby samples are grouped in such a way that guarantees individuals of a population have an equal chance of being represented (Cresswell, 2014). Probability sampling is reliable and can yield generalizable results. Simple random sampling method was used for this research. This refers to the type of sampling whereby a set of individuals are selected randomly and by chance from a larger set. (Collins, et al., 2000). This research focused on children who met the selection criteria. For this research, the records were selected randomly until the sample size was reached. Therefore, the first record in the register for the year 2018 was selected at random, if the sampled record did not meet the inclusion criteria, then that record was excluded, and the next record was then selected. This process was done until a sample of 410 is reached for each year. In this case, all the participants were listed numerically and random selection was made to the participants until they got to the desired sample size.

3.5.3 Sample Size

Study size refers to a group of the population selected for a particular study with the members of the sample referred to as subjects or respondents (Collins, et al., 2000). For the study, the researcher has selected a heterogeneous population.

The sample size in this research was estimated using a formula with known prevalence as the population size is unknown.

$$n = \frac{Z^2 pq}{d^2}$$

Where,

n is the sample size

Z is the 95% confidence interval

p is the prevalence of the condition being studied in a similar setting

d is the sampling error (5%)

The prevalence of 51% has been reported by Phanguphangu (2017) in paediatrics in Limpopo, South Africa therefore,

$$N = (1.95)^2 \cdot 0.51(1-0.51) /$$

$$\frac{(1.95)^2(0.51)(1-0.51)}{(0.05)^2}$$

$$= 3.803(0.245) / 0.0025$$

$$= 372.7$$

The design effect was set at 2 (two), therefore a total of 745 records/hospital files were sampled for the period 2018 to 2019 with 10% added to compensate for the hospital files that might not be found (non-response) thus resulting in 820 hospital files utilized for the current study.

3.5.4 Sample

A random sample size of 820 hospital files was used to estimate the prevalence of ear pathologies among children aged 0-7 years seen at Voortrekker Hospital, Waterberg

3.5.4.1 Inclusion and exclusion criteria

Inclusion criteria

- All records of children 7 years and below that were seen in the audiology department and were registered in the year 2018 January and December 2019.
- All records of children that were patients in the hospital with medical records/files.
- Records of children aged 7 years and below.

Exclusion criteria:

- All records of children that were seen at the Out Patient Department (OPD) without any referral to the Audiologist as they are not registered in the audiology register and can be missed during the study

3.6 Data collection

This section consists of the method by which data was collected for this study and the tools that were utilised. Pre-recorded medical records/hospital files for children that were seen at Voortrekker hospital for the year 2018 January to December 2019 were retrieved and utilised for the study. The findings in the patients' medical records were used to retrieve information required information for the current study as displayed in FORM A & B below.

3.6.1 Data collection procedure

The researcher used the standardized WHO ear and hearing survey to develop closed ended questions as displayed in FORM A & FORM B to be utilized in the current study. The researcher used these questions to derive information from the hospital files obtained by the researcher during the study. Before data collection could commence, the Department of Health granted the researcher permission to perform the study after ethical clearance from the university (Appendix A) was awarded to the researcher. The researcher then requested the Voortrekker Hospital CEO approval to carry out the research at the hospital. The researcher took a week to prepare for data collection. During this preparation week, the administration personnel in charge of the hospital records were informed of the study and the procedures that are to be followed during data collection as per the hospital's CEO's request. Thus preparing them to assist the researcher in retrieving the required hospital records/files for the study. Files were retrieved and the required information was obtained and recorded on Microsoft excel by the researcher. Data was then cleaned and coded. Cleaned and coded data was later moved to STATA software for further analysis.

3.6.2 Measuring equipment and instruments

FORM A: A questionnaire derived and adapted from the standardized WHO Ear and Hearing Disorders survey handbook, form A, C, and D (WHO, 2020) was used in the current study as FORM A. These adapted close ended questions will be used to determine the prevalence and the risk factors contributing to ear pathologies in children

at Voortrekker Hospital. Originally, the WHO (2020) ear and hearing survey handbook is used globally to determine the prevalence and causes of ear pathologies and hearing loss. It consists of five (5) sections (A to E), however for the current study, the survey was adapted and only questions derived from section A, C and D from the will be utilised. These sections were adapted and renamed Section A, B, C and D. The table below indicates information that was required from the hospital files/records for data collection in the current study.

Table 1: File review form A

| Section | Description | Rationale |
|---|---|---|
| A. Demographic information. | Hospital files Number, age, race and gender. | To determine the prevalence of ear pathologies at an age, race and gender level. |
| B. Basic ear assessment. | Otosopic examination and/ or tympanometry | To determine the prevalence of ear pathologies in children at Voortrekker. |
| C. A possible contributing factor to the auditory pathology | This will be done at the end of the last section. | To assist in determining the possible contributing factor to ear pathology described. |

Adapted from WHO ear and hearing disorders survey

3.7 Data management and analysis

Data was double checked for errors and duplications, thus it was cleaned using pivot tables and coded using Microsoft Excel. The data was imported into the STATA version 15 for a windows (STATA Corporation, College Station, Texas) computer software for further analysis. The researcher made use of Pie charts, tables and bar graphs to make visual presentations of the data obtained for the current study. These visual presentations were created using Microsoft excel 2013.

Descriptive statistics was used to summarise, analyze and summarize quantitative data which was visually presented on the tables, pie-charts and graphs provided in chapter 4. Pie-charts and frequency tables were used to demonstrate the prevalence of ear pathologies and socio-demographic characteristics of the study participants while logistic regressions were used to evaluate relationships between different variables e.g., to find association between ear pathologies and socio-demographic data of participants such as gender, age and certain underlying medical conditions . To summarize and analyze collected data, the researcher used STATA version 15 software and the statistical methods listed below:

Frequency distribution:

This was used to assess the number of times in which a variable appears. This was done to assess the prevalence of ear pathologies and the distribution of different age groups and genders amongst the participants.

-Independent variables

In this study, the independent variables were socio demographic factors such as age, gender, period diagnosed with ear pathology and basic ear assessment

-Dependent variables

The dependent variable was the diagnosis of ear pathology and the type of the ear pathology

T-test:

The p-value of less than 0.05 in the study results is considered statistically significant.

Logistic regressions:

Logistic regressions were used in order to investigate associations between the dependent and/or the independent variables such as age, gender, underlying medical condition etc.

Odds Ratio:

Odds ratios were utilised to assess the likelihood of an event happening, thus the measure of association between the exposure and the outcome. For this study odds ratio were used to determine the likelihood of a child getting an ear pathology based on their age, gender, underlying medical conditions.

3.8 Reliability and validity of the study

3.8.1 Reliability of the study

Reliability refers to the degree to which a scale yields consistent results or scores (Collins, et al., 2000). In order to ensure that the study is reliable the researcher will ask another qualified audiologist to go through the data collection form to ensure that it speaks to the aims and objectives stated in the proposal. A WHO adapted collection tool was adapted and used for the study. The researcher will also ensure that she is familiar and well trained with the data collection tool.

3.8.2 Validity of the study

Validity refers to how well a study measures what it intends to measure (Neuman, 1997). Validity can be divided into content and face validity. Content validity is the ability for the instrument to fairly represent/measure the concept in question while face validity refers to the degree whereby this concept is measured accurately.

To ensure content validity, the researcher requested other audiologists to go through FORM A and give their inputs. Form A was derived and adapted from WHO standardised ear and hearing survey handbook to assess ear and hearing disorders which is in line with the researcher's objectives and aims.

To ensure face validity of the study, the researcher will ensure:

- Replicability of the data entries. The researcher did double data entries to ensure the findings are the same.

- Only hospital files with complete data that is required for the study were used.
- WHO ear and hearing survey booklet based tool was used for classification of ear pathologies and it was also used to estimate the prevalence and the risk factors contributing to ear pathologies.
- Only data that was filled in by a qualified health professional was utilized during data collection, therefore the hospital notes had to be signed at the end to ensure that they were written by a qualified health professional.

3.9 Bias

Bias refers to can result in false and misleading conclusion Creswell (2014). The current study was susceptible to selection, reporting and information bias which could affect the reliability and lead to false conclusions.

3.9.1 Measures to reduce selection and sampling bias:

- To reduce selection bias, the researcher ensured that only the hospital files that meet the selection criteria were selected for the study.
- Random selection was utilized for the current study and a large heterogeneous sample was used (i.e. 10% was added).

3.9.2 Measures to reduce Reporting Bias

- Reporting bias was minimised by ensuring that the hospital files that were sampled consisted of the information that was required for this study as listed on the data collection tools.
- The data extraction tool was carefully completed and captured on excel where data was carefully cleaned and coded.
- The questions that are used on the extraction tool consisted of the variables that were in line with the study such as age, gender and medical diagnosis of the participants.

3.7.3 Measures to reduce information Bias

- A standardised set of questions (data collection tool) was used for the study
- One method of data analysis was utilised for the current study, which is STATA.

- The researcher ensured that she is familiar with the data collection tools and Microsoft excel that was used to record data thus improving the efficiency and effectiveness of data captured.

3.10 Ethical considerations

3.10.1 Ethical considerations related to the study

Ethics refers to principles that help the researcher to conduct their research in a morally acceptable manner whereby participants are protected from harm David & Resnik (2020). The following ethical considerations were put in place prior the commencement of data collection and analysis of the study:

- *Privacy and confidentiality.*

For the proposed study, the researcher utilized the patients' hospital files which consisted of personal and private information. Although Collins et al. (2000) suggest that privacy is practically non-existent in research, respecting the participant's privacy should always be made a priority. To avoid disregarding the right to privacy the following measures were put in place researcher:

- Instead of patient's names and surname the researcher ensured that the identifier codes were used as a form of identification.
- The researcher took Oath, this legally and morally obligates the researcher to respect the confidentiality of the information derived from the hospital files.
- The researcher was collecting the data independently, therefore data obtained was protected from third party/ies.

- *Beneficence*

This refers to the ethical principle that aims to improve the benefits for the study participants and prevent harm. In this study participants were protected from any physical harm as the data collection methods and filling of the questionnaire did not include physical interactions from the researcher and the participants. This was beneficial to participants' health as data was collected during the Covid-19 pandemic. Participant's names were not be used as a form of identification for the patients, thus protecting the patients' emotional well-being and stigmatisation. The finalised results will be shared with the hospital management and medical staff in order to develop better management and treatment protocols of children with ear pathologies.

- *Approval*

Ethical clearance to conduct the study was granted by the Turfloop Research and Ethics committee. (SREC& TREC). The researcher ensured that informed and written consent is obtained from all the necessary stakeholders in the hospital and the department of health. The ethics committee was granted the right to monitor the research throughout and the researcher was transparent to the committee about any adverse events or any changes of the protocol that the researcher might want to put in place. The following ethical standards derived from the declaration of Helsinki were applied throughout the proposed study to protect and prioritise the health of the participants: **Risk, Burden and Benefits**. Majority of medical research consists of risks and benefits; the researcher has weighed the risks and the benefits of the proposed study thus far. The researcher conducted a study that uses secondary data, therefore the participants' health will not be jeopardised.

3.11 Conclusion:

This is the end of chapter 3 where the researcher outlined all materials, and research methodology used in conducting the present study.

4 CHAPTER FOUR: RESULTS

A review of a total of 810 hospital records was conducted to investigate the prevalence of ear pathologies amongst children aged 7 years and below. The other 10 records were left out due to incomplete information. There was no statistical significant difference between gender ($p=0.978$) and majority of patients files were in the age group 4 – 7 years at 54.4% followed by those in age group 1 – 3 years and less than 1 year at 37.9% and 7.6% respectively. Audiological diagnoses/findings for each gender were analysed and it was revealed that 17.7% did not have any audiological diagnosis and majority of the patients were diagnosed with impacted wax 40.6% and males were mostly diagnosed with impacted wax at 43.9% as compared to females at 37.3%. The second most diagnosis was Perforated Tympanic Membrane at 29.1% with slight differences between males and females. Only 5.2% were diagnosed having a foreign body while only 2.6% were diagnosed with Red Inflamed Tympanic Membrane and only 1.1% were diagnosed with Otitis Media. Hearing loss was found to be 1.9% on overall and females had a higher proportion of hearing loss than males at 2.6% and 1.2% respectively as presented in Table 4.1 above.

Table 4.1: Participants Socio-demographic information, Audiological findings stratified by gender

| | | Both gender | Males (n=402) | Females (n=408) | P-value |
|---------------------------|----------------------|-------------|---------------|-----------------|----------------|
| Age in years | | | n (%) | n (%) | |
| | <1 | 62 (7.7) | 30 (7.5) | 32 (7.8) | 0.978 |
| | 1 – 3 | 307 (37.9) | 153 (38.06) | 154 (37.8) | |
| | 4 – 7 | 441 (54.4) | 219(54.5) | 222 (54.4) | |
| | | | | | |
| AUDIOLOGY FINDINGS | | | n (%) | n (%) | P-value |
| | NAD | 143 (17.7) | 75 (18.7) | 68 (16.7) | 0.034 |
| | EAR PAIN | 4 (0.5) | 2 (0.5) | 2 (0.5) | |
| | AURICLE MALFORMATION | 4 (0.5) | 1 (0.3) | 3 (0.7) | |
| | IMPACTED WAX | 329 (40.6) | 150 (37.3) | 179 (43.9) | |
| | FOREIGN BODY | 42 (5.2) | 21 (5.2) | 21 (5.2) | |
| | FUNGAL INFECTION | 2 (0.3) | 2 (0.5) | 0 (0.0) | |
| | RED+INFLAMMED T.M | 21 (2.6) | 18 (4.5) | 3 (0.7) | |
| | PERFORATED T.M | 236 (29.1) | 120 (29.9) | 116 (28.4) | |
| | OTITIS MEDIA (O.M) | 9 (1.1) | 6 (1.5) | 3 (0.7) | |
| | HEARING LOSS | 15 (1.9) | 5 (1.2) | 10 (2.6) | |
| | DEAF & Signing | 0 (0.0) | 0 (0.0) | 0 (0,0) | |
| | OTHER | 15 (1.9) | 5 (1.2) | 10 (2.6) | |

NAD= No abnormality detected, T.M= Tympanic Membrane, O.M=Otitis Media

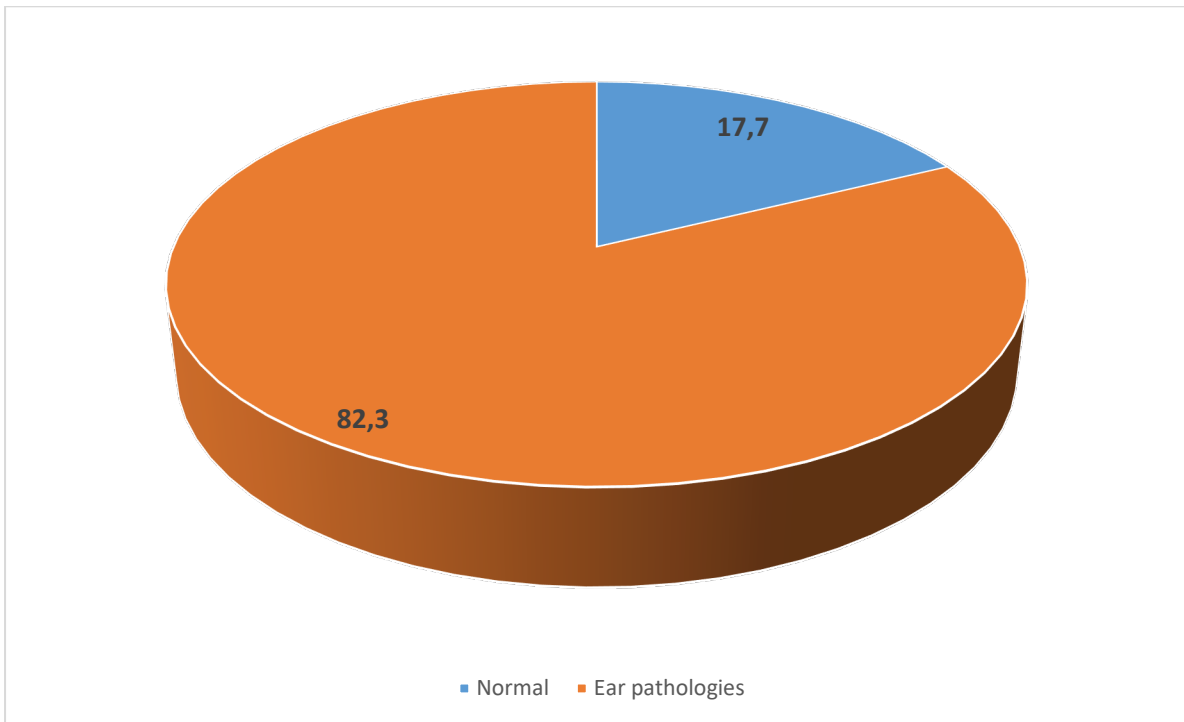


Figure 4.1: Overall prevalence of ear Pathologies

Figure 4.1 above presents the overall prevalence of ear pathologies and it was revealed that 82.3% of the children had ear pathologies.

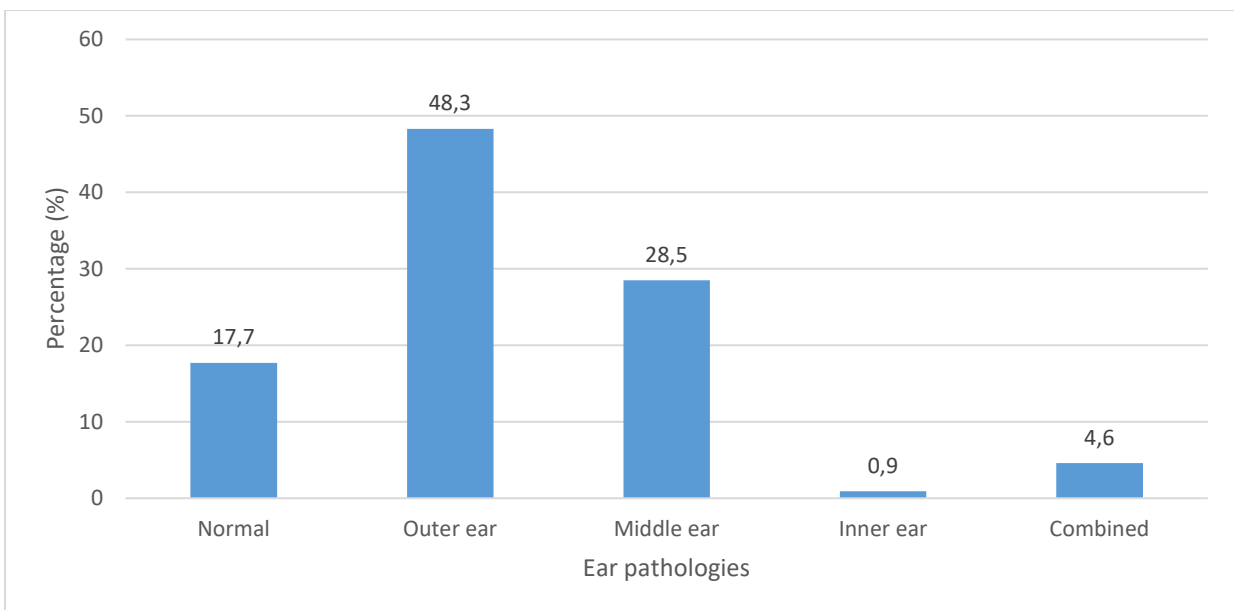


Figure 4.2: Prevalence of ear pathologies based on the classification of ear pathologies

Based on the classification of ear pathologies, the Figure 4.2 above presents the prevalence of ear pathologies based on the three classifications of ear pathologies and combination whereby more than one type of ear pathology exists. The three categories of ear pathologies in the current study were those which affected the outer, middle, and inner ear. Therefore, based on the analysis, the Outer ear pathologies were the most common amongst the three at 48.3% followed by middle ear at 28.5% while inner ear had only 0.9% and the combined had 4.6%.

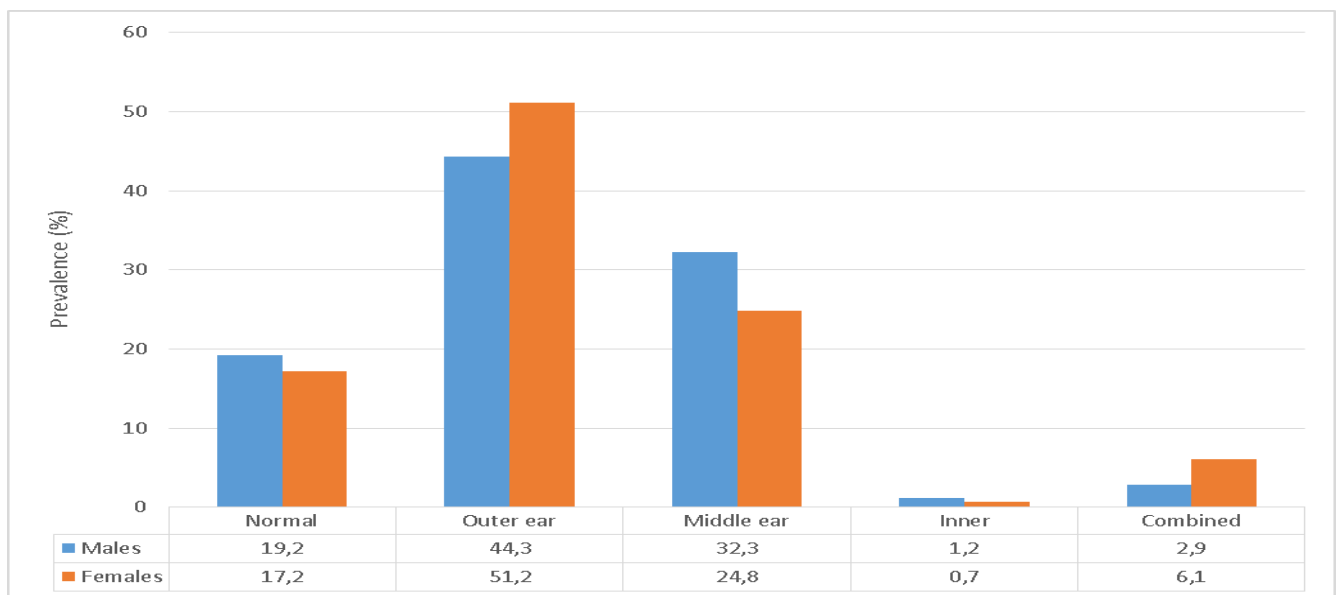


Figure 4.3 Prevalence of ear pathologies by age group stratified by gender

The above Figure 4.3 presents the prevalence of ear pathologies stratified by gender and similarly to the overall prevalence of ear pathologies, the most common ear pathologies in both males and females is outer ear pathologies. The prevalence of outer ear pathologies was high in females at 51.2% while the highest prevalence in males was in middle ear pathologies at 32.3%. In overall, for this study, more females than males presented with an ear pathologies.

Table 4.2: Prevalence of Ear pathologies across gender and different age categories

| Age in years | | | |
|----------------------------------|--------------------|--------------------|--------------------|
| | <1 | 1 - 3 | 4 - 7 |
| | % (95% CI) | % (95% CI) | % (95%CI) |
| Females (n= 408) | | | |
| NO Abnormality | 31.3 (17.5 – 49.3) | 21.4 (15.6 – 28.6) | 12 .1 (8.4 – 17.1) |
| Outer ear | 62.5 (15.3 – 22.2) | 37.0 (29.7 – 44,9) | 67.6 (61.1 – 73.4) |
| Middle ear | 56.3 (38.7– 72.4) | 35.7 (28.5 – 43.6) | 12.6 (8.8 – 17.7) |
| Inner ear | 0 (0.0) | 0 (0.0) | 13.5 (0.4 – 4.1) |
| Combination (outer + middle ear) | 6.3(1.5 – 22.3) | 5.8 (3.1 – 10.9) | 6.3 (3.8 – 10.4) |
| Males (n= 402) | | | |
| NO Abnormality | 40 (24.4 – 58.4) | 19.6 (14.3 – 26.7) | 16.0 (11.7 – 21.5) |
| Outer ear | 10,0 (31.9 – 27.3) | 34.6 (27.5 – 42.6) | 55.7 (49.0 – 62.2) |
| Middle ear | 46.7 (29.6 – 64.5) | 42.5 (34.9 – 50.5) | 23.3 (18.1 – 29.4) |
| Inner ear | 0 (0.0) | 0 (0.0) | 2.3 (0.9 – 5.4) |
| Combination (outer + middle ear) | 3.3 (0.4 – 20.9) | 3.3 (1.4 – 7.6) | 2.7 (1.2 – 6.0) |

The prevalence of ear pathologies across two genders and various age groups is shown in Table 4.2. The prevalence of outer ear pathologies in females were high in age group 4 – 7 years old at 67.6% followed by age group less than one year and 1 – 3 years 62.5% and 37% respectively. In females the prevalence of middle ear pathologies decreased with increasing age from 56.3% in age group less than one year to 35.7% and 12.6% in age groups 1 – 3 years and 4 – 7 years old respectively. The prevalence of outer ear pathologies in males were high in age group 4 – 7 years old at 55.7% followed by age group 1 – 3 years and less than one year old at 34.6% and 10% respectively. The prevalence of middle ear pathologies decreased with increasing age in males from 46.7% in age group less than one year to 42.5% and 23.3% in age groups 1 – 3 years and 4 – 7 years old respectively. Only the older children at age group 4 – 7 years had inner ear pathologies at 13.5% for females and 2.3% for males. The prevalence of a combination of outer and middle ear pathologies was 6.3% in both age groups less than one year old and 4 – 7 years old followed by 5.8% for age group 1 – 3 years in females. On the other hand, the prevalence of a combination of outer and middle ear pathologies was 3.3% in both age groups less than one year old and 1 – 3 years old followed by 2.7% for age group 4 – 7 years old in males as presented in Table 4.2 above.

Table 4.3: Medical Risk factors for ear pathologies by gender amongst study participants.

| Underlying Medical Condition | Female(408) n (%) | Male(402) n (%) | Overall n (%) |
|-------------------------------------|------------------------------|----------------------------|--------------------------|
| No Abnormality Detected | 294 (72.1) | 301 (74.9) | 595 (73.4) |
| Allergies | 1 (0.3) | 1 (0.3) | 2 (0.3) |
| URTI | 52 (12.8) | 44 (10.9) | 96 (11.9) |
| LRTI | 10 (2.5) | 8 (1.9) | 18 (2.2) |
| MAM/SAM | 19 (4.7) | 17 (4.2) | 36 (4.4) |
| Genetic disorders | 5 (1.2) | 1 (0.3) | 6 (0.7) |
| RVD+ underlying conditions | 8 (1.9) | 1 (0.3) | 9 (1.1) |
| Congenital disorders | 1 (0.3) | 5 (1.3) | 6 (0.7) |
| Chronic OM | 0 (0.00) | 2 (0.5) | 2 (0.3) |
| Parotitis | 15 (3.7) | 21 (5.2) | 36 (4.4) |
| Acute Gastroenteritis | 2 (0.5) | 1 (0.3) | 3 (0.4) |
| Other | 1 (0.3) | 0 (0.0) | 1 (0.1) |

The hospital files were reviewed to look for the primary medical diagnosis the study participants presented with during the time of their audiological diagnosis. Table 4.3 above indicates various medical conditions that the children presented with that could also be contributing as risk factors for the development of ear pathologies. Upper respiratory tract infections were found to be the most common underlying medical condition in children that were seen by the audiologist with 11.9% overall frequency followed by Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM); Parotitis both at 4.4%.

Table 4.4: Univariate Logistic Regression

| Age in years | Ear pathologies | | | |
|-------------------------------------|----------------------------------|----------------------------------|-----------------------------------|--------------------------------|
| | Outer ear | Middle ear | Inner ear | Combined |
| | OR(95%CI) | OR(95%CI) | OR(95%CI) | OR(95%CI) |
| ≤ 1 | Ref | Ref | Ref | Ref |
| Older | 0.3 (0.2 – 0.4) ^{***} | 3.2 (2.3 – 4.4) ^{***} | – | 1.02 (0.5 – 1.9) ^a |
| Age group in years | | | | |
| <1 | Ref | Ref | Ref | Ref |
| 1 - 3 | 0.2 (0.1 – 0.4) ^{***} | 1.7 (0.9 – 2.9) ^a | – | 1.1 (0.3 – 3.8) ^a |
| 4 - 7 | 0.1 (0.02 – 0.13) ^{***} | 4.9 (2.8 – 8.5) ^{***} | – | 1.1 (0.3 – 3.7) ^a |
| Underlying medical condition | | | | |
| None | Ref | Ref | Ref | Ref |
| Allergies | 1.4 (0.1 – 23.2) | 0.2 (0.01 – 3.1) ^a | – | – |
| URTI | 6.7 (3.9 – 11.6) ^{***} | 0.1 (0.05 – 0.14) ^{***} | – | 0.4 (0.2 – 0.9) ^{**} |
| LRTI | 7.2 (2.1 – 25.2) ^{**} | 0.2 (0.1 – 0.5) ^{**} | 0.05 (0.009 – 0.32) ^{**} | 0.5 (0.06 – 3.9) ^a |
| MAM?SAM | 7.2 (2.9 – 17.6) ^{***} | 0.2 (0.1 – 0.3) ^{***} | – | 0.2 (0.06 – 0.5) ^{**} |
| Genetic disorders | 0.7 (0.1 – 3.9) ^a | – | 0.03 (0.003 – 0.36) ^{**} | 0.1 (0.02 – 1.3) ^a |
| RVD+ others | 5.1 (1.0 – 24.5) [*] | 0.2 (0.04 – 0.6) ^{**} | – | 0.2 (0.03 – 1.9) ^a |
| Congenital disorders | 7.2 (0.8 – 62.2) ^a | 0.9 (0.1 – 8.4) ^a | 0.03 (0.003 – 0.36) ^{**} | – |
| Chronic OM | – | – | – | – |
| Parotitis | – | 0.3 (0.01 – 0.08) ^{***} | – | 0.2 (0.06 – 1.9) ^{**} |
| Other | 2.9 (0.3 – 32.0) ^a | – | – | – |
| Acute Gastroenteritis | – | – | – | – |

Values are reported as odds ratios (95%CI); *significant at $p < 0.05$; **significant at $p < 0.005$; ***significant at $p < 0.001$, ^aNot significant

The association between ear pathologies and the identified risk factors amongst children of 7 years and below at Voortrekker District Hospital, Mokopane.

Older children above one year were found to 0.3 times less likely to have outer ear pathologies which was statistically significant at $p < 0.001$ as compared to younger children of one year or below. On contrary to middle ear pathologies, older children above one year were found to 3.2 times more likely to have middle ear pathologies which was statistically significant at $p < 0.001$ as compared to younger children of one year or below. Older children above one year were found to 1.02 times more likely to have a combination of outer and middle ear pathologies which was not statistically significant as compared to younger children of one year or below. In breaking down the age groups, children who were 1 – 3 years old were found to 0.2 times less likely to have outer ear pathologies which was statistically significant at $p < 0.001$ while those who were 4 – 7 years old were found to be 0.1 times less likely to have outer ear pathologies which was statistically significant at $p < 0.001$ as compared to younger children of one year or below. Children who were 1 – 3 years old were found to 1.7 times more likely to have middle ear pathologies which was not statistically while those children who were 4 – 7 years old were found to be 4.9 times more likely to have middle ear pathologies which was statistically significant at $p < 0.001$ as compared to younger children of one year or below as presented in Table 4.4 above.

Children with lower respiratory tract infections (LRTI) and those having Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM) were both found to be 7.2 times more likely to have outer ear pathologies which was significant at $p < 0.005$ and $p < 0.001$ respectively as compared with children without any underlying medical condition. Children with upper respiratory tract infections (URTI) were found to be 6.7 times more likely to have outer ear pathologies followed by children with retroviral diseases (RVD) at 5.1 times more likely to have outer ear pathologies which was significant at $p < 0.001$ and $p < 0.05$ respectively as compared with children without any underlying medical condition as presented in Table 4.4 above.

Children with parotitis were found to be 0.3 times less likely to have middle ear pathologies which was significant at $p<0.005$ as compared with children without any underlying medical condition. Children with Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM) were found to be 0.2 times less likely to have middle ear pathologies which was significant at $p<0.001$ followed by children with lower respiratory tract infections (LRTI) and retroviral diseases (RVD) both at 0.2 times less likely to have middle ear pathologies at $p<0.005$ as presented in Table 4.4 above.

Children with lower respiratory tract infections (LRTI) were found to be 0.05 times less likely to have inner ear pathologies followed by children with genetic disorders and congenital disorders both at 0.03 times less likely to have inner ear pathologies which was significant at $p<0.005$ as compared with children without any underlying medical condition. Lastly, children with upper respiratory tract infections (URTI) were found to be 0.4 times less likely to have a combination of outer and middle ear pathologies which was significant at $p<0.005$ followed by children with Moderate Acute Malnutrition (MAM) and parotitis both at 0.2 times less likely to have a combination of outer and middle ear pathologies which was significant at $p<0.005$ as presented in Table 4.4 above.

5 CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter, the findings of this study were presented and interpreted. In this chapter, the results of this study are discussed and compared to the relevant literature. The chapter is divided into the following sub-sections:

- Introduction;
- Characteristics of study population;
- The prevalence of ear pathologies;
- Factors associated with ear pathologies
- Study limitations;
- Conclusion and
- Recommendations.

5.2 Characteristics of study population

The current study revealed that there was no statistical significant difference between gender which differs from a study conducted by Kukwa, Guilleminault, Tomaszewska, Kukwa, Krzeski and Migacz, (2018) in Poland but similar to a study conducted in China (Deng, Lu, Li, Chen, He & Sundell et al., 2017). Even though ear infection is primarily a disease of infants and young children, it can also affect adults (Hailu, Mekonnen, Derby, Mulu & Abera, 2016). In the current study, majority of patients were in the age group 4 – 7 years which concurs with a study conducted in Denmark (Todberg, Koch, Andersson, Olsen, Lous & Homøe, 2014).

Ear infections in children are a major public health problem and these may be linked with hearing impairment; delayed speech and language development; and academic and educational development (Karunanayake, Albritton, Rennie, Lawson, McCallum & Gardipy et al., 2016). In the current study, majority of the patients were diagnosed with impacted wax which concurs with a study conducted in Ghana amongst school going children reporting high prevalence of impacted wax (Osei, Larnyo, Azaglo, Sedzro & Torgbenu, 2018). Males were mostly

diagnosed with impacted wax as compared to females in the current study which differs with another study findings from Ghana (Akotey, Adza, Awini, Cobbinah, Darko & Ador et al., 2017) as females had a high proportion with impacted wax. This might be because the majority of illnesses of the outer ear are simpler to identify and diagnose (Myburgh, Van Zijl, Swanepoel, Hellström & Laurent, 2016). Earwax is the most common cause of ear canal obstruction and it can result in a variety of implications such as loss of hearing, tinnitus, overflowing, itching, otalgia, discharge, odour, and cough. Therefore, it is critical to monitor children for development of earwax (Deshmukh & Agrawal, 2021).

The second most diagnosis was in the current study was perforated tympanic membrane amongst children which differs with findings from a study conducted in Canada (Fitzpatrick, McCurdy, Whittingham, Rourke, Nassrallah & Grandpierre et al., 2021). The difference could be the fact that the study in Canada focused on Grade 6 learners only while the current study focused on children from 0 years to 7 years. at 29.1% with slight differences between males and females. The proportion of children diagnosed with Otitis Media was very low which is similar to the findings from a study conducted in Tanzania (Ertzgaard, Kristin, Sofie, Sindberg, Bang ,& Cosmas et al., 2020) which reported a low prevalence of chronic Otitis Media among urban school children which was ascribed to better medical services which facilitate early diagnosis and treatment of Acute Otitis Media. This may also be due to a lack of resources, such as tools to detect and diagnose children's inner ear disorders, which leaves many cases undiagnosed and untreated. Hearing loss in the current study was found to be very low as compared to a study conducted in (McGuire et al., 2019). This significant difference could be mainly because the study by McGuire et al., (2019) was a community based study and it focused on children between 3 and 10 years old as compared to the current study which was based on hospital files and only focusing on children 7 years and below.

5.3 Prevalence of ear pathologies

Hearing impairment can result from ear disease affecting the middle ear (conductive hearing loss), inner ear or cochlear nerve (sensorineural hearing loss),

or both (mixed hearing loss). Depending on the aetiology, hearing loss may be permanent or transient (Graydon, Waterworth, Miller & Gunasekera, 2019). In the current study, the prevalence of ear pathologies was found to be much higher than a study conducted in Limpopo, South Africa (Phanguphangu, 2017) and this significant difference could be mainly because the study was conducted at a school as a school health screening campaign. However, a study conducted in Uganda reported a prevalence of 90% in children aged 0-6 years (Kisembo, Mugwanya, Atumanya, Othin, Oworinawe & Kagimu et al., 2018) which is higher than the prevalence in the current study. This supports the findings that on estimation almost all children will have had an ear infection by the age of five years (Karunanayake, Albritton, Rennie, Lawson, McCallum & Gardipya et al., 2016).

A study conducted by Mahomed-Asmail et al., (2016) reported that the prevalence of middle ear pathology among young children varied between 13.4% and 29.4% which concurs with the current study findings as the prevalence of middle ear was found to be 28.5%. However, this was lower than the prevalence of middle ear which was found in studies conducted in Rwanda of 5.8% (Mukara, Lilford, Tucci & Waiswa, 2017) and Cameroon 9.5% (Libwea, Kobela, Ndombo, Syrjänen, Huhtala & Fointamaet et al., 2018). It should be stressed that middle ear pathology can obscure the presence or absence of a permanent hearing issue, which is why it is advisable to preventatively screen later in life once peak incidence of acute Otitis Media (AOM) has passed (Norowitz et al., 2019). Middle ear pathologies were a major problem from children aged less than one year in the current study which concurs with other studies (Kaur, Morris Pichichero, 2017; Venekamp, Schilder, van den Heuvel & Hay, 2020) as it is reported that by 1 year of age, 23% of the children experienced more than 1 episode of ear pathology. The World Health Organization considers middle ear pathology prevalence of $\geq 4\%$ indicative of a public health problem serious enough to require urgent attention as related complications result in approximately 21,000 deaths each year worldwide (Coleman, Wood, Bialasiewicz, Ware, Marsh & Cervin, 2018).

The prevalence of inner ear pathologies in the current study was found to be very low at 0.9% as compared to other studies (Kaur, R., Morris, M. and Pichichero, M.E., 2017) which had higher prevalence ranging from pediatric population. The main reason for this huge difference could be because it is difficult to evaluate precisely inner ear pathologies because the symptoms are not specific and often misleading (Wolk, 2016). Inner ear infections can cause certain parts of the inner ear to become inflamed. These infections can affect a person's hearing and balance. They often occur when a person has a cold or the flu or if a middle ear infection spreads into the inner ear (Shamriz, Tal & Gross, 2018).

5.4 Factors associated with ear pathologies

A prospective cohort study in England reported supports the findings of the current study as one in two children has had three episodes of middle ear pathologies by age 3 years (Venekamp et al., 2020). The current study revealed that older children more likely to have middle ear pathologies which is supported by Kaspar, Kei, Driscoll, Swanepoel and Goulios, (2016). Middle ear disease is often initiated by an acute upper respiratory tract infection leading to acute OM (AOM) with ear pain, bulging of the tympanic membrane and potentially perforation (Avnstorp, Homøe, Bjerregaard & Jensen, 2016). This supports the findings of the current study as upper respiratory tract infections were significantly associated with occurrence of middle ear infections. Infectious diseases and middle ear infections are recognized as the major causes of avoidable hearing impairment in children (Kaspar et al., 2016). Middle ear infections in the current study was significantly associated with retroviral diseases which is supported by (Kaspar et al., 2016) who reported that middle ear infection is among the first clinical manifestations of pediatric HIV/AIDS. The prevalence of hearing loss and middle ear infections can be associated with different factors, e.g. economic status and access to information about hygienic routines and methods of treatment for infections. It will therefore be necessary, with good hygiene routines, to prevent the risk of further infections. The prevalence of chronic suppurative Otitis Media which is a middle ear infections has previously been reported to high among rural school children as compared to urban school children ((Ertzgaard et al., 2020). However, the current study did not investigate

the factors such as socioeconomic status and hygiene practices by parents of the children.

5.5 Limitations of the study

The present study had several limitations. First, the quality of medical records was variable and some key information was often not recorded, so this made it difficult for some questions to be answered. Therefore, confounder information has been lacking and there might be missing information on data quality. The information related to factors contributing to ear pathologies were not fully recorded and it was not possible to determine the fully the contributory factors to ear pathologies like the socioeconomic status and hygiene practices of the parents of the children.

5.6 Conclusions and Relevance

More males presented with ear pathologies as compared to females and the prevalence of ear pathologies was high in the current study with outer ear pathologies leading followed by middle ear pathologies. The risk factors for ear pathologies were LRTI, URTI, MAM/SAM, RVD, parotitis and congenital disorders. Impacted wax was the most typical diagnosis in both genders while Otitis Media was the least and this could be due to a lack of accessibility and availability of resources for early identification of inner ear disorders. Ear pathologies are a major public health problem that contributes mostly to the growing number of disabilities amongst people globally. Mokopane, is a small Town in Limpopo with rural communities that depend mainly on clinics and hospitals to access health care services such as hearing services (audiological). Professionals who are able to identify and manage hearing loss (Audiologists), are mainly based in hospitals in Mokopane area, with limited resources and minimal visits to clinics during outreach programs. This results in many cases of ear pathologies in children being missed and remaining untreated till adulthood.

5.7 RECOMMENDATIONS

5.7.1 Policies

The current study revealed that there is a paucity of primary data on the contributory factors to ear pathologies. The study strongly recommends future

researchers to do an interventional study which could yield results to address factors influencing occurrence of ear pathologies in children which will facilitate the development of better public health interventions to reduce the burden of ear pathologies amongst children's.

5.7.2 Health facilities

The current study revealed that there is high prevalence of ear pathologies amongst children's and therefore, a significant concern that should be explored is the intervention that can reduce the burden of ear pathologies. The prevalence of inner ear pathologies was very low which could be due to lack of resources to do early and proper diagnosis. Therefore, it is recommended that hospitals in Limpopo be provided with resources to screen and diagnose ear pathologies in children at young age to prevent deafness.

5.7.3 Research

Middle ear infections in the current study was significantly associated with retroviral diseases and this may become important in future studies.

REFERENCES

Akotey, S.C., Adza, E.K., Awini, A., Cobbinah, J.B., Darko, K., Ador, E.W., Arckertson, L.P., Dadzie-Bonney, P., Adzoe, C., Asamoah, B. and Agomboka, A.A., 2017. Significance of ear wax impaction in school children: a case of winneba west circuit, ghana. *Significance*, 35.

Avnstorp, M.B., Homøe, P., Bjerregaard, P. and Jensen, R.G., 2016. Chronic suppurative Otitis Media, middle ear pathology and corresponding hearing loss in a cohort of Greenlandic children. *International journal of pediatric otorhinolaryngology*, 83, pp.148-153.

Babbie, E., & Mouton, J. (2010). *The practice of social research* (10th ed.). Oxford university press.

Baek, J. (2019). Introduction to Biostatistics-Lecture 3: Statistical Inference for Proportions.

Biagio, L., Swanepoel, D., Laurent, C., & Lundberg, T. (2014). Paedatric Otitis Media at a primary health care clinic in South Africa. *The South African Medical Journal*, 431-435.

Bickenbach, J. (2018). Addressing The Rising Prevalence of Hearing Loss. In Disability and Society (Vol. 26, Issue 5). <https://doi.org/10.1080/09687599.2011.589198>

Bošnjak, S. (2001). The Declaration of Helsinki - The cornerstone of research ethics. *Archive of Oncology*, 9(3), 179–184.

Botma, Y. G. (2010). Research in health sciences. South Africa: Nozuko Makhuvha.

Céspedes, M. T., & Putz, T. S. (2019). Prevalence of middle ear disease in Chilean natives and the impact of development over 14 years. *Brazilian Journal of Otorhinolaryngology*, xx. <https://doi.org/10.1016/j.bjorl.2019.09.004>

Coleman, A., Wood, A., Bialasiewicz, S., Ware, R.S., Marsh, R.L. and Cervin, A., 2018. The unsolved problem of Otitis Media in indigenous populations: a systematic review of upper respiratory and middle ear microbiology in indigenous children with Otitis Media. *Microbiome*, 6(1), pp.1-15.

Collins, K. E. (2000). *Research in the social sciences*. Pretoria: University of South Africa.

Cresswell, D. J., & Cresswell, J. W. (2014). *Research Design. Qualitative, Quantitative and mixed methods Approaches*. (5th Editio, Vol. 53, Issue 9). SAGE Publications Inc. <https://doi.org/10.1017/CBO9781107415324.004>

David, C., A.F, S., Casselbrant, M., Robbert, J., Ensink, Buchinsky, F., . . . Isaacson, G. (2017, December). Prevalence of Chronic ear disease among HIV+ children in Sub-Saharan Africa. *International Journal of Pediatric Otorhinolaryngology*, 103, 133-136. Retrieved from <https://doi.org/10.1016/j.ijporl.2017.10.024>

Dawood, G., Klop, D., Oliver, E., Elliott, H., & Pillay, M. (2020). Nature and extent of hearing loss in HIV-infected children: A scoping review. *international journal of pediatric otorhinolaryngology*, 134. Retrieved from <http://doi.org/10.1016/j.ijporl.2020.110036>

De Vos, A., Strydom, H., Fouche, C., & Delpont, C. (2005). *Research at Grass Roots: For the Social Science Professionals*. (3rd ed.). Pretoria: JL Van Schaik Publishers.

Deng, Q., Lu, C., Li, Y., Chen, L., He, Y., Sundell, J. and Norbäck, D., 2017. Association between prenatal exposure to industrial air pollution and onset of early childhood ear infection in China. *Atmospheric environment*, 157, pp.18-26.

Deshmukh, P.T. and Agrawal, V., 2021. Ear Wax and its Impaction: Clinical Findings and Management. *Journal of Pharmaceutical Research International*, pp.176-182.

Einhorn, K. (2017, February 5). infections over the ages. Hearing review. *Music & Hearing*.

Ellen M. Mandel, M. M. (2016). Eustachian tube function in 6 year old children with and without a history of middle ear disease. *American Academy of Otolaryngology-Head and Neck Surgery*, 502-507.

Ertzgaard, S.I., Kristin, N., Sofie, T., Sindberg, H.G., Bang, H.T., Cosmas, M., Vedul, T.T., Aslam, N. and Jon, Ø., 2020. Prevalence of hearing impairment among primary school children in the Kilimanjaro region within Tanzania. *International Journal of Pediatric Otorhinolaryngology*, 130, p.109797.

Fathalla, M. F. (2004). A Practical Guide for Health Researchers. In M. F. Fathalla, *A practical health for researchers* (pp. 43-54). South Africa: WHO regional publications.

Fitzpatrick, E.M., McCurdy, L., Whittingham, J., Rourke, R., Nassrallah, F., Grandpierre, V., Momoli, F. and Bijelic, V., 2021. Hearing loss prevalence and hearing health among school-aged children in the Canadian Arctic. *International Journal of Audiology*, 60(7), pp.521-531.

Gilberto, N., Custódio, S., Colaço, T., Santos, R., Sousa, P., & Escada, P. (2020). Middle ear congenital cholesteatoma: systematic review, meta-analysis and insights on its pathogenesis. *European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery*, 277(4), 987–998. <https://doi.org/10.1007/s00405-020-05792-4>

Graydon, K., Waterworth, C., Miller, H. and Gunasekera, H., 2019. Global burden of hearing impairment and ear disease. *The Journal of Laryngology & Otology*, 133(1), pp.18-25.

Hailu, D., Mekonnen, D., Derbie, A., Mulu, W. and Abera, B., 2016. Pathogenic bacteria profile and antimicrobial susceptibility patterns of ear infection at Bahir Dar Regional Health Research Laboratory Center, Ethiopia. *SpringerPlus*, 5(1), pp.1-6.

Hunter, D. J. (2003). Evidence-based management: a practical guide for health professionals. In *International Journal of Integrated Care* (Vol. 3, Issue 1). <https://doi.org/10.5334/ijic.70>

Igwenagu, C. (2016). *Fundamentals of Research methodology and data collection*. Nigeria: LAP Lambert Academic Publishing.

Joubert, K., Sebothoma, B., & Kgare, K. (2017). Public awareness of audiology, hearing and hearing health in the Limpopo Province, South Africa. *South African Journal of Communication Disorders*, 64(1). Contributing factors to high prevalence of hearing impairment in the Elias motsoaledi local municipal area, South Africa: A rural perspective. *South African Journal of Communication Disorders*, 66(1), 1–7. <https://doi.org/10.4102/sajcd.v66i1.611>

Karunanayake, C.P., Albritton, W., Rennie, D.C., Lawson, J.A., McCallum, L., Gardipy, P.J., Seesequasis, J., Naytowhow, A., Hagel, L., McMullin, K. and Ramsden, V., 2016. Ear infection and its associated risk factors in first nations and rural school-aged Canadian children. *International journal of pediatrics*, 2016.

Kaspar, A., Kei, J., Driscoll, C., Swanepoel, D.W. and Goulios, H., 2016. Overview of a public health approach to pediatric hearing impairment in the Pacific Islands. *International Journal of Pediatric Otorhinolaryngology*, 86, pp.43-52.

Kaur, R., Morris, M. and Pichichero, M.E., 2017. Epidemiology of acute Otitis Media in the postpneumococcal conjugate vaccine era. *Pediatrics*, 140(3).

Khoza-Shangaze, K., & Anastasiou, J. (2020). An exploration of recorded otological manifestations in South African children living with HIV/AIDS. *Pediatric Otorhinolaryngology*, 133.

Kisembo, P., Mugwanya, F., Atumanya, P., Othin, M., Oworinawe, R., Kagimu, B., Kisakye, A. and Bagambe, F., 2018. Prevalence of ear infections in first year children of primary schools in a Western Ugandan community. *African Journal of Biomedical Research*, 21(2), pp.117-122.

Kukwa, W., Guillemineault, C., Tomaszewska, M., Kukwa, A., Krzeski, A. and Migacz, E., 2018. Prevalence of upper respiratory tract infections in habitually snoring and mouth breathing children. *International journal of pediatric otorhinolaryngology*, 107, pp.37-41.

Libwea, J.N., Kobela, M., Ndombo, P.K., Syrjänen, R.K., Huhtala, H., Fointama, N., Koulla-Shiro, S., Nohynek, H., Nuorti, J.P. and Palmu, A.A., 2018. The prevalence of Otitis Media in 2–3 year old Cameroonian children estimated by tympanometry. *International journal of pediatric otorhinolaryngology*, 115, pp.181-187

Mahomed-Asmail, F., Swanepoel, D.W. and Eikelboom, R.H., 2016. Hearing loss in urban South African school children (grade 1 to 3). *International journal of pediatric otorhinolaryngology*, 84, pp.27-31.

Martin, F. & Clark. (2014). Introduction to audiology (12th ed.). Boston: Pearson Education, inc.

Mayo, C. S. (2019, May). Ear infection (middle ear). Retrieved from Mayo clinic web site: <http://www.mayoclinic.org>

McDonald, K. (2008). The pathophysiology of the IDOs. *Australian Life Scientist*, 5(6), 20–21.

McGuire, D.O., Tian, L.H., Yeargin-Allsopp, M., Dowling, N.F. and Christensen, D.L., 2019. Prevalence of cerebral palsy, intellectual disability, hearing loss, and blindness, National Health Interview Survey, 2009–2016. *Disability and health journal*, 12(3), pp.443-451.

Mohammad, W., & Mohammad, A. (2020). Otitis Media. Medscape.

Mukara, K. L., & Tucci, D. P. (2017). Prevalence of middle ear infections and associated risk factors in children under 5 years in Gasabo District of Kigali City, Rwanda. *international journal of pediatrics*, 2017. Retrieved July 29, 2020, from [//doi.org/10.1155/2017/4280583](https://doi.org/10.1155/2017/4280583)

Mukara, K., Waiswa, P., Lilford, R., & Tucci, D. (2017). Knowledge and care seeking Practices for ear infections among parents of under five children in Kigali, Rwanda. *BMC Ear, Nose and Throat Disorders*.

Mukara, K.B., Lilford, R.J., Tucci, D.L. and Waiswa, P., 2017. Prevalence of middle ear infections and associated risk factors in children under 5 years in gasabo district of Kigali City, Rwanda. *International journal of pediatrics*, 2017.'

Myburgh, H.C., Van Zijl, W.H., Swanepoel, D., Hellström, S. and Laurent, C., 2016. Otitis Media diagnosis for developing countries using tympanic membrane image-analysis. *EBioMedicine*, 5, pp.156-160.

Norowitz, H.L., Morello, T., Kupfer, H.M., Kohlhoff, S.A. and Smith-Norowitz, T.A., 2019. Association between Otitis Media infection and failed hearing screenings in children. *Plos one*, 14(2), p.e0212777.

Osei, A.O., Larnyo, P.A., Azaglo, A., Sedzro, T.M. and Torgbenu, E.L., 2018. Screening for hearing loss among school going children. *International journal of pediatric otorhinolaryngology*, 111, pp.7-12.

Phanguphangu, M.C., 2017. Otosopic examinations reveal high prevalence of outer and middle ear pathologies in paediatrics in Limpopo, South Africa. *International Journal of Audiology*, 56(4), pp.215-218.

Prevention of deafness: WHO. (2020, March 1). *WHO global estimates on prevalence of hearing loss*. Retrieved from A WHO web site: <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>

Rowland, J. (2018, August 29). Ear infections. Healthline. Retrieved July 30, 2020, from <https://www.healthline.com/health/double-ear-infection>

Scholes, S., Biddulph, J., Davis, A., & Mindell, J. (2017). Socioeconomic differences in hearing among middle-aged and older adults. *BMJ open*.

Seventieth World Health Assembly,. (2017). Prevention of deafness and hearing loss. 3(May), 2014–2016.

Shamriz, O., Tal, Y. and Gross, M., 2018. Autoimmune inner ear disease: immune biomarkers, audiovestibular aspects, and therapeutic modalities of Cogan's syndrome. *Journal of immunology research*, 2018.)

Smith, A. ., & Mackenzie, I. . (1999). WHO ear and hearing disorders survey protocol for a population-based survey of prevalence and causes of deafness and hearing impairment and other ear diseases (pp. 1–27). [http://apps.who.int/iris/bitstream/10665/67892/1/WHO_PBD_PDH_99.8\(1\).pdf](http://apps.who.int/iris/bitstream/10665/67892/1/WHO_PBD_PDH_99.8(1).pdf)

Taj, M., Azam, S., Ali, S., & Ahmed, L. (2020). Different causes of ear infections and its management. *Journal of biodiversity and environmental sciences*, 92-102.

The joint committee on infant hearing. (2019). Year 2019 position statement: principles and guidelines on early hearing detection and intervention programs. *The journal of early hearing detection and intervention*, 1-44.

Todberg, T., Koch, A., Andersson, M., Olsen, S.F., Lous, J. and Homøe, P., 2014. Incidence of Otitis Media in a contemporary Danish National Birth Cohort. *PLoS One*, 9(12), p.e111732.

UNAIDS. (2019). Global HIV and AIDS statistics 2019 Fact sheet. *Global HIV and AIDs Statistics, World AIDS Day 2019 Fact Sheet*, 1(June), 1–6.

Venekamp, R.P., Schilder, A.G., van den Heuvel, M. and Hay, A.D., 2020. Acute middle ear infection (acute Otitis Media) in children. *bmj*, 371.

WHO. (2006). Primary ear and hearing care training resource. *Chronic Disease prevention and management*, 15-20.

WHO. (2013). HIV & AIDS: Consolidated ARV guidelines. Retrieved from <https://www.who.int/hiv/pub/guidelines/arv2013/intro/keyterms/en>

Wolk, D.M., 2016. Microbiology of middle ear infections: do you hear what I hear?. *Clinical Microbiology Newsletter*, 38(11), pp.87-93.

Annexure A: FILE REVIEW FORM A

Prevalence and risk factors contributing towards ear pathologies in children at Voortrekker hospital, Limpopo Province: An archival study.

| A. Participant's details | | |
|---------------------------------|-------------------|------------------------------|
| File Nr: | | |
| Date of consultation: | | |
| D.OB/Age: | | |
| Race: | | |
| Referral ward: | OPD (Out-patient) | Paediatric ward (In-patient) |
| Gender | Male | Female |
| B. Basic Ear assessment | | |

| | YES(specify which ear) | NO | Uncertain |
|---|------------------------|----|-----------|
| I. Did patient report any ear problems? If No, do not continue with other questions. If yes continue. | | | |
| II. Ear Pain | | | |
| III. Auricle Malformation | | | |
| IV. Ear Canal malformation | | | |
| V. Impacted Wax | | | |
| VI. Foreign Body | | | |
| VII. Fungal infection | | | |
| VIII. Inflamed Ear drum | | | |
| IX. Perforated Ear drum | | | |
| X. Discharging ear | | | |
| XI. Hearing loss | | | |
| XII. Deaf (using sign Language) | | | |
| Other ear complaints not noted above? Please specify if YES | | | |
| C. Type of ear Pathology indicated <i>(tick ✓ the correct answer)</i> | | | |

| | | |
|------------------------------|---|---------------------|
| I. | Outer ear | |
| II. | Middle ear | |
| III. | Inner ear | |
| D. Underlying Disease | | |
| I. | Does the patient present with any underlying disease? YES/ NO (circle your answer) <i>If Yes continue with the questions below.</i> | |
| II. | Type of disease | Name of the disease |
| III. | Infectious disease | |
| IV. | Non-Infectious | |
| V. | Genetic Condition | |

Derived and adapted from WHO ear and hearing Survey form.

Coding instruction for the File review form A.

Section A

Referral wards should be classified according to the following:

- Out-patient department (OPD)
- In-patient department (admitted in any ward)

Race of the participants should be classified based on the following:

B-Black

W-White

O-Other

Gender: Tick either Male or Female

Section B: Tick/select the appropriate box with $\sqrt{\quad}$. Either L or R or both.

Section C: Tick/select the appropriate box with $\sqrt{\quad}$. Either L or R or both.

Section D: Specify if the participant presented with the following or with a history of the following infectious or non-infectious diseases stated in the file:

Infectious diseases should be classified as:

- HIV
- TB
- Other

Non-Infectious diseases should be classified in the following manner

- Diabetes
- Severe Acute Malnutrition (SAM)
- Other

Genetic Conditions: Does the patient present with any genetic condition stated in the file? If yes specify according to the following:

- Craniofacial anomalies
- Down Syndrome
- Others

Undetermined cause: The participant presents with ear pathology without any known cause/underlying disease.

Abbreviations used in the form:

HL: Hearing loss

DB: Decibel

L: Left ear

R: Right ear

NAD: No abnormality detected

OPD: Outpatient department.

APPENDIX A: PERMISSION LETTER TO THE DEPARTMENT OF HEALTH

Department of Public Health University of Limpopo
Private Bag X116
Sovenga 0727

Date:

The Head of Department
Limpopo Provincial Government
College Avenue
Hospital Park
0699

RE: PERMISSION TO CONDUCT RESEARCH ON EAR PATHOLOGIES IN CHILDREN AT VOORTREKKER HOSPITAL, MOKOPANE.

My name is Hlamarisa Vadanile Mabasa student number 201110617, a Masters student in the Department of Public Health at the University of Limpopo (Turfloop Campus). I am interested in conducting a study to determine the prevalence and the risk factors contributing towards ear pathologies in children that were seen at Voortrekker hospital over a period 2 years that is from January 2018 to December 2019.

I hereby apply to be granted permission to conduct this research at the above-mentioned hospital. I would like to reassure that ethical considerations are put in place before the study and will be maintained throughout the study to protect the rights to confidentiality of the patients. The methods of data collection will include retrieval of clinical information of children with ear pathologies who were seen by Audiologists at Voortrekker hospital.

Your approval will be highly appreciated

Yours Faithfully

Mabasa Hlamarisa Vadanile (Masters Student)

Date _____

Prof. Maimela E. (Main Supervisor)

Date: _____

APPENDIX B: PERMISSION LETTER TO VOORTREKKER HOSPITAL

Department of Public Health University of Limpopo

Private Bag X116

Sovenga 0727

Date:

The Head of the Hospital

Voortrekker Hospital

2 Geyser Street

0699

RE: PERMISSION TO CONDUCT RESEARCH ON EAR PATHOLOGIES IN CHILDREN AT VOORTREKKER HOSPITAL, MOKOPANE.

My name is Hlamarisa Vadanile Mabasa student number 201110617, a Masters student in the Department of Public Health at the University of Limpopo (Turfloop Campus) and employee at Voortrekker hospital, Audiology department. I am interested in conducting a study of the prevalence and the risk factors contributing towards ear pathologies in children that were seen at Voortrekker hospital over one year periods that is from January 2018 to December 2019.

I hereby apply to be granted permission to conduct this research at the above-mentioned hospital. I would like to reassure that ethical considerations are put in place before the study and will be maintained throughout the study until completion to protect the rights of the patients. The methods of data collection will include retrieval of clinical information of children with ear pathologies who were seen by Audiologists at Voortrekker hospital.

Your approval will be highly appreciated

Yours Faithfully

Mabasa Hlamarisa Vadanile (Masters Student)

Date: _____

Prof. Maimela (Main Supervisor)

Date: _____

APPENDIX C: Faculty Approval



University of Limpopo
Faculty of Health Sciences
Executive Dean

Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 2149, Fax: (015) 268 2685, Email: tebogo.mothiba@ul.ac.za

DATE: 19 November 2021

NAME OF STUDENT: MABASA HV
STUDENT NUMBER: 201110617
DEPARTMENT: PUBLIC HEALTH
SCHOOL: HEALTH CARE SCIENCES
QUALIFICATION: MPH

Dear Student

FACULTY APPROVAL OF PROPOSAL (PROPOSAL NO. FHDC2021/8)

I have pleasure in informing you that your MPH proposal served at the Faculty Higher Degrees Meeting on the 17 November 2021 and your title was approved as follows:

Approved Title: "Prevalence of Ear Pathologies and Associated Risk Factors in children aged 0-7 years Attending Voortrekker Hospital in Mokopane, South Africa".

Note the following:

| Ethical Clearance | Tick One |
|--|----------|
| Requires no ethical clearance Proceed with the study | |
| Requires ethical clearance (TREC) (apply online) Proceed with the study only after receipt of ethical clearance certificate | ✓ |

Yours faithfully

Prof T.M Mothiba
Chairperson

CC: Supervisor: Prof E. Maimela
CO- Supervisor : Mr D.G Mashala

APPENDIX D: Ethical Clearance



University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 08 December 2021

PROJECT NUMBER: TREC/335/2021: PG

PROJECT:

Title: Prevalence of Ear Pathologies and Associated Risk Factors in Children Aged 0-7 Years Attending Voortrekker Hospital in Mokopane, South Africa
Researcher: HV Mabasa
Supervisor: Prof E Maimela
Co-Supervisor/s: Mr DG Mashala
School: Health Care Sciences
Degree: Master of Public Health

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

APPENDIX E: Department of Health Approval



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Department of Health

Ref : LP_2022-02-007
Enquires : Ms PF Mahlokwane
Tel : 015-293 6028
Email : Phoebe.Mahlokwane@dhsd.limpopo.gov.za

MABASA HLAMARISA VADANILE


PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

PREVALENCE OF EAR PATHOLOGIES AND ASSOCIATED RISK FACTORS IN CHILDREN AGED 0-7 YEARS ATTENDING VOORTREKKER HOSPITAL IN MOKOPANE, SOUTH AFRICA

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
 - a. Present this letter of permission to the institution supervisor/s a week before the study is conducted.
 - b. This approval is Only for Voortrekker Hospital
 - c. In the course of your study, there should be no action that disrupts the routine services, or incur any cost on the Department.
 - d. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
 - e. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
 - f. The approval is only valid for a 1-year period.
 - g. If the proposal has been amended, a new approval should be sought from the Department of Health
 - h. Kindly note that, the Department can withdraw the approval at any time.

--- Your cooperation will be highly appreciated


pp Head of Department

14/03/2022

Date

Private Bag X9302 Polokwane
Fidel Castro Ruz House, 18 College Street, Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.
Website: <http://www.limpopo.gov.za>

The heartland of Southern Africa – Development is about people!

APPENDIX F: Certificate from language editor

Tiyiselani & Rapetsoa scientific services

Desktop Publishing • Web Design • Proof-reading • Editing

Your one stop document handling service

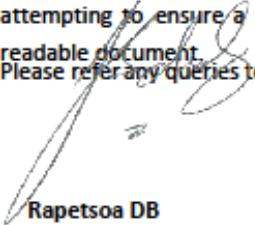


85 Compensatie Street,
Duplex Park No 5,
Polokwane, 0699
Postnet Suite 179 • Private Bag X9307 • Polokwane •
0700 Tel: 074 8666 914 • Fax: 0864154022

Date: 19 August 2022

To Whom it May Concern

I hereby confirm that I have proof-read the document entitled: "Prevalence of ear pathologies and associated risk factors in children aged 0-7 years attending Voortrekker Hospital in Mokopane, South Africa" authored by Ms HV Mabasa with student number 201110617 from University of Limpopo. The document has been edited and proofread for grammar, spelling, punctuation, overall style and logical flow. Considering the suggested changes that the author may or may not accept, at her discretion, each of us has our own unique voice as far as both spoken and written language is concerned. In my role as proof-reader I try not to let my own "written voice" overshadow the voice of the author, while at the same time attempting to ensure a readable document. Please refer any queries to me.


Rapetsoa DB