

AN ASSESSMENT OF THE MEASLES IMMUNISATION STATUS AND
MANAGEMENT IN ENGELA DISTRICT, OHANGWENA REGION

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ABSTRACT

Immunisation is one of the most cost effective public health interventions that provide protection against infectious diseases. The purpose of this study was to assess and describe the measles immunisation status and vaccine management in the Engela district.

A descriptive, cross-sectional study was conducted using a proportionate and systematic sampling technique. A structured administered interview to participants, supplemented with an observational checklist to assess measles coverage, vaccine and cold chain management. The data was analysed using Epi Info.7 software and setting p-values of 0.05 for statistical significance.

A total of 162 parents/caregivers of the children aged between 9-59 months were interviewed and 17 public health facilities were assessed. The median age of children was 24.5 months and 88 (54.3%) were males. The majority of children 155 (95.7%) had been vaccinated against measles, with a 95% confidence interval of (91.3% - 98.3%). More unvaccinated children were diagnosed with measles compared to the vaccinated (28.6% vs 6.5%, $p=0.029$), and this could be attributed to vaccine failure or improper management of vaccines and the cold chain. Receiving information on immunization was associated with vaccination ($p = 0.0001$).

Fifteen (88%) of the health facilities had functional cold chain equipment and vaccines that were stored at temperatures ranging between +2°C and +8°C. The storage management of the vaccines however did not meet the minimum storage requirements as backup systems were flawed in the sense that gas cylinders or generators were not available for the refrigerators in case of power outages. The coverage was also sub-optimum as 13 (76%) of the health facilities had a measles coverage of less than 80%, and 8 (47.1%) had a dropout rate of more than 10%.

Recommendations were submitted to the Ministry of Health and Social Services. The more important recommendations focused on reviving the health education sessions, increasing the routine measles coverage and reducing the dropout rate as well as improving the vaccine and cold chain management.

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DEDICATION

This research is dedicated to:

- My husband, Simson Nangobe, who lovingly supported my professional development and perseveres throughout the challenging duration of the course and implementation of this study.
- My lovely son, Simson Junior, who has sacrificed my care and attention to his needs for the sake of my studies.
- My beautiful daughters, Valentine and Evangeline, who tolerated my absent from home. Let this accomplishment be a source of inspiration for your future studies.

DECLARATION

I, Ruth Nangobe, hereby declare that this study is a true reflection of my own research, and that this work or part thereof has not been submitted for a degree at any other institution of higher education.

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.....
Ruth Nangobe

Date

ABBREVIATIONS

AFR	African Region
CDC	Centers for Disease Control and Prevention
CFR	Case Fatality Rate
CIF	Case Investigation Form
DCC	District Coordinating Committee
DHIS	District Health Information Software
DPHCS	District Primary Health Care Supervisor
EPI	Expanded Program on Immunisation
FEFO	First- Expired, First- Out
FIFO	First- In First- Out
GAVI	Global Alliance for Vaccines and Immunisation
HF	Health Facility
ID	Identification Number
IDSR	Integrated Disease Surveillance and Response
IMCI	Integrated Management of Childhood Illnesses
MCV	Measles Containing Vaccine
MCHDs	Maternal Child Health Days
MDG	Millennium Development Goal
MMR	Measles, Mumps, Rubella
MoHSS	Ministry of Health and Social Services

RED	Reach Every District
RMT	Regional Management Team
SIAs	Supplementary Immunisation Activities
UCI	Universal Childhood Immunisation
UNAM	University of Namibia
UNICEF	United Nations Children's Fund
VVM	Vial Vaccine Monitor
WHO	World Health Organization
WHO/AFRO	World Health Organization /Regional Office for Africa

CHAPTER ONE

ORIENTATION AND OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND INFORMATION

Measles immunisation status is measured when a child is identified as being vaccinated with at least one dose of a Measles Containing Vaccine (MCV), a live attenuated vaccine, which causes one's immune system to produce antibodies against the measles virus and prevent the disease (CDC, 2010; WHO, 2011). Disease prevention is the key to public health, and immunisation is one of the most basic methods. The MCV is known to be extremely safe and very effective. In Namibia, the measles vaccine is routinely given as one dose at the age of nine months. However, routine measles vaccination is also offered at nine months of age, and two doses of the measles vaccine are recommended by the World Health Organization (WHO) to ensure immunity and prevent measles outbreaks.

Measles is a vaccine-preventable disease. About 95% of single-dose recipients are considered to develop protective immunity against the measles virus. However, the remaining 5% of the non-vaccinated population is adequate to sustain a measles outbreak (WHO, 2007). As a result, the number of susceptible individuals may accumulate over time with the potential for measles outbreaks to occur.

To prevent this, a second opportunity for measles vaccination should be offered through routine services or supplemental immunisation activities (SIAs), to eliminate measles (WHO and UNICEF, 2009). Therefore, many countries apply the two-dose MCV vaccination schedule in order to maintain a high level of vaccination coverage (Moss, 2006). Immunity against measles is believed to be lifelong immunity after natural infection with the measles virus or following a dose of the MCV that is properly administered to an appropriate host (WHO, 2011).

The World Health Organization (WHO) initiated the Expanded Programmes on Immunisation (EPI) in 1974. The aims were to provide countries with guidance and support, to improve vaccine delivery and to make vaccines available for all children (WHO, 2005). In 1983, World Health Organization launched the Universal Childhood Immunisation (UCI) programme with the purpose of achieving maximum immunisation of the world's children. Under the guidance of the World Health Organization, all national political leaders, representing 158 nation states, made a commitment to achieve 80% immunisation coverage in their respective countries by the year 1990. Personnel were trained on immunisation and capacity building with regard to vaccines and cold chain management (WHO, 2005).

In 2002, the Reaching Every District (RED) approach was introduced by the World Health Organization (WHO), United Nations Children's Fund (UNICEF) and other partners in the Global Alliance for Vaccines and Immunisation (GAVI) to improve immunisation systems in areas with low coverage. The RED approach outlined five operational components aimed at improving coverage in every district. The operational components were the re-establishment of regular outreach services, supportive supervision, and on-site training, community links with service delivery, use of data for better planning and the management of human and financial resources. Since 2003, about 53 developing countries started implementing RED strategies through EPI, with Namibia one of these countries (WHO and UNICEF, 2009).

Every child who attends a health facility or an outreach point for the purpose of receiving immunisation is entitled to safe and quality health care which should be provided by health care providers. Therefore, vaccine management plays a vital role in measles immunisation services in the way that the vaccines are stored and transported at all times within the recommended temperature range of +2°C to +8°C to maintain the effectiveness and potency for it to prevent measles once the child is vaccinated. It involves the storage and maintenance of the vaccines so that the potency is well sustained (WHO and UNICEF, 2009). The storage involves the state of the fridge where the vaccines are stored, consequently, if the fridge is working well, the cold

chain should be maintained and temperatures need to be monitored twice a day in order for the vaccines to be safe to use. The cold chain is a system used for keeping and distributing vaccines in good condition. The equipment used in the cold chain includes generators, refrigerators, freezers and vaccine storage carriers. These require continuous maintenance and periodic repair services.

The World Health Organization (WHO) and United Nations Children's Fund (UNICEF) have identified a number of strategies for measles mortality reduction. The first strategy aims to achieve and maintain a high coverage of $\geq 80\%$ in each district and $\geq 90\%$ in each region or nationally. Secondly, the provision should be made for two doses MCV delivered through routine services or supplemental immunisation activities (SIAs). Thirdly there should be intensification in measles surveillance (WHO and UNICEF, 2009). Even though, the WHO had exerted great efforts to reduce the public health burden of measles, the disease still remains a public health problem in many developing countries, where vaccination coverage is low. It also remains one of the leading causes of death among young children globally, regardless of the availability of safe and effective vaccines.

The fourth Millennium Development Goal (MDG 4) aims to reduce the under-five mortality rate by two-thirds between 1990 and 2015.

Measles vaccination coverage is used as an indicator to monitor progress towards achieving this fourth Millennium Development Goal (MDG, 2008). Measles vaccination is recognized as having the potential in lowering child mortality and is considered a marker of access to child health services.

After independence in 1990, Namibia's health services have been orientated towards the provision of Primary Health Care Services focusing on community health, prevention and prompt treatment of illnesses. The Expanded Programmes on Immunisation (EPI) is one of the most successful primary health care programmes considered to be the cornerstone of other programmes. The major focus of the EPI programmes had been to strengthen routine immunisation. At the same time, EPI acceleration weeks were conducted four times a year between 1990 and 1995 in all districts to increase vaccination coverage. Because of this, a significant rise was observed in coverage of all antigens including measles from 40% to 80% during this period (MoHSS, 2013). In addition, SIAs were conducted every three years between 1996 and 2012 and Maternal Child Health Days (MCHDs) were conducted biannually, since 2012 up to date to increase vaccination coverage and to trace missed opportunities. Despite these efforts low measles coverage was recorded in Namibia from 1996 to 2012 (MoHSS, 2013).

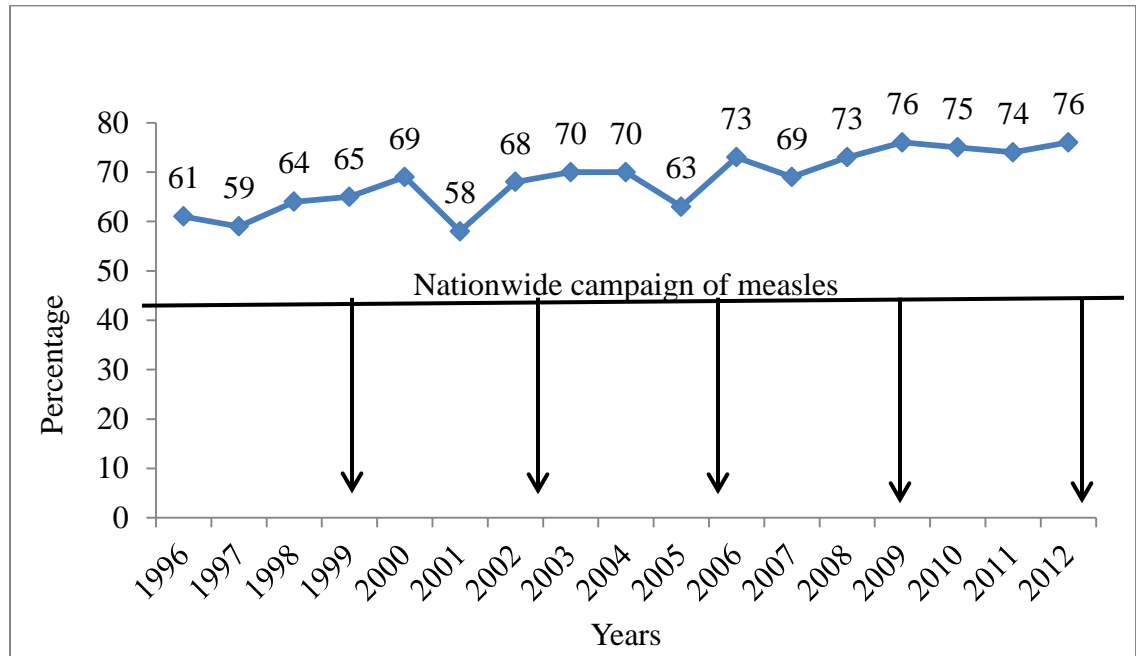


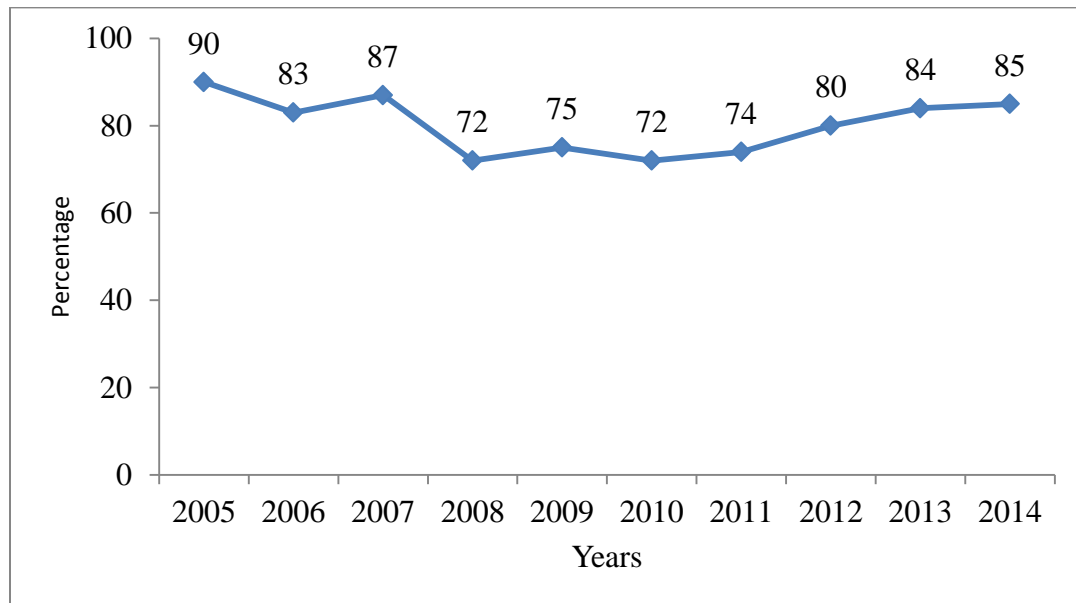
Figure1.1: The trends of routine measles coverage in Namibia, 1996 to 2012 (MoHSS, 2013)

Figure 1.1 indicates that low measles coverage is an ongoing problem in Namibia in the past 17 years. Namibia never reaches the WHO target of 80% and above. Nationwide campaigns of measles were conducted every third year from 2000 to 2012. Measles coverage had risen with 3% to 4% every three years due to this nationwide campaign.

Namibia has fourteen regions; and Ohangwena region is the poorest and second highest populated region in Namibia (Census, 2011). The region has three districts, namely Engela, Eenhana and Okongo districts.

This study focused on the Engela district, the most populous district in the Ohangwena region as well as in Namibia, with an estimated population of 181 446 of 21 774 (12%) are children aged between 9 to 59 months (Census, 2011) . The Engela district consists of one hospital with 230 beds, 17 public health facilities and 42 outreach points. The district is bordering Angola at the Oshikango border post, which is the biggest port of entry to and from Angola. This border post puts the district at an additional risk of possible outbreak of infectious diseases, especially measles.

The Engela district had been conducting the Expanded Programme on Immunisation (EPI) for vaccine-preventable diseases in all public health facilities and outreach points since 1990. The district has been identified as one of the low-performing districts on EPI in the region as well as in Namibia. Therefore, it was selected to be among the pilot districts for the implementation of the Integrated Management of Childhood Illnesses (IMCI) in 2000 and the Reach Every District (RED) approach in 2007 in order to improve child health services, including, including immunisation. Due to these activities, measles coverage has increased from 80% to 85% between 2012 and 2014.



**Figure1.2: Trends of routine measles coverage in the Engela district,
Ohangwena region, 2005 to 2014 (MoHSS, 2014)**

In the Engela district, measles coverage trend ranged between 72% - 90% from 2005 to 2014. The district did not achieve the $\geq 80\%$ measles coverage for the period 2008 - 2011. But the measles coverage has increased from 80% in 2012 to 85% in 2014¹.

¹ However, that could be an artificial increase, as there were several health facilities that did not achieve the target, while some reported more than 100% coverage.

1.2 STATEMENT OF THE PROBLEM

The Engela district has been conducting the Expanded Program of immunisation (EPI) for vaccine-preventable diseases in all public health facilities and outreach points since 1990. Vaccination against measles is regarded as a safe and cost-effective strategy to prevent measles-related morbidity and deaths (Demicheli, Rivetti, Debalini, and Di Pietrantonj, 2011).

Despite progress in measles coverage at district level, some health facilities do not achieve the target of 80% as recommended by the World Health Organization. As a result, the district experienced frequent measles outbreaks during the period spanning from 2009 to 2014. Almost 42% of the measles cases were recorded in children younger than five years of age. This age group is the target for measles vaccination and need to be protected against measles through vaccination. However, about 23% of confirmed measles cases were among children who vaccinated which give the impression that some children are vaccinated but may not develop immunity against measles (DHIS, 2013).

The literature indicates that being vaccinated, but not developing immunity against measles could be related to improper measles vaccine and cold chain management.

In addition, low measles coverage and unvaccinated children have also been shown to be related to the occurrence of measles outbreaks (Sembuche, 2010; Babatsikou, 2010).

Thus, questions emerge related to the measles immunisation status and coverage, as well as, how health facilities manage elements related to vaccine and the cold chain. Hence, this study aimed at obtaining information on the level of measles immunisation status through routine vaccination services together with management in the public health facilities in the Engela district.

1.3 PURPOSE AND OBJECTIVES OF THE STUDY

1.3.1 Purpose of the study

The purpose of this study is to assess and describe measles immunisation status and vaccine management in the Engela district in Ohangwena region.

1.3.2 Research objectives

- To assess and describe the measles immunisation status of children aged 9 to 59 months in the Engela district.
- To assess the vaccine and cold chain management in the public health facilities in the Engela district.

- To assess the measles coverages in the public health facilities in the Engela district.

1.4 SIGNIFICANCE OF THE STUDY

The study assessed the measles immunisation status and vaccine management in the public health facilities in the Engela district in Ohangwena region. It is predicted that the study results will be used by the Ministry of Health and Social Services (MoHSS) and by the Ohangwena region at large. In addition, the study should be of significance in guiding the Ohangwena Regional Health Directorate and the Engela district, in ensuring that their planning and budgeting processes are in line with improving the measles immunisation coverage and vaccine management. The findings will assist the researcher to make appropriate recommendations to the relevant authority, who will consider the implementation of these recommendations.

The results of this study may stimulate other researchers to carry out analytical studies to identify determinants of low measles coverage in the Engela district. There are few published studies which have been conducted associated with vaccine and cold chain management in Namibia. There also has been no published study found relating to the assessment of measles immunisation status of children aged 9 to 59 months in the Engela district.

1.5 OPERATIONAL DEFINITIONS

Cold chain: Vial Vaccine Monitoring is a thermochromics label put on vials containing vaccines which gives a visual indication of whether the vaccine has been kept at a temperature which preserves its potency (WHO and UNICEF, 2013).

Immunisation: Refers to the production of an immune response in the host after the introduction of a foreign antigen. It is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. The terms immunisation and vaccination tend however to be used interchangeably (WHO, 2011).

Immunisation/Vaccination Coverage: The extent to which programme administrative figures capture the number of doses delivered to the target population for a particular antigen. In order to estimate the percentage vaccination coverage, this number is divided by the total estimated number of people to be vaccinated in the target population (CDC, 2009).

Supplementary Immunisation Activities (SIAs): These are immunisations given after routine schedules. For measles the vaccine supplementary administration is done every third year, which normally goes together with vitamin A drops and antihelminths (MoHSS, 2013).

Vaccine Management: Refers to the effective and appropriate storage and handling of vaccines (WHO and UNICEF, 2013).

1.6 SUMMARY

This chapter provided background information concerning measles immunisation status, coverage, vaccine and cold chain management in the district under study. The researcher highlighted the research problem, purpose, and objectives, significance of the study as well as operational definitions. . The next chapter will concentrate on the literature review with regards to the measles immunisation status, coverage, vaccine and cold chain management in developed and developing countries.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The literature review is an account of what is available on a topic that has already been published by accredited scholars and researchers. The purpose is to convey to the reader what is currently known regarding the topic of interest and what their strengths and weaknesses are (Burns and Grove, 2005). The literature review also helps the researcher to avoid duplication of work that has been done by other people before and to focus on the variables under study.

2.2 OVERVIEW OF IMMUNISATION

Immunisation is the term used for the process of both being vaccinated and becoming immune to the disease as a result of the vaccine. It is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. Vaccines stimulate the body's own immune system to protect the person against diseases (WHO, 2011). Therefore, immunisation is a proven tool for controlling and eliminating life-threatening and is estimated to avert between 2 and 3 million deaths each year. Therefore, it has clearly defined target groups; can be delivered

effectively through outreach activities; and does not require any major lifestyle change (WHO, 2015). Disease prevention is the key to public health, and one of the most basic methods for the prevention of diseases is immunisation. Immunisation is also one of the most cost effective public health interventions that provide protection against diseases such as measles. Measles vaccine is given as a single dose and administered subcutaneously in the right upper arm, to protect against measles. Common side effects of measles immunisation are redness, soreness at the site of injections and mild fever (CDC, 2011).

In the first months of life, a baby is protected from most infections by antibodies from her or his mother which are transferred to the baby during pregnancy. When these antibodies wear off, the baby is at risk of serious infections and so the first immunisations are given before these antibodies are depleted, and the immunisations are also repeated onwards (CDC, 2011).

The World Health Organization (WHO) initiated the Expanded Programmes on Immunisation (EPI) in 1974 to provide countries with guidance and support in order to improve vaccine delivery and to make vaccines available for all health facilities (WHO, 2005). It is estimated that about three million children under five years of age die each year in the African region and a significant number of these deaths could be prevented by vaccines (WHO, 2011). Yet one in five children does not receive immunisation.

Lack of service delivery in remote areas or lack of information about the effectiveness of vaccines is a major reason many children do not receive immunisation services (WHO, 2011).

Immunisation against the major infectious diseases is one of the eight elements of the Primary Health Care (PHC) approach that has been adopted by the Ministry of Health and Social Services (MoHSS) in Namibia. The Expanded Programme on Immunisation (EPI) within MOHSS was formally established in June 1990, three months after Namibia's independence. The programme aims to achieve and maintain vaccine coverage above 90% for all antigens including measles in every district, and also to achieve a dropout rate of less than 5% by the year 2010 and beyond (MoHSS and Macro, 2008).

The major focus of EPI is to strengthen routine immunisation. At the same time, EPI acceleration weeks were conducted four times a year between 1990 and 1995 in all districts to raise vaccination coverage. Following this acceleration weeks, a significant increase was observed in the coverage of all antigens, from 40%-80% during that period. Immunisation in general had demonstrated to help children stay healthy and avoid harmful effects on vaccine preventable diseases.

2.3 MEASLES IMMUNISATION STATUS

Measles immunisation status is measure when a child is identified as being vaccinated with at least one dose of Measles Containing Vaccine (MCV), a live attenuated vaccine which is administered to prevent measles. The vaccine is known to be extremely safe and very effective; it contains a live but weakened version of the virus, and it causes the immune system to produce antibodies against the measles virus (CDC, 2009). The MCV is routinely given as a single dose at the age of 9 months in Namibia. Immunity against measles is believed to be lifelong following a dose of MCV that is properly administered to an appropriate host or a natural infection with the measles virus (WHO, 2011). Even though measles vaccines are given, not everyone is protected against the disease; for instance it only protects 85% of children who have received one dose. Therefore, more than one dose of the measles vaccine is needed as recommended by World Health Organization to ensure immunity and prevent measles outbreaks, as about 15% of vaccinated children fail to develop immunity from the first dose (WHO, 2005).

In a study conducted in Vietnam by Mayxay (2007) it was revealed that one dose of measles vaccine at the age of 9–23 months may not be enough to protect children from measles, as one quarter of the children who had only one-dose of measles vaccine developed measles. This could be the same

situation in Namibia as only one dose of measles vaccine is routinely given at the age of 9 months. In addition, the Mayxay (2007) study also discovered that accumulations of unvaccinated children are associated with measles outbreaks. This finding is similar to a study conducted in South Africa that indicated a significant positive association with unvaccinated infants and measles outbreak (Sartorius, 2013). These findings were supported by the WHO's (2011) report, according to which the frequent measles outbreaks that occurred in 2009 and 2010 in many African countries such as Angola, South Africa, and Namibia, were among children who missed routine measles vaccinations. In addition, lack of information about the effectiveness of vaccines is a major reason many children did not receive routine measles vaccination (WHO, 2011). However, a study conducted in Mozambique by De-Schacht, Jani, and Bjune (2008) on reasons for failure to vaccinate, the findings were that most of the children were defaulting due to illness.

Factors that may influence the immunisation status of the children are the demographic characteristics of the children which include sex, age, birth order and relationship. In a study led by Mutua, Kimami and Ettarh, (2011), it was reported that mainly only male children were immunized. Their findings, Mutua et al. (2011), were however different from a two studies conducted in India which found that measles vaccination scores for girls were significantly higher than those for boys (Singh 2012; Morris, Awasthic, et al. 2013).

These findings are similar to a related study conducted in Namibia which revealed that more female children had been vaccinated against measles as compared to male children (Tjiveze, 2012).

The effect of vaccination also depends on how early a child had been vaccinated, and secondly on the progressive effect of vaccination which may have been more effective in particular years (Mutua, et al 2011). Measles antibodies develop in approximately 95% of the children vaccinated at 12 months of age and in 98% of the children vaccinated at 15 months of age (CDC, 2009).

Children's birth orders is also one the factors that influencing the immunisation status of the children. A study conducted in India found that later birth order is disadvantaged in being vaccinated. The study further noted that higher-birth order children also have poorer vaccination outcomes (Rammohan, Awafeso, and Iqbal, 2014)

The relationship of the parents and caretakers to the children with regard to their measles immunisation was also assessed in a related study conducted in Namibia. The findings indicated that the majority of the respondents were the biological mothers of the children as compared to the caregivers. However, there was no statistically significant association between the relationship to the children and the measles vaccination status of the children (Tjiveze, 2012).

In conclusion, vaccines are powerful tools for protecting health. Immunisations have led to the control and elimination of vaccine-preventable diseases. Without proper immunisation, the potential to transmit diseases such as measles to unprotected persons increases drastically. Therefore, assessments of measles immunisation status of children aged 9 to 59 months are needed.

2.4 VACCINE AND COLD CHAIN MANAGEMENT

Vaccine management refers to the effective and appropriate storage and handling of vaccines. The cold chain management refers to the transporting and storage of vaccines in a safe temperature ranging between +2°C to +8°C. The equipment used in the cold chain (from cold rooms to vaccine carriers) is that recommended by WHO and UNICEF. All cold chain equipment procured for EPI are listed in the WHO Product Information Sheets (PIS) and distributed from the Central Medical Stores (CMS) to all levels (WHO and UNICEF, 2013). The CMS at national level receives vaccines for all communicable/preventable diseases twice a year from international manufacturers through the government supply system. An up-to-date inventory of all cold chain equipment and transport (provided for immunisation activities) is maintained at each administrative level (central through facility levels) to ensure potency and availability of the vaccines.

Most of the health facilities in the rural areas should be provided with two in one vaccine refrigerators connected to a power supply and gas (MoHSS, 2013).

A cold chain inventory and assessment conducted in Namibia during 2013 showed that 55% of all cold chain equipment, especially at district and facility level, has exceeded the WHO approved 10 years life span with no replacement plan. Furthermore, the cold chain and logistic situation was also assessed in August 2013 with development of a 5- year replacement plan 2013 to 2017 (MoHSS, 2013).

A study conducted in India by Gupta, Vidya and Gupte, (2011); Ramachandran, (2008) revealed that irregular cold chain maintenance may be associated with measles outbreaks. The same study c indicated that poor vaccine and cold chain management and lack of public awareness of the importance of vaccination were also associated with measles outbreaks. Therefore, storage temperature is recorded twice a day, once in the morning and once in the afternoon, for all refrigerators containing vaccines.

A study conducted by MoHSS in Namibia during 2013, on Effective Vaccines Management Assessment found that at the districts level, only 51% of vaccines are stored within WHO- recommended temperature (MoHSS, 2013).

2.5 MEASLES IMMUNISATION/VACCINATION COVERAGE

Measles immunisation coverage is measured as the number of children aged between 9-59 months that have received their first dose of a measles-containing vaccine in year divided by the same population at the same period. A true estimate is based on the data quality, consideration of potential biases, and contributions of local experts (WHO and UNICEF, 2013). It is also the extent to which programme administrative figures capture the number of doses delivered to the target population for a particular antigen. The immunisation coverage of $\geq 80\%$ is the standard set by World Health Organization and this is called the target coverage. Immunisation coverage is a key measure of immunisation system performance (WHO, 2011).

In a study conducted in Sub-Sahara African countries it was found that Malawi, Namibia and Zambia achieved the measles immunisation target coverage (Tumussime, Gonani ; Walker, Asbu, Awases and Kariyo, 2007). Measles outbreak normally occurred after every 2 to 4 years due to the accumulation of unvaccinated individuals. However, when high levels of vaccine coverage are attained, measles incidence decreases and the intervals between outbreaks are lengthened from 4 to 8 years (WHO, 2005). In opposition to the Tumussime et al study (2007), the 2011 routine immunisation performance report of MoHSS, indicated that more than half

of the 34 districts in Namibia, including Engela district, have reported measles coverage between 50% and 79% which is far below the expected target (MoHSS, 2013).

Globally, there has been a steady increase in routine measles coverage from 71% to 82% between 2000 and 2009, and from 56% to 73% during the same period in 47 African countries. However, regardless of the successes of immunisation, almost 20% of all children born every year in developing countries do not get immunized against measles (WHO and UNICEF, 2009). Immunisation prevents an estimated 2.5 million child deaths per year, but despite the achievements, millions of children in developing countries are not immunized against measles during their first year of life. This was reflected in 2007, that an estimated 23 million children under one year of age were still not receiving their first dose of measles vaccine through routine immunisation (WHO and UNICEF, 2009).

According to a study conducted in Mozambique by De-Schacht, Jani, and Bjune (2008) on low measles coverage, the findings were that most of the children were defaulting due to illness and forgetfulness of the parents/ caregivers. This aspect of forgetfulness was also included in the researcher's instrument.

In 1990 WHO set a new standard for the governments of the world, to intensify the goal of achieving a 90% immunisation coverage by the year 2000. By the end of 1991, an estimated 80% of world children were reported vaccinated with measles vaccines (UNICEF, 2009). Between 2000 and 2010, many African countries conducted at least one catch-up SIA for children aged 9 months to 15 years, leading to a 92% reduction in measles mortality in sub-Saharan Africa between 2000 and 2008 (CDC, 2009). Thereafter, due to a low measles-containing vaccine (MCV) coverage and suboptimal follow-up SIAs, 27 countries, including Namibia had confirmed measles outbreaks between 2009 and 2011 (Maresha, Fall, Eshetu, Sosler and Alleman, 2011)

According to the Namibia Demographic and Health Survey report of 2006 – 2007, immunisation coverage has remained below the target. The large outbreaks occur every few years in areas which have reached less than 80% vaccination coverage and in areas with accumulation of persons unvaccinated or vaccinated but did not develop immunity (WHO and UNICEF, 2009).

Ohangwena Regional Annual reports of 2005 to 2014, showed that Engela district had not achieved the WHO recommended target coverage from 2008 to 2011 (MoHSS, 2014). This corroborates to the findings of the mini- survey on EPI conducted in three health facilities (Eudafano, Omungwelume and Ondobe) in the Engela district, which reported the low measles vaccination coverage (Handjaba. Hamalwa, Angolo, 2008).

As a result, the Reach Every District (RED) strategy was introduced in Engela district to increase measles coverage. The measles coverage is also affected by children who are due for measles vaccination but did not visit a health facility for follow-up. This is called a measles drop out and is one of the indicators of EPI performance that needs to be considered in this study. Measles dropout demonstrates that immunisation opportunities are lost in approximately one of every ten children before the age of 12 months (MoHSS, 2013).

According to Machingaidze, Wiysonge and Hussey (2013), the measles drop-out rate is used for measuring Expanded Program on Immunisation (EPI) performance, where a measles drop-out of less than 10% is considered good, while with a dropout rate of more than 10% action needs to be taken. The quoted study also indicated that the measles drop-out immunisation was significantly associated with certain factors, such as quality of information received after child immunisation and frequency of immunisation services conducted. Some improvement in the proportion of measles drop-out rate less than 10% was observed in many AFRO countries between 1990 and 2000. However, a significant increase was then again observed from 28% in 2001 to 60% in 2011 (WHO, 2011).

A mini- survey on EPI conducted in three health facilities (Eudafano, Omungwelume and Ondobe) in Engela district reported a significantly high

measles dropout rates, which ranged from 20% to 26% (Handjaba, et al, 2008).

Vaccination coverage assessment is done at different time intervals in different countries, ranging from monthly/quarterly/half yearly/annually because it is a key measure of EPI performance. In Namibia coverage assessment is done on an annual basis. Therefore, one of the objectives of this study was to assess immunisation coverage in the public health facilities in the Engela district.

2.6 MINISTRY OF HEALTH AND SOCIAL SERVICES (MOHSS) POLICIES TO SUPPORT THE MEASLES IMMUNISATION STATUS AND MANAGEMENT

A policy is defined as a set of guidelines or rules to be followed during a certain procedure (Torjman, 2005). In this study, the term referred to the National Expanded programme of immunisation policy, which was formulated by MOHSS in cooperation with the World Health Organization (WHO). It consists of the immunisation service, vaccine coverage and management, logistics, including cold chain support (MoHSS, 2005).

The EPI policy was launched within the Directorate of Primary Health Care (PHC) in 1990. The Ministry of Health in Namibia has adopted the implementation of PHC for basic health care delivery with the main aim to reduce the infant morbidity and mortality rate in children under-five years of age through immunisation services. There are three components of the EPI policy namely (i) Routine immunisation which is delivered through the Reaching Every District (RED) approach in all districts (ii) the Supplemental Immunisation Activities (SIAs) and Maternal and child health days (MCHDs) and lastly (iii) the Vaccine-Preventable Diseases, targeting measles, and other diseases component (MoHSS, 2005).

It was mentioned in the background information of this study that EPI is one of the most cost-effective health interventions and has been proven to prevent 24% of the deaths of children under the age of five years (Sanou, Simboro, Kouyaté, Dugas, Graham, & Bibeau 2009).

2.6.1 Policy regarding measles immunisation status

The National EPI Policy in Namibia related to measles immunisation status is that each child should receive one dose of measles vaccination at 9 months. This policy recommends that every health facility has to conduct immunisation services on a daily basis. In addition, its goals as they relate to measles elimination are: to ensure full immunisation of children less than one

year of age in every district and to reduce measles-related deaths (MoHSS, 2013). It is against this background that this study aimed at assessing the immunization status of children aged 9-59 months in the Engela district.

2.6.2 Policy regarding vaccine and cold chain management

Vaccine and cold chain management is the cornerstone of ensuring that vaccines are safe and that they protect all children.

The Ministry of Health in Namibia in working with UNICEF, and WHO, recommend that vaccines should be kept at a temperature range of between 2°C to 8°C from the point of manufacture to their use in an immunisation session. In case of measles vaccination, vaccines should be used within six (6) hours of reconstitution. (MoHSS and Macro International, 2008). Moreover, the MoHSS invests in cold and supply chain infrastructure and management to improve the conditions in which vaccines are delivered. These investments, including the introduction of two in one refrigerators, temperature monitoring thermometers, reduce vaccine stock-outs and enhance information systems for data monitoring. It also helps to establish the use of solar power, mobile technology and biometrics to safely get the right vaccines to the right places at the right time (MoHSS, 2013).

The Ministry of Health recommends regular conducting of inventory of all cold chain equipment at all health facilities to ensure potency and availability of the vaccines (MoHSS, 2013). Therefore, this study assessed and described vaccine and cold chain management at all 17 health facilities which provide immunization services in Engela district.

2.6.3 Policy regarding immunisation coverage

In Namibia immunisation coverage usually requires vaccine administration data that is provided by health facilities during immunisation services on a monthly basis. It is useful to measure immunisation coverage at local levels, as immunisation coverage is not homogenous within states and localities. The programme aims to achieve and maintain vaccine coverage above 90% for all antigens with a dropout rate of less than 5% by the year 2010 and beyond (MoHSS, 2009). In addition, MoHSS adopted the supplementary immunisation activities (SIAs) which complement the routine vaccination to address coverage inequities and rapidly close population immunity gaps in targeted age groups (MoHSS, 2014). However, MoHSS recently introduced the Maternal Child Health Days (MCHDs), instead of SIAs, which are conducted twice a year to trace missed opportunities for vaccination. Therefore, this study assessed the extent of measles immunization coverage for children of age 9-59 months in Engela district.

2.7 SUMMARY

In this chapter the researcher discussed similar and contrasting studies conducted on the assessment of measles immunisation status, coverage, vaccine and cold chain management in developing countries. The Ministry of Health policies put in place to support the measles immunisation status and management are also discussed. There are few published studies which have define index in a word document

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The literature review which included measles immunisation status, coverage and vaccine and cold chain management was presented in the previous chapter. In this chapter, the researcher explained the methodology used to guide this study in assessing the measles immunisation status and management in Engela district. This section presents an overview of the research design, population, sampling, data collection, data analysis and important aspects on research ethics.

3.2 RESEARCH DESIGN

A research design is the overall plan, structure and strategy of investigations of answering the research questions (Christensen, 2014; Brink, 2009). In this study questions on measles immunisation status were posed to the respondents and observational checklists used to assess coverage, vaccines and cold chain management of all public health facilities in the Engela district. The research design utilized to achieve answers to these questions was quantitative descriptive, and cross-sectional in its approach.

Quantitative research as defined by Burns and Grove (2005) is a formal, objective, systematic process in which numerical data are used to obtain information about the world, and it is used to describe variables, examine relationships among variables and to determine cause-and-effect interactions between variables. Quantitative data are measures of values or counts and are expressed as numbers. In seeking these answers, a structured interview schedule was employed in this study, as well as an observational checklist.

A descriptive design is used to investigate a phenomenon and the manner in which it manifests itself (Brink, 2009). According to Trochim (2008), a descriptive research is a study designed to depict the participants in an accurate way and to describe people who take part in a study. This study was descriptive as the researcher systematically observed and collected data about the subjects without affecting their normal behaviour, and presented the data to give a clear picture of the situation. Furthermore, the data was summarized and described using sets of univariate analysis such as measures of frequencies distributions and central tendencies (median).

A cross-sectional study is observational in nature and is also known as descriptive research (Aschengrau and Seage, 2013). Therefore, the researcher recorded the information that emerged from a population without manipulating the variables.

It is a type of observational study that involves the analysis of data collected from a population or a representative subset, at one specific point in time (At work, 2015). The main benefit of a cross-sectional study design is that it allows researchers to compare many different variables at the same time. However, cross-sectional studies may not provide definite information about cause-and-effect relationships. This is because such studies offer a snapshot of a single moment in time; they do not consider what happens before or after the snapshot is taken (Aschengrau, et.al, 2013). This study therefore also could be classified as cross-sectional as it adheres to mentioned descriptions.

3.3 STUDY POPULATION

A study population is any defined group that is selected as a subject for research. It includes all the members or units, of a group that can be clearly defined in terms of its distinguishing criteria, whether they are people, objects or events and having some common characteristics (Brink, 2009). This study comprised of two populations. The first study population comprised of children aged between 9 to 59 months, represented by their parents and caregivers, in the Engela district. This age group is the one targeted for measles immunisation. Engela district has an estimated population of 181 446, of which 21 774(12%) are children aged 9 to 59 months (Census, 2011). The researcher assessed the immunisation status of this age group.

The district has 17 public health facilities. The second study population included all of these 17 public health facilities that provide immunisation services in the Engela district. The Engela district was selected due to measles outbreaks which occurred in the past six years (2009 to 2014) with about 23% of the cases occurring among vaccinated individuals (DHIS, 2013). The next topic will discuss the sampling, sample size and sample approaches that had been used for the one population that was sampled.

3.4 SAMPLING

Sampling is the process of selecting a representative part of the whole population (Brink, 2009). According to Trochim (2008), sampling involves selecting individual units to measure from a larger population. The purpose of sampling is to enable a researcher to determine the characteristics of a population by directly observing a portion (or sample) of the population. In this study only the first population were sampled, which is explained under sample size. Randomized sampling by means of proportional and systematic sampling techniques were used which will be described in the sampling approach.

3.4.1 Sample size for the first population (parents/caregivers)

A sample refers to a small portion of the total set of the population, and together they comprise the subjects of the study. The sample size refers to the number of targeted study participants about which the researcher wishes to acquire further information (Brink, 2009).

A sample size for this study was 162 parents/caregivers who represent the children aged 9 to 59 months, and was calculated using the Kish and Leslie formula for estimating sample size for the descriptive studies (Kish and Leslie, 2012). The formula is: $n = \frac{Z^2 pq}{d^2}$, where: n= minimum sample size, Z = risk of a Type 1 error. It is 1.96 for a confidence of 95%, p = expected proportion of children aged 9-59 months in the population, which is 12% (0.12), q = 1-p and d = level of precision (5%).

Therefore, in the formula where $n = \frac{(1.96^2 \times 0.12 \times (0.88))}{0.05^2}$,

- n= 162
- Thus the sample is 162

The next discussion is on the sampling approaches.

3.4.2 Sampling approaches

The sample size of 162 parents/caregivers was divided into 17 strata by using a proportionate sampling technique depending on the population size of the stratum. The proportionate sampling technique is aimed at providing equal or better precision, preventing bias on dissemination of the results, which becomes feasible in terms of time and available resources. With proportional stratification, the sample size of each stratum was proportionated to the population size of the stratum. This means that each stratum has the same sampling fraction (Aschengrau, et.al, 2013).

After identification of the strata, the researcher commenced with systematic random sampling in each stratum until the sample size of that specific health facility was reached. Systematic random requires selecting samples based on a system of intervals in a numbered population (Mizner, 2009).

Therefore, the sample size per strata (health facility) was calculated according to the population size of children aged 9 to 59 months (Table 3.1). The second sample size was comprised of all 17 public health facilities in the Engela district. There was no sampling technique needed.

Table 3.1: A proportionated sample size per public health facility (HF) in the Engela district, N=17

No	Name of health facility	Population	Proportion²
1	Edundja clinic	1096	8
2	Endola clinic	1831	14
3	Engela clinic	1688	13
4	Eudafano clinic	1260	9
5	Hamukoto waKapa clinic	1007	7
6	Odibo health centre	1923	14
7	Ohalushu clinic	1063	8
8	Ohangwena clinic	1039	8
9	Ohaukelo clinic	1089	8
10	Okambebe clinic	1296	10
11	Okatope clinic	1045	8
12	Omungwelume clinic	1640	12
13	Onamukulo clinic	1123	8
14	Ondobe clinic	1166	9
15	Onekwaya clinic	1187	9
16	Ongenga clinic	1037	7
17	Ongha health centre	1284	10
Engela district		21 774	162

² The proportion of sample size was calculated using the following formula:

population per health facility divided by total population multiply by sample size

= proportion per health facilities.

3.5 DATA COLLECTION PROCESS

This section focuses on the data collection instruments and procedures. Data collection refers to the process of gathering and measuring information on the variables of interest in an established systematic fashion that enables the researcher to answer the stated research questions and evaluate the outcomes (Trochim, 2008). During this process, the researcher considers exactly what type of information was needed, how the data will be collected, who will collect the data, where the data will be collected and when the data will be collected (Brink, 2009). Data were collected using a structured interview schedule administered to parents and caregivers and observational checklists to assess the health facilities. The data collection instruments and data collection procedures used in the study is discussed next.

3.5.1 Data collection instruments

A data collection instrument is a measuring device used in the gathering of information needed to address a research problem or question (Polit and Beck, 2012). The researcher used two sets of data collecting instruments, namely an interviewer-administered questionnaire and an observational checklist. An interviewer-administered questionnaire was appropriate for the study, because it accommodated participants that were not literate.

It also minimized incompleteness, as the researcher ensured that all questions were answered and it allowed probing where possible (Aday and Llewelly, 2011).

The observational checklist was used to assess the measles coverage, vaccine and cold chain management in all 17 public health facilities in the Engela district.

3.5.1.1 Compilation of instruments

❖ The compilation of the questionnaire

A questionnaire [interviewer-administered questionnaire in this study] is used for a variety of reasons; that is, - to gather information or to measure performance (CDC, 2010). In this study it was used for both reasons. The questionnaire included two sections: Section A which was to determine information about demographic characteristics, and section B, for determining the measles immunisation status as well as the supplementary vaccination history of the children (See Annexure B). It was designed with a unique identifier number, which classified each questionnaire. The number was written on each page and entered in the same way in the software, for example 001; 002, etc.

The content of the questionnaire was based on guidelines from the WHO as well as requirements from MoHSS (MoHSS and Macro International, 2008). See also additional discussion under validity of the data collection instrument (point 3.7.1.2)

❖ **The compilation of the checklist**

The observational checklist consisted of two sections that addressed elements related to measles coverage namely, dropout rate, and vaccine and cold chain management (See Annexure C). It was identified by writing the name of the health facility which has been assessed. The content of the checklist was based on minimum standards as put forward by both WHO and UNICEF (WHO and UNICEF, 2013), as well as MoHSS (MoHSS, 2013). See also the discussion under validity of the data collection instrument (point 3.7.1.2)

3.5.2 Validity of the data collection instruments

Trochim, (2010) refers to validity as the ability of what an instrument measures, what it is supposed to measure, and if it performs as it is designed to perform. As a process, validation involves collecting and analyzing data to assess the accuracy of an instrument. In this study, face and content validity were assessed.

❖ **Interview Questionnaire**

An interview questionnaire is a set of questions with structured answers to guide an observer, interviewer, researcher or investigator.

- **Face validity**

The researcher established face validity by submitting the questionnaire to three Districts Primary Health Care Supervisors (DPHCS) and two regional directors. They were asked to evaluate the questions and the thesis outline in relation to the objectives of the study. They agreed and two additional items such as birth orders of children and the age at which a child vaccinated were added, based on their suggestions.

- **Content validity**

Content validity refers to the appropriateness of the content of an instrument (Mizner, 2009). In this study, the researcher measured content validity by submitting the instrument to experts in the field to evaluate it before the main study. Two lecturers, both epidemiologists, assisted in this regard. In addition, existing literature on the assessment of measles immunisation status, vaccine and cold chain management was investigated. [See the relevant discussion in the chapter on the literature review, namely headings 2.2, 2.3, 2.4 and 2.5.

❖ The observational checklist

The observational checklist was adopted from a standard form called the “Health Facility Supervisory Checklist”, routinely used by the MoHSS during for support visits to the health facilities. The standard form is designed by the Family Health Directorate of MoHSS in Namibia (MoHSS, 2009). The researcher removed some information such as the identification number of the health care workers in the facility and measles surveillance questions that were not appropriate for this study’s objectives. Therefore, the checklist was adopted and adhered to MoHSS protocols. It is adhere to ministerial standards with regards to face and content validity.

3.5.3 Reliability of the data collection instruments

- **Only the interview questionnaire was formally tested for reliability.**

Reliability is regarded as the regularity of measurement applied to identical entities, and still producing equivalent results every time (Trochim, 2010). Consequently, Tappen (2011) indicates that the idea behind reliability is that any significant results must be more than a once-off finding and be inherently repeatable. In this study, the researcher established specific measures to ensure reliability of the data collection instrument.

The interviewer-administered questionnaire was tested and retested to control individuals before the main study. The researcher interviewed three caregivers, and a second person interviewed the same three caregivers. The results were compared and provided same answers. Therefore, the interviewer-administered questionnaire had met the test - retest reliability.

The observational checklist was not tested for reliability, but only assessed during the pilot study.

3.5.4 Pilot study

A pilot study is a small scale version of the study conducted before the intended study. Piloting is the method of administering the instruments to a small number of people who resemble or are drawn from the population of interest, prior to the main study. The purpose of a pilot study is to investigate the feasibility of the proposed study, sequencing of questions and to detect possible flaws in the data collection instruments (Brink, 2009). Piloting can also help to identify ambiguity, relevance, sensitivity and acceptability of the questions and likely duration of administering (University of Surrey, 2009)

In this study the interviewer-administered questionnaire was piloted in the Eenhana district during July 2015 and administered to 15 parents/caregivers who were excluded from the main study after approval was received from MoHSS. It emerged that there were some ambiguous questions and some variables had not been included. These questions were then rephrased.

The observational checklist was tested in three public health facilities in the same district to ensure validity of the data collection instrument. The observational checklist was found to be clear, useful and no changes were made. These processes ensured that the instruments reflected the responses measuring the variables in the study.

3.5.5 Data collection procedure

Data collection procedure is the actual method on how the data was collected (Connaway and Powel, 2010). In this study, interviewer-administered questionnaire and an observational checklist was utilized to collect the data. Both the structured interviews and health facility assessments took place simultaneously in these facilities during July 2015 after permission from the MoHSS has been obtained.

3.5.5.1 Data collection by means of the structured interview questionnaire

The data were collected by interviewing 162 parents/caregivers who brought children aged 9 to 59 months to the public health facilities in the Engela District. The study participants were requested to draw numbers from a closed bowl with folded papers numbered one to ten. The researcher explained the purpose of the study to potential participants. Then verbal consent was sought from the potential participants before picking a number.

These who selected an odd number were requested to sign a consent form before the interview took place. Data was collected in a private place where confidentiality and courtesy was provided, whereby the researcher read out the question to the participant. (See detailed discussion on ethical consideration which refers to these aspects).

3.5.5.2 Data collection by means of the observational checklist

The researcher assessed all 17 public health facilities in the Engela district which provide immunisation services. The observational checklist was used where by one health facility was assessed per day. The researcher was accompanied by the nurse in charge of the health facility while assessing the measles coverage, vaccine and cold chain elements (Annexure C).

3.6 DATA ANALYSIS

Data analysis is the process of systematically organizing and investigating collected data and transforming it into numerical data in such a way that they address the research questions and present the results. (Bryman, 2006). Data was entered, cleaned, coded and edited for inconsistencies before analysed in Epi Info version 7. In this study, descriptive and analytical analysis was conducted. The first discussion will be on the descriptive analysis.

3.6.1 Descriptive analyses

Descriptive analyses are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data (Trochim, 2010).

In this study distributions were displayed using frequencies and percentages to describe the demographic characteristics of the children aged between 9 and 59 months, and their measles immunisation status. Frequencies distribution and percentages were also produced to assess measles vaccines and cold chain management per health facility. Some of the results were displayed in tables, and some were depicted by means of graphs

The central tendency was also used to estimate the "center" of a distribution of values. The two major types of estimating of the central tendencies that were used in this study were median age and range. The median age was grouped into categories. The analytical analysis will be discussed next.

3.6.2 Cross sectional analysis

Cross sectional analysis is one of the most popular methods for data analysis. It helps the researcher to understand what relations exist among two categorical variables by using cross tabulations (2 by 2 tables). In this study the researcher compared categorical variables in order to identify the

association between routine measles immunisation status and the following categorical variables: gender, receiving information about immunisation and the diagnosed with measles. The chi squared test and p-values were used in determining the existence of any possible statistical significance between variables. The p-value of 0.05 was fixed as a cut-off for statistical significance.

3.7. ETHICAL CONSIDERATION

Ethics are a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal and social obligation to study participants. When humans are used as subjects in investigations, great care must be exercised in ensuring that their rights are protected (Brink, 2009; Trochim, 2010).

The researcher obtained ethical clearance from the University of Namibia's Research Committee (Annexure C) and in addition a Research Permission Letter from the School of Nursing and Public Health was also obtained (Annexure D). Approval for data collection was granted from the National Health Research Unit (HRU) of the Ministry of Health and Social Services (MoHSS) through the Permanent Secretary (Annexure F). A copy of this approval was also forwarded to the Director of the Ohangwena region.

According to Trochim (2010), there are three fundamental ethical principles to guide a research, namely, respect of persons, beneficence and justice.

These principles are based on the human rights that must be protected during any research project, including the right to self-determination, privacy, anonymity, and confidentiality, protection from discomfort as well as protection from harm. The first aspect to be discussed is about informed consent.

❖ **Informed consent**

Written informed consent was obtained from parents and caregivers before the interviews. It means that the persons participating in the research were fully informed about the study being conducted. The researcher also explained the purpose and objectives of the study before conducting the interview. The main purpose of informed consent is that the participant would be able to make an informed decision as to whether they will participate in the evaluation or not (Trochim 2010). No false promises were made to any individual. The instructions and contact details of the researcher appeared on the document (Annexure A).

❖ **Voluntary participation**

Voluntary participation means that people participating in the study are free from coercion. Participation was voluntary and participants were assured that they may withdraw from the study at any stage.

❖ **Non maleficence**

Harm can be both physical and/or psychological and therefore can be in the form of stress, pain, anxiety, diminishing self-esteem or an invasion of privacy. It is imperative that the study process does not in any way harm participants. The participants were assured that there will be no risks to them in sharing information because their identity will not be revealed.

❖ **Confidentiality**

Confidentiality means that any identifying information is not made available to, or accessed by anyone but the programme coordinator. Confidentiality was ensured that such identifying information is and will be excluded from any reports or published documents. Furthermore, confidentiality was also ensured, as no information was disclosed other than to the supervisors of the study. The collected information was entered in the researcher's personal computer for analysis. The computer was locked with the password only known to the researcher

❖ **Anonymity**

Anonymity is a stricter form of privacy than confidentiality, as the identity of the participant remains unknown to the research team. In this study, anonymity was upheld because no names were entered onto the questionnaire, instead serial identification numbers were used (Interim, 2014).

3.8 SUMMARY

This chapter presented the research methodology that was used in the study. It focused on the research design, population, sampling, data collection method, data analysis and the issue of research ethics.

This study employed a quantitative, descriptive, and cross-sectional design. The population for the study comprised the parents/caretakers of children aged between 9 and 59 months and public health facilities in Engela district. A total number of 162 parents/caretakers were drawn as a sample. The instrument was piloted before the main study, to identify ambiguity, relevance, sensitivity and acceptability of the questions and likely duration of administering. Validity and reliability of the data collection instruments were ensured.

The data analysis was conducted using the Epi Info version 7 software package. Descriptive and analytical analysis by means of univariate and bivariate analyses were explained. The ethical principles were based on the human rights that include the right to self-determination, privacy, anonymity, confidentiality, non-maleficence, and were also discussed. The next chapter will present the research findings, as well as a discussion of the findings, with an applicable comparison and control.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 INTRODUCTION

This chapter describes the research findings as well as the discussion on the measles immunisation status, vaccine and cold chain management. Data was analyzed descriptively as well as analytically. The analytical component utilized cross tabulations by means of the Epi Info.7 software, and setting p-values at 0.05 as cut-off for statistical significance in order to discover the existence of any possible statistical significance between categorical variables. The results of the structured interview questionnaire and observational checklist will be presented according to the sequence of the sections in the two instruments.

The interviewer-administered questionnaire consisted of the following sections:

- Section A: The demographic characteristics of the children
- Section B: The immunisation status of the children

The observational checklist instrument consisted of the following sections:

- Section A: Vaccine and cold chain management
- Section B: Measles immunisation coverage

The first discussion will be on demographic characteristics of the children.

4.2 DEMOGRAPHIC CHARACTERISTICS OF THE CHILDREN

The table below represents the children sampled from all 17 public health facilities in the Engela district.

Table 4.1 Presentation of children aged 9 to 59 months in the different health facilities in Engela district, N=17

Name of health facility	Children in study	Percentage
Edundja Clinic	8	4.9
Endola Clinic	14	8.6
Engela Clinic	13	8.0
Eudafano Clinic	9	5.6
Hamukoto waKapa Clinic	7	4.3
Odibo Health Center	14	8.6
Ohalushu Clinic	8	4.9
Ohangwena Clinic	8	4.9
Ohaukelo Clinic	8	4.9
Okambebe Clinic	10	6.2
Okatope Clinic	8	4.9
Omungwelume Clinic	12	7.4
Onamukulo Clinic	8	4.9
Ondobe Clinic	9	5.6
Onekwaya Clinic	9	5.6
Ongenga Clinic	7	4.3
Ongha Health Center	10	6.2
Total	162	100.0

A total of 162 parents/caregivers of children aged 9 to 59 months were interviewed in the study.

4.2.1 Ages of the children

The parents/caregivers were asked to indicate the ages of their children in months, and this information was also confirmed from the children's health passports.

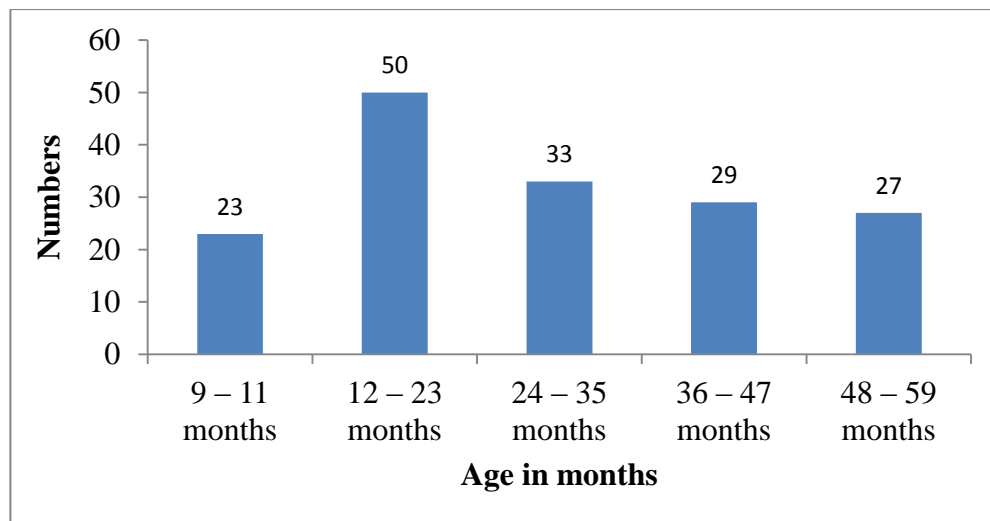


Figure 4.1: Age distribution of the children

The median age was 24.2 months, with a range of 9 - 59 months. . As shown in Figure 4.1, a majority of the children 50 (30.9%) were 12 - 23 months of age, followed by 33 (20.4%) of children aged 24 - 35 months, and 29 (17.9%) of children aged 36 - 47 months. The findings indicate that a majority of the children were within the recommended age range for the first dose of measles vaccination (WHO and UNICEF, 2009).

4.2.2 Gender of the children

A question on gender was included as an important variable that might influences the utilization of health care services.

Table 4.2: Gender distribution of the children

Gender	Frequency	Percentage
Male	88	54.3
Female	74	45.7
Total	162	100.0

The majority of the children, 88(54.3%) were male while 74(46%) were female, providing a male to female ratio of 1.29:1 (Table 4.2). This shows that a majority of the children in this study were males. This finding is however not statistical significant (Table 4.18).

This finding was dissimilar to a related study conducted in Opuwo where female children were more often vaccinated compared to male children, but no statistical significance was found (Tjiveze, 2012). In some developing countries, like in India, it was found that girls face lower access to preventive care compared to boys, including access to measles immunisation.

These results were also not statistically significant (Murhekar, Hutin, Ramakrishnan et al. 2011; Singh 2012; Morris et al. 2013).

4.2.3 Birth order of the children

Information about the birth order of the children was collected from the children's parents and caregivers.

Table 4.3: Birth order of the children

Birth Orders	Frequency	Percentage
1st -3rd	132	81.5
≥ 4th	30	18.5
Total	162	100.0

Table 4.3 shows that a majority of the children 132 (81.5%) in the study were first to third born children while 30 (18.5%) were fourth born and later.

Significantly more children (81.5%) who were first to third born were vaccinated in comparison to later born children (18.5%) with p value ($p < 0.0001$).

This finding is similar to findings of studies conducted in Malawi and India, which revealed that later birth-order, is at a disadvantage with regards to being vaccinated. Vaccination in first to third-born children in the Malawi

and Indian studies were statistically significant higher than among later born children (Muntahli, 2007; Rammohan, Awafeso, & Iqbal, 2014).

4.2.4 Relationship to the children

The relationship of participants to the children was also considered in order to classify the relationship of persons who accompanied them to the health facilities.

Table 4.4 Relationship to the children

Relationship	Frequency	Percentage
Parent	105	64.8
Caregiver	57	35.2
Total	162	100.0

Table 4.4 shows that a majority of the children were accompanied by their parents 105(64.8%), while 57(35.2%) were accompanied by caregivers. These numbers indicate that more children were accompanied by their parents; thus in the Engela district more parents tend to oversee the immunisation status of their children. Furthermore, this finding is supported descriptively in a similar study conducted in Namibia by Tjiveze (2012), according to which parents ensured this function.

4.3 MEASLES IMMUNISATION STATUS OF THE CHILDREN

A child was considered to have been immunized for measles if they have received at least one dose of a measles containing vaccine (MCV) before 59 months of age. This information can be obtained from the parents or/ caregivers, or through the child's health passport.

4.3.1 Child health passport

A health passport revealed the demographic characteristics of the child, including the measles immunisation status.

Table 4.5: The children who had health passports

Health Passport	Frequency	Percentage
Yes	161	99.4
No	1	0.6
Total	162	100.0

As is evident in Table 4.5 above nearly all the parents/caregivers 161 (99.4%) in the study, were able to present their children's health passports.

It is essential for the parents/caregivers to have their children's health passports in which the researcher was able to verify information about measles vaccination. For participants who were not in possession of their children's health passports provided the necessary information, verbally.

The availability of health passports is a policy requirement from the Ministry of Health and Social Services, and in the Engela district this requirement was met (MoHSS, 2005).

4.3.2 The routine measles vaccination

The parents/caregivers were asked whether their children have received their measles vaccination. In addition to data on variables such as age at which the children received their routine measles vaccination, information regarding reasons for not being vaccinated against measles, were also collected.

Table 4.6 Routine measles immunisation of the children

Routine measles vaccination	Frequency	Percentage	95% CI
Vaccinated	155	95.7	91.3- 98.3
Unvaccinated	7	4.3	1.7- 8.7
Total	162	100.0	

Table 4.6 shows that 155 (95.7%) of the children had been vaccinated against measles, with a 95% confidence interval of (91.3% - 98.3%). The majority of children were thus vaccinated against measles, and this is what the WHO and MoHSS has anticipated for eligible children (WHO and UNICEF, 2013; MoHSS, 2014).

4.3.3 Age at which the children received their routine measles vaccination

The age at which a child received their routine measles vaccination was important in order to determine the timeliness of measles vaccination.

Table 4.7: Age at which the children received their routine measles vaccination

Age	Vaccinated	Percentage
At 9 months	149	96.1
10 - 12 months	4	2.6
>12 months	2	1.3
Total	155	100.0

Several studies have pointed to the timeliness of measles vaccination as being an important factor (Singh, 2012; Morris, Awasthic, Kumard, Shete, Kheraf, and Nakhaea, 2013), in the development of measles antibodies (CDC, 2013).

Table 4.7 indicates that, among the total of 155 vaccinated children, the majority 149 (96.1%) were vaccinated at 9 months of age, whereas 4 (2.6%) had been vaccinated between 10 - 12 months of age and 2 (1.3%) were vaccinated after 12 months. It thus is noteworthy that most of the children in this study had been vaccinated at the recommended age of 9 to 12 months (WHO, 2015).

4.3.4 Reasons for failure to vaccinate children against measles

The parents/caregivers whose children were not vaccinated against measles were asked to provide reasons for failure to have their children vaccinated

Table 4.8 Reasons for failure to vaccinate children against measles

Reasons	Frequency	Percentage
Do not know	4	57.1
No follow up given	2	28.6
Child was sick	1	14.3
Total	7	100.0

According to Table 4.8, four (57.1%) of the parents/caregivers responded that they do not know why their children were not vaccinated against measles, while two (28.6%) answered that it was because the follow up date for their next visit was not given and one (14.3%) said that the child was sick.

The majority of parents /caregivers did not provide any reasons for omitting their children's vaccination. According to studies were conducted by Morris, et.al. (2013) and De-Schacht.et.al (2008), lack of timely vaccination and the parents'/caregivers' forgetfulness is likely to be one of the main causes of measles epidemics.

A study conducted in Mozambique by De-Schacht, Jani, and Bjune (2008) on reasons for failure to vaccinate, indicated that most of the children were defaulting due to illnesses.

4.3.5 Information provided during the immunisation services

The parents and caregivers were asked to indicate whether they received information about immunisation.

Table 4.9: Receiving information about immunisation

Received information about immunisation	Frequency	Percentage
Yes	148	91.4
No	14	8.6
Total	162	100.0

Table 4.9 shows that the majority of parents and caregivers 148(91.4%) received information about immunisation, while 14(8.6%) did not receive such information.

Babatsikou (2010) wrote that not receiving information about immunisation may result in children not returning for the required follow-up visits. This view is supported by WHO (2011), which further stated that specific information be given to parents and caregivers during the vaccination of their

children regarding the type of vaccine administered, indication of the vaccine, possible adverse effects and follow-up date for the next visit.

4.3.6 Types of information provided during the immunisation services

The parents and caregivers were asked what types of information were provided during immunisation services.

Table 4.10: Types of information provided during immunisation services

Variables	Frequency	Percentage
Antigen administered	32	19.7
What to do if fever or abscess develops	1	0.6
Follow up date for next visit	84	51.8
Do not remember	55	33.9
No information given	18	11.0

Table 4.10 shows that a majority 84 (51.8%) of the parents/caregivers in this study had been informed about the follow-up dates for their next visits. Emerging also from this item was that more than half of the parents/caregivers had been receiving information which they were able to recall. About 55 (33.9%) of the parents/caregivers were however not able to remember what information had been provided to them.

A study conducted in Mozambique by De-Schacht, et.al (2008), concluded that most of the children were defaulting due to forgetfulness of the parents and caregivers.

Thirty two (19.7%) of this study participants were also informed about the type of antigen administered. A study conducted by Sembuche (2010) in the Sinyanga region in Tanzania found that the children whose parents/caregivers knew the purpose of vaccination were twice more likely to be fully vaccinated than children whose parents/caregivers did not know the purpose of the vaccination. Unfortunately, for the Engela district study, 18 (11%) of the participants did not receive any information at all, while only one (0.6%) received information on what to do in case of a fever or when abscesses develop.

The scope of nursing practice specifies that health education be part of the independent function of the nurse (MoHSS, 2014). In this study this function had not been optimally performed.

4.3.7 How often the health facility conducting routine immunisation services in a week

The parents and caregivers were asked how often the immunisation services were conducted at their nearest health facility.

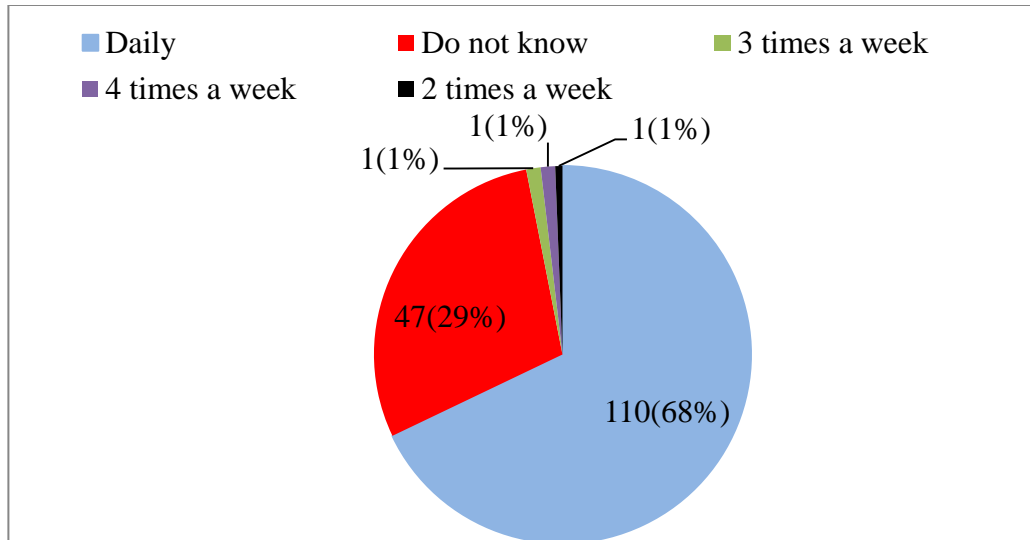


Figure 4.2: Frequency of routine measles immunisation services conducted

The majority 110 (68%) of the participants responded that immunisation services were conducted at their nearest health facility on a daily basis, while 47 (29%) were unaware about the frequency, and 3% responded that immunisation services were conducted twice, three and four times a week respectively. Thus, the majority of the public health facilities in Engela district implemented the MoHSS recommendations that daily vaccination services should be available (MoHSS, 2013).

4.3.8 Participants' satisfaction ratings of immunisation services offered

The participants were requested to appraise the immunisation services offered at their nearest health facility.

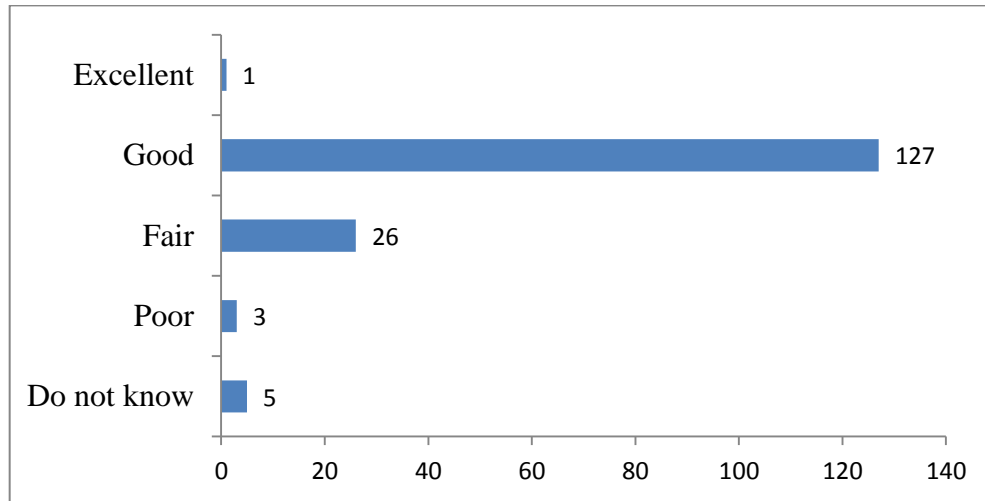


Figure 4.3: Participants' satisfaction rate of the immunisation services offered by their nearest health facility/outreach point

Figure 4.4 above, shows that the majority of the participants, 127 (78.4%) rated immunisation services as good, while 26 (16.1%) rated it as fair, resulting in the majority of participants 153 (94.5%) rating the immunisation services as good to fair. It is noteworthy that the majority of parents/caregivers valued and were appreciative of the services they received during immunisation.

However, three (1.9%) participants rated the service as poor based on unavailable vaccines and insufficient nurses who also seem to have extended lunch breaks. In a study conducted in the Democratic Republic of Congo by Mapatano, Kayembe, Piripiri & Nyandwe (2008), it was found that unavailable vaccines was associated with incomplete vaccination, while the

length of time spent waiting for vaccination services could also contribute to a low immunisation status of the children (Tjiveze, 2012).

4.3.9 Supplementary immunisation activities (SIAs) conducted

The previous supplementary immunisation activities (SIAs) have been conducted in 2014 to enhanced immunisation coverage, thus the item was included.

Table 4.11: Children who received measles vaccination during SIAs

Children who received measles vaccination	Frequency	Percentage
Yes	94	58.0
No	68	42.0
Total	162	100.0

All 162 (100%) of the participants responded that SIAs have been conducted in their areas. Table 4.11 revealed that 94 (58%) of the children have received measles vaccination during those activities, while 68 (42%) did not. In this study, the number of children who received SIAs was lower than the target of 80% as recommended by the World Health Organization (WHO, 2005). The combination of routine measles vaccination and SIAs is important to achieve the target of 80% in countries with a high number of measles cases as a key public health strategy to reduce global measles morbidity and mortality rates (WHO, 2015).

4.3.10 Main source of information about Supplementary Immunisation Activities (SIAs)

The participants were requested to mention their main sources of information during SIAs. It is essential that parents and caretakers be informed and educated through the media or health education at health facilities and in the communities, about the importance of immunisation.

Table 4.12 Main source of information about SIAs

Main source of information	Frequency	Percentage
Radio		
Yes	129	79.6
No	33	20.4
Health Care Workers(HCWs)		
Yes	17	10.5
No	145	89.5
Schools		
Yes	28	17.3
No	134	82.7
Councilors		
Yes	1	0.6
No	161	99.4
Others (Church)		
Yes	2	1.2
No	160	98.8

Table 4.12 shows that the majority of participants 129 (79.6%) had received information through the radio, followed by information received from schools, 28 (17.3%) and health care workers 17 (10.5%). Thus, the main source of information in this study to convey information about supplementary immunisation activities was the radio.

This finding is in contrast to a related study conducted by Tjiveze in Namibia (Tjiveze, 2012) where it emerged that the health care workers were the main source of information, and not the media.

4.3.11 Children diagnosed with measles

The focus of this item was on whether the child has ever been diagnosed with measles.

Table 4.13: The children who were diagnosed with measles

Children diagnosed with measles	Frequency	Percentage
Yes	12	7.4
No	146	90.1
Do not know	4	2.5
Total	162	100.0

Table 4.13 above indicates that the majority 146 (90.1%) of children were not diagnosed with measles. The number of children, who were diagnosed with measles, was 12 (7.4%).

In this study the finding of 12 measles cases can be regarded as unacceptable when compared with the standard case definition of measles where only one measles case constitutes an outbreak (IDSR, 2011).

4.3.11.1 The age at which the children were diagnosed with measles

The researcher also assessed the age at which children were diagnosed with measles by asking the parents/caregiver and also verified the diagnosis with the children's health passports.

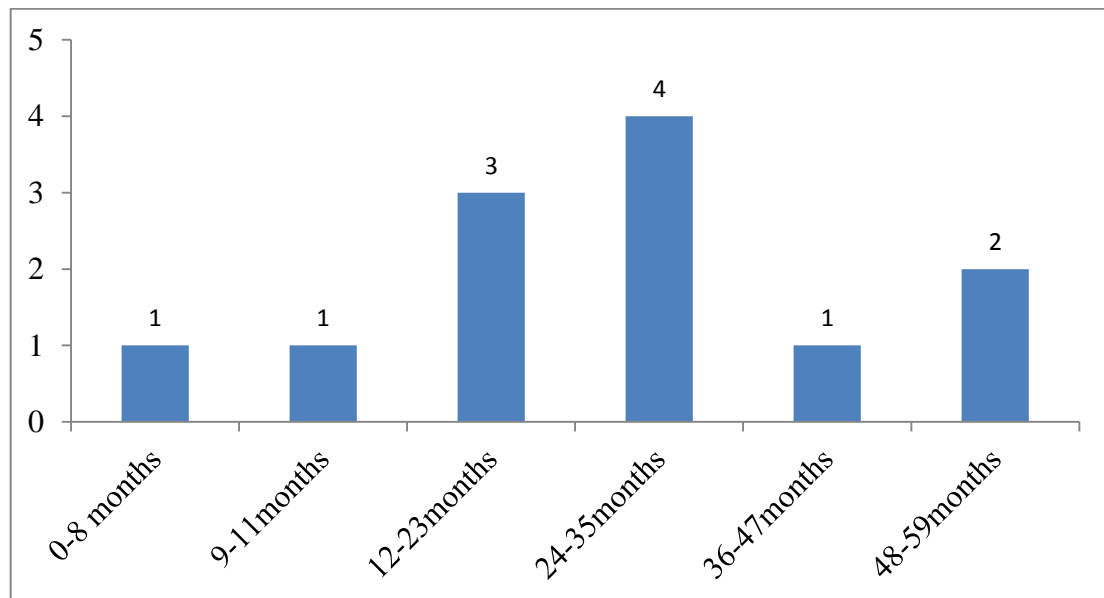


Figure 4.4: The age at which the children who were diagnosed with measles

Figure 4.5 showed that out of the 12 children who were diagnosed with measles in this study, four (33.3%) , three (25.1%), and two (16.7%) were

diagnosed at the age groups of 24-35 months, 12-23 months and 48-59 months, respectively.

According to Moss and Griffin (2011), the age at which the children develop measles depends upon the rate of contact with infected persons, failure to develop immunity against measles and low measles coverage.

In this study the children who were diagnosed with measles might be attributed to possible failure to develop immunity or problems with the vaccines, their timelines and storage deficiencies.

4.3.11.2 Immunisation status of children who were diagnosed with measles

The parents and caregivers of the children who were diagnosed with measles were asked about the immunisation status of their children at the time of their diagnoses

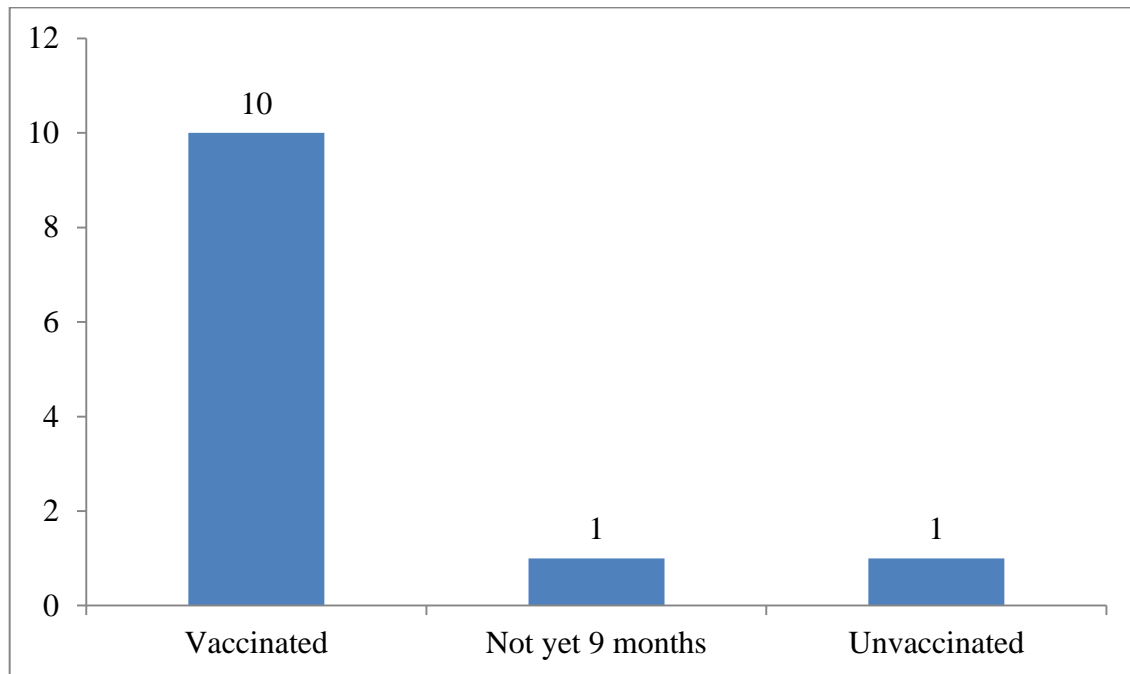


Figure 4.5 Measles immunisation status of the children who were diagnosed with measles

Figure 4.6, shows that among the children who diagnosed with measles 10 (83.3%) of them were immunized against measles, one (8.3%) was not yet 9 months and only one (8.3%) was not immunized against measles.

In this study, the majority of the children were immunized against measles but they still developed measles. In a study conducted by Gupta, et.al (2011), the conclusion was that failure to develop immunity in children who were immunized could be attributed to vaccines failure, damaged vaccines, incorrect records, and improper cold chain management.

In this study, the findings showed that a majority of the children were immunized against measles but at the same time were diagnosed with measles which could be due to failure to develop immunity.

4.3.11.3 Number of measles vaccination doses of children who were diagnosed with measles

Every child should at least receive one dose of measles vaccination to be protected against measles. It is vital to know the number of measles vaccines doses a child had received, especially those who developed measles in order to have base-line evidence.

Table 4.14 Number of measles vaccination doses received by children who were diagnosed with measles

Measles vaccine doses	Frequency	Percentage
None	2	16.7
One dose	3	25.0
Two doses	7	58.3
Total	12	100.0

Table 4.14 presents the number of measles vaccine doses administered to children who developed measles.

More than a half 7(58.3%) of the children were vaccinated with two doses, while three (25.0%) received one-dose of measles vaccines and two (16.7%) were not vaccinated.

In a study conducted by Mayxay, the conclusion was that measles outbreak occurred in vaccinated populations due to vaccine failure or being vaccinated outside the recommended period (Mayxay, 2007).

The majority of children who were diagnosed with measles received two doses of measles vaccination. However, in this study no statistical significant association was found between the number of vaccination doses received, and the development of measles.

This concludes the presentation, analysis and discussion of the interviewer-administered questionnaire which dealt with the demographic characteristics of the children, [Section A in the instrument], and the immunisation status of the children, [Section B in the instrument].

The next topic will present the findings, analysis and discussion of the items of the second instrument, which is the observational checklist. This checklist addressed the vaccine and cold chain management, as well as the measles coverage.

4.4 VACCINE AND COLD CHAIN MANAGEMENT

All health facilities which are providing immunisation services should manage their vaccines properly and have functional cold chain equipment. The MoHSS recommends a regular conducting of inventories of all cold chain equipment at all health facilities to ensure potency and availability of the vaccines (MoHSS, 2013). In this study, all 17 public health facilities in Engela district were assessed

Table 4.15: Vaccine management in public health facilities N=17

Variables	Frequency	Percentage
1.1 Measles vaccines available		
Yes	15	88.2
No	2	11.8
1.2 Measles vaccines correctly packed and stored		
Yes	15	88.2
No	2	12.5
1.3 Measles vials matched with diluents		
Yes	4	23.5
No	13	76.5
1.4 Measles vaccine vials without labels in the fridge		
Yes	1	5.9
No	16	94.1
1.5 Expired measles vaccines?		
Yes	0	0.0
No	17	100.0

1.6 How often the facility order measles antigens

Weekly	3	17.7
Monthly	14	82.3
Quarterly	0	0.0

Table 4.15 indicates that in 15 (88%) of the public health facilities measles vaccines were available, of which 15 (88.2%) were packed and stored correctly in their refrigerators. Two (11.8%) of the health facilities had no measles vaccines available. The requirement is that all health facilities should be fully stocked at all times. In this study this requirement had not been met.

A constant supply of measles vaccines at health facilities is likely to encourage parents and caregivers to bring their children for vaccination because they are confident that vaccines are available at all times. In the situations where there is an inconsistent supply of the vaccine, the parents and caregivers might have negative attitudes towards the services because they might have been denied immunisation services previously due to a lack of vaccines.

In the majority 13 (76.5%) of the health facilities, the measles vaccines and their matching diluents did not correlate. The diluents used to reconstitute measles vaccine are manufactured specific for measles vaccines only.

Using an incorrect or substitute diluent will result in damage to the vaccine and/or serious reactions to those receiving the vaccine (CDC, 2013). In this study, this particular finding is of concern due to possible negative effects on the vaccines.

No public health facilities in the Engela district were found with measles vaccine vials without labels or with expired dates in their refrigerators. The majority 14 (82.3%) of the health facilities ordered measles antigen on a monthly basis, while 3 (17.7%) did so weekly. The rule in the Ministry of Health and Social Services is that ordering should be done on a monthly basis as it ensures that adequate stock is ordered, specifically if the patient load might suddenly increase (MoHSS, 2013).

Table 4.16: Cold chain equipment in public health facilities, N=17

Availability of equipment	Frequency	Percentage
1.7 Functional refrigerators for vaccines storage		
Yes	17	100.0
No	0	0.0
1.8 Types of fridge		
Electrical	9	52.9
Electrical and Gas	8	47.1
1.9 Gas cylinder/generator for backup		
Yes	2	11.8
No	15	88.2

1.10 Cool boxes to store in vaccines for the day		
Yes	6	35.3
No	11	64.7
1.11 Vaccine storage containers to store vaccines		
During vaccination sessions		
Yes	17	100.0
No	0	0.0
1.12 Thermometer inside the fridge		
Yes	16	94.1
No	1	5.9
1.13 Temperature in the refrigerator between (+2^oc and 8^oc)		
Yes	16	94.1
No	1	5.9
1.14 Temperature monitored twice a day ³		
Yes	14	82.4
No	3	17.6

Table 4.16 shows that all 17 (100%) of the public health facilities in Engela district had functional refrigerators for vaccines storage. The temperatures measured inside the refrigerators were between (+2^oc and 8^oc) during the assessment.

³ The numbering in this item [1.1 - 1.14] is following the sequence in the health facility checklist instrument (Annexure C).

Sixteen (94.1%) of the health facilities had thermometers inside the refrigerators, and 14 (82.4%) had their temperature monitored twice a day.

The majority of the public health facilities 11 (64.7%) also had cool boxes to store vaccines for the day and all 17 (100%) of them had vaccine storage containers for vaccines during the vaccination sessions.

The equipment used in the vaccines and cold chain management are recommended by WHO and UNICEF (WHO and UNICEF, 2013).

In this study all health facilities in the Engela district had functional cold chain equipment, and measles vaccines were stored within the recommended temperature and were monitored twice a day (WHO, 2011).

The study revealed that 9 (52.9%) of the public health facilities used electrical fridges, while 8 (47.1%) used both electrical and gas fridges for measles vaccine storage. That means, most of the health facilities had been provided with two-in-one vaccine refrigerators that could be connected to electrical power supply as well as gas, but no gas cylinders, neither generator for back-up in case of power outages, were available. The implication in this study is that during possible power outages, the vaccines might be rendered ineffective.

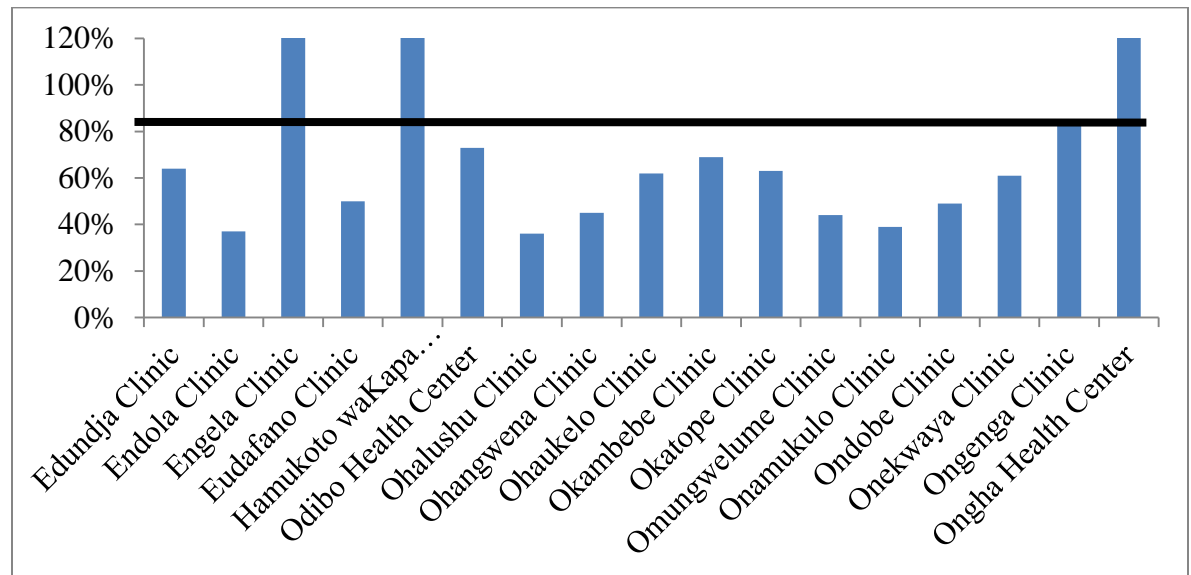
The next section will address assessments of measles immunisation coverage and dropout rates as well as tools that were used to monitor immunisation coverage.

4.5 MEASLES IMMUNISATION COVERAGE

4.5.1 The measles coverage

Measles coverage is the performance indicator for Expanded the Programme on Immunisation (EPI) where every health facility should achieve a coverage $\geq 80\%$. The aggregated measles raw data for 2014 were extracted from the District Health Information Software (DHIS).

The data were calculated by using the estimated population of children aged between 9 to 59 months for each health facility to measure the measles coverage. The information in the figure below is a secondary data analysis to assess the measles coverage per health facility in the Engela district.



**Figure 4.6: An assessment of measles coverage per health facility (N=17)
in Engela district, 2014 (DHIS, version 14)**

Figure 4.7 shows that only four (23.6%) of the public health facilities achieved a coverage $\geq 80\%$ of measles coverage, while the majority 13 (76%) of the health facilities did not reach the target of 80% as recommended by the World Health Organization (WHO, 2013). This data correlates with the MoHSS's report on the routine measles immunisation performance of Engela district where a measles coverage between 50% and 79% had been reported (MoHSS, 2013).

The measles coverage of more than 100% was reported in Engela clinic, Hamukoto waKapa clinic and Ongha health center, which is an indication of erratic quality of data, or unreliable estimated populations in children

younger than five years. Unreliable data impedes proper planning and management, and in these three health facilities, the quality of data was not optimal.

The national target for measles immunisation coverage in Namibia is $\geq 80\%$. At least 80% of all children in each district and at national level needed to be vaccinated through the Expanded Programme of Immunisation (MoHSS, 2009). This programme aims to achieve and maintain vaccine coverage above 90% for all antigens including measles in every district and with a dropout rate of less than 10% by the year 2010 and beyond (MoHSS and Macro, 2008).

4.5.2 The Measles dropout rate

Measles dropout rate is achieved by comparing the number of children who received Pentavalent 3 with the children who were vaccinated with a single dose of measles vaccine.

Table 4.17: Measles dropout per public health facility N=17 in Engela district, 2014 (DHIS version 14).

Name of the health facility	Measles Dropout
Edundja Clinic	-5.6%
Endola Clinic	-36.6%
Engela Clinic	22.8%
Eudafano Clinic	-23.7%
Hamukoto waKapa Clinic	26.3%
Odibo Health Center	34.9%
Ohalushu Clinic	13.2%
Ohangwena Clinic	10.1%
Ohaukelo Clinic	17.8%
Okambebe Clinic	-44.2%
Okatope Clinic	3.9%
Omungwelume Clinic	-12.5%
Onamukulo Clinic	4.2%
Ondobe Clinic	-17.6%
Onekwaya Clinic	-19.8%
Ongenga Clinic	20.6%
Ongha Health Center	19.8%
Engela District	13.6%

MoHSS aims to achieve and maintain the vaccine coverage above 90% for all antigens including measles in every health facilities with a dropout rate of less than 10% by the year 2010 and beyond (MoHSS and Macro, 2008).

From the data in Table 4.16 it emerged that only two (11.8%) of the health facilities namely, Onamukulo with a dropout rate of 4.2 %, and Okatope clinic, with a dropout rate of 3.9% had achieved a measles dropout of less than 10%. This is an indication of good quality of measles immunisation utilisation.

Seven (41.2%) of the health facilities had negative measles drop-out rates as a result of unreliable estimated populations of children less than 5 years, that led to bad quality of data (CDC, 2013).

Furthermore, 8 (47.0%) of the health facilities reported dropout rates of more than 10%, indicating poor utilization of immunisation services. Thus in this study the aim of a dropout rate of less than 10 %, as proposed by MoHSS, had not been achieved to all of the health facilities in the Engela district.

4.5.3 Measles immunisation coverage assessment tools

Graphs are usually used as assessment and motivation tools to stimulate action towards improving immunisation coverage. A cohort register is a register where children's immunisation schedules are recorded according to their months of birth. Every health facility should have a cohort register to identify the missed opportunities.

**Table 4.18: Checklist of measles immunisation coverage assessment tools
per health facility in Engela district**

Variables	Frequency	Percentage
2.3 How often a health facility conducts immunisation services		
Daily	17	100.0
Twice a week	0	0.0
Three times a week	0	0.0
2.4 Graphs of measles coverage available for 2015		
Yes	13	76.5
No	4	23.5
2.5 Cohort register available		
Yes	15	88.2
No	2	11.8
2.6 Cohort registered used correctly		
Yes	5	29.4
No	12	70.6
2.7 Children screened for immunisation status		
Yes	10	58.8
No	7	41.2

Table 4.18 shows that all 17 (100%) of the health facilities were conducting immunisation services on a daily basis. The majority 13 (76.5%) of the health facilities had graphs displaying information of measles coverage. Cohort registers were also available in 15 (88.2%) facilities, but only five (29.4%) were completed correctly.

A related study conducted in the Opuwo district revealed that cohort registers were available in which the immunisations follow-up dates were recorded at health facilities. The researcher in the Opuwo study concluded that the availability of registers, as well as their correct use is associated with an improved immunisation status of children (Tjiveze, 2012).

In only 10 (58.8%) of the health facilities, children were routinely screened for their immunisation status. This finding is not ideal, as it is recommended by MoHSS that children be vaccinated whenever they attend a health facility and are in need of such a service. Handjaba et.al (2008) also emphasised the necessity for all health care workers to be vigilant on screening all eligible children for immunisation during health facility visits, and to refer them for vaccinations which should be given concurrently at the health facility.

In this study optimal measles coverage assessment tools were not used, which included the cohort registers and routine assessment of all children regarding their immunisation status.

The previous discussion focused on the descriptive component of the research. The next discussion will be on the analytical component.

4.6 CROSS TABULATIONS

Cross tabulations are tools that allow the researcher to assess the association between two categorical variables. In this study the researcher compared categorical variables in order to identify the association between immunisation status and the following categorical variables:

- Gender
- Birth orders
- Received information on immunisation
- Radio as the main source of information during SIAs and
- Diagnosed with measles.

The first cross tabulation to be discussed is the association between the gender of children and their immunisation status.

4.6.1 Association between the gender of children and routine measles vaccination

The researcher determined the relationship between the children's gender and their immunisation status.

Table 4.19: Gender of children in relation to immunisation status

Gender	Immunisation status		
	Vaccinated %	Not vaccinated %	Total (%)
Male	83 (94.3)	5 (5.7)	88 (100.0)
Female	72 (97.3)	2 (2.7)	74 (100.0)
Total	155 (95.7%)	7 (4.3%)	162 (100.0)
	$\chi^2 = 0.8629$,	$p = 0.353$	

The study revealed that there was no statistically significant difference in the proportion of measles vaccinated children between males (83/88, 94.3%) and females (72/74, 97.3%). The Chi-square test showed no significant association between gender and routine measles vaccination status ($\chi^2=0.8629$, degrees of freedom (df) =1, $p=0.353$).

However, this study's finding is in contradiction with studies conducted in India by Sharma, Desai and Kavishvar, (2009); Singh, (2012) and Morris et al. (2013), who have found that the proportion of measles immunized children was higher in females than in males and measles vaccination scores for girls were significantly higher than those for boys.

4.6.2 Association between the birth order of children and immunisation status

The association between the birth order of children and immunisation status was also assessed to determine whether any relationship exists between them

Table 4.20 Birth orders in relation to measles immunisation status

Birth order	Measles vaccination status		
	Yes (%)	No (%)	Total (%)
1-3	126 (95.4)	6 (4.6)	132 (100.0)
≥4	29 (96.7)	1 (3.3)	30 (100.0)
Total	155 (95.7)	7 (4.3)	162 (100.0)
$\chi^2 = 0.869$ $p = 0.768$			

The study has shown that there was no statistically significant relationship between the birth order of the children and their measles vaccination status ($\chi^2 = 0.869$, $p = 0.768$). This finding is contrary to the finding of a study conducted in Malawi (Munthali, 2007) which revealed that vaccination status among first-born children was higher than those children born later in the birth order.

It concluded that in this study the children's birth order did not influence their measles vaccination.

4.6.3 Association between received information and measles immunisation status

The study also investigated the association between receiving information about immunisation, and immunisation status in order to discover whether there was a relationship between these variables.

**Table 4.21: Information received in relation to measles immunisation
status**

Received information about immunisation	Measles immunisation status		
	Vaccinated %	Not vaccinated %	Total %
Yes	145 (98.0)	3 (2.0)	148 (100.0)
No	10 (71.4)	4 (28.6)	14 (100.0)
Total	155 (95.7)	7 (4.3)	162 (100.0)
	$\chi^2 = 25.997,$	$p = 0.0001$	

Table 4.21 shows that routine measles vaccination was significantly higher among parents/caregivers who received information about immunisation (145/148, 98.0%) compared to those who did not (10/14, 95.7%). The Chi-square test showed a statistically significant association between receiving information about immunisation and measles immunisation status ($\chi^2 = 25.9978, p = 0.0001$).

These findings concurred with the findings of studies conducted in the Lucknow district in India (Nath, Singh, Awasthi, Bhushan, Kumar and Singh, 2007), in Nigeria (Odusanya, Alufolai, Meurice and Ahonkhai, 2008) and in the Surat district in India (Trivedi et. al. 2009). In all these studies it was found that the parents' information about immunisation services was statistically significant associated with the immunisation status of their children. This was also supported by the study conducted in the Opuwo district in Namibia (Tjiveze, 2012), in the sense that participants who recalled having received information had their children immunized against measles.

4.6.4 Association between the radios as main source of information and the measles immunisation during SIAs

In this study, the radio is mainly the medium that was used as a source of information to announce information about immunisation services during SIAs

Table 4.22: Radio as source of information in relation to children who received measles immunisation during SIAs

Radio	Children receiving immunisation during SIAs		Total
	Yes	No	
Yes	76 (58.9)	53 (41.1)	129 (100.0)
No	19(57.6)	14(42.4)	33 (100.0)
Total	95 (58.6)	67 (41.4)	162 (100.0)
$\chi^2 = 0.0194$, $p=0.8891$			

The study showed that there was no significant difference in the proportion of children immunized during SIAs between those who listened to the radio (58.9%) compared to those who did not (57.6%). The Chi-square test showed no significant association between the radio as a source of information and children being vaccinated during Supplementary Immunization Activities (SIAs) ($\chi^2 = 0.0194$, $p=0.8891$).

This finding concurs with a related study conducted by Tjiveze, that there was no statistically significant relationship between the radio as the source of information and the measles vaccination of children (Tjiveze, 2012)

4.6.5 Association between immunisation status and being diagnosed with measles

The study also examined the association between routine measles vaccination and being diagnosed with measles in order to establish if the children who had been immunized against measles were protected.

Table 4.23: Measles immunisation status in relation to children who were diagnosed with measles

Measles immunisation status	Children diagnosed with measles		
	Yes %	No %	Total %
Vaccinated	10(6.5)	145(93.5)	155(100.0)
Not vaccinated	2(28.6)	5(71.4)	7(100.0)
Total	12(7.4)	150(92.6)	162(100.0)
	$\chi^2 = 4.7779,$	$p = 0.029$	

Table 4.20 shows that there was a significant association ($\chi^2 = 4.7779$, $p = 0.029$) between routine measles vaccination and being diagnosed with measles such that a significantly higher proportion of the unvaccinated children (2/7, 28.6%) were diagnosed with measles compared to the vaccinated children (10/155, 6.5%). The table also shows that the majority, namely 10 out 12(83%) of the children who were diagnosed with measles were also immunized against measles. Therefore, this could be an indication of children being immunized but who did not develop immunity, or failure of

the vaccines that could be due to the improper vaccine and cold chain management.

A study conducted by Gupta, et.al, (2011), revealed that irregular cold chain maintenance may be associated with a measles diagnosis while being vaccinated. A similar study conducted in the Kangra district in India, revealed that poor vaccine and cold chain management could be related with an unexpected measles diagnosis (Ramachandran, 2008).

4.7 SUMMARY

This chapter dealt with the presentation of the research findings, the analysis thereof as well as the discussions. Two data collection instruments namely, an interviewer-administered questionnaire and an observational checklist were used. The data were collected by the researcher firstly with the structured interview schedule interviewing parents and caregiver and then by means of the observational checklist to assess the public health facilities. The findings were presented in frequency tables, pie charts, bar graphs and cross tabulation tables, after which each item was individually discussed and integrated with applicable literature.

In the following chapter the conclusions, recommendations as well as limitations identified during the study period, will be discussed.

CHAPTER FIVE

CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS OF THE STUDY

5.1 INTRODUCTION

A description and statistical analysis of the research data were presented and discussed in the previous chapter. In this chapter, the conclusions and possible recommendations as well as limitations identified, will be presented. The recommendations will be submitted after the conclusion of each objective had been discussed. The sequence of the discussion regarding the conclusions will be based on the stated objectives, which for clarity purposes will be presented again in the text.

5.2 CONCLUSIONS

The first conclusions to be discussed will be regarding the first objective of the study.

5.2.1 Conclusions regarding the first objective: To assess and describe the measles immunisation status of children aged 9 to 59 months in the Engela district

In this study the majority of children were immunized within the recommended age of 9 to 12 months as stipulated by WHO and MoHSS. Male children were in the majority and were mainly brought in by their parents. Most of them were vaccinated more than once and of those vaccinated 10 (6%) were diagnosed with measles, which was statistically significant. This finding can be regarded as a measles outbreak when compared with the standard case definition of measles outbreak where only one measles case is required.

Most of the parents and caregivers received the required information about immunisation from the health facilities. Parents and care givers who received information were more likely to have their children immunized. This finding was also statistically significant. This finding was also statistical significant. The radio was the main source of additional information dispensation during SIAs. Applicable information was provided in different places and through different sources.

The next discussion will be on the conclusions related to the second objective.

5.2.2 Conclusions regarding the second objective: To assess the elements related to vaccine and cold chain management in the Engela district.

The ordering of measles vaccines occurred on a monthly basis and was stored in functional refrigerators as recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). Storage of these vaccines occurred at the endorsed temperature (+2°C and +8°C), which was monitored twice daily. The majority 15 (88%) of the health facilities had no backup system for the refrigerators in case of power failure. A constant temperature is required as measles vaccines are sensitive to heat, and in these health facilities without backup systems, vaccines may lose their potency.

Sufficient measles vaccines were available but did not match with their diluents. Using an incorrect diluent will result in chemical change in the vaccines and/or serious reactions to those receiving the vaccine. It can be concluded that optimum storage of vaccines is not ensured at all times and that the composition of the vaccines may be altered due to incorrect diluents.

The next discussion will be on the conclusions related to the third objective.

5.2.3 Conclusions regarding the third objective: To assess the measles immunisation coverage in the public health facilities in Engela district

Measles coverage and dropout rate is the performance indicator for the expanded programme of immunisation(EPI), and a coverage of more than 80%, and dropout of less than 10% is recommended by the WHO. All the health facilities in the Engela district conducted immunisation services on a daily basis as required, but only four (24%) obtained $\geq 80\%$ measles coverage and only 9 (53%) of them achieved a measles dropout rate of less than 10%. These findings were not statistically significant.

In this study the optimal measles coverage was not achieved. A dropout rate of less than 10% was also not obtained.

5.3 RECOMMENDATIONS

Several recommendations were made and are submitted for consideration by the different stakeholders. .

5.3.1 Recommendation one: Optimizing opportunities for vaccination

- At district level, the vigilance on the part of all health care workers at all departments should be enhanced on screening all eligible children for immunisation during health facility visits and refer them for vaccinations. This should occur whenever the parents/caregivers present at the health facility with their children.

5.3.2 Recommendation two: Applicable health education

- The District Primary Health Care Supervisor (DPHCS) needs to review health education sessions at the health facilities to ensure that health care workers provide comprehensive information regarding the importance of immunisation services to all parents and caregivers when they bring their children for immunisation. This recommendation falls within the scope practice of the registered nurse.

5.3.3 Recommendation three: Optimize managerial aspects at health facilities

- At district level, where the measles antigens are disassembled and dispatched, quality control measurements need to be implemented. This involves correct packaging and researching for high quality protecting coverings. It also should focus on the correct number of vaccines being supplied, as well as the correct diluents
- The Engela District Health Management Team should budget for additional gas cylinders for backup in case of power outages at all public health facilities and develop operation standard procedures (SOP) to be followed if vaccines temperatures are out of range.
- At health facility level, quality control measurements need to be developed to ensure timely ordering based on their requirements. Provision is also to be made for possible delay of deliveries.

5.3.4 Recommendation four: Optimize reporting and displaying of immunisation data, as well as measures to detect non-vaccinated children

- The Ministry of Health and Social Services recently introduced the Maternal Child Health Days (MCHDs), instead of SIAs, which trace missed opportunities for measles vaccination in districts with low measles coverage. The researcher recommends the MCHDs to include all children less than 5 years of age irrespective of previous measles vaccination to increase herd immunity.
- At district level, the District Primary Health Care Supervisor should conduct supervisory support visits to the health facilities on a regular basis to monitor graphs that display measles coverage and dropout rates to ensure that they are correctly completed and used for their intended purposes and to come up with strategies regarding the tracing of missed opportunities of immunisation.

5.4 RECOMMENDATIONS FOR FURTHER RESEARCH

- This study needs to be replicated to other districts; as this could strengthen the reliability of the data as well as the generalizability.
- A qualitative study should be conducted to explore the reasons of parents and caregivers who did not avail their children for vaccination.

- An additional in-depth research needs to be conducted to further explore the causes of children who were vaccinated against measles but were still being diagnosed with this disease.

5.5 LIMITATIONS OF THE STUDY

The researcher identified some limitations in the study which are highlighted below.

Since this study was based in one district, the findings could not be generalized to the entire country. The study employed a systematic sampling technique, but there was no list of participants in the sampled population, and not all parents and caregivers visited the health facilities during the study period. In addition, the quantitative approach might not allow exploring a problem or concepts in depth.

The study relied on parents and caregivers' history for assessing measles supplementary vaccination of children as it was not recorded in the health passports. This might have led to a recall bias if the parents/caregivers could not recall whether the child had received measles vaccine during the supplementary activities or not.

5.6 FINAL CONCLUSIONS

This study focused on the immunisation status and management of measles in the Engela district and a descriptive, quantitative, cross-sectional study was conducted using a proportionate and systematic sampling technique. In total 162 parents and caregivers were interviewed and seventeen health facilities were assessed. The findings were presented in a descriptive and analytical approach and the discussions were simultaneously integrated with the findings and controlled with literature. The conclusions regarding these findings were discussed under the relevant objectives. The limitations were stated and possible recommendations were submitted.

The findings of the study will be disseminated to the Ministry of Health and Social Services, Regional Management Team (RMT) as well as the District Management Team (DMT).

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ANNEXURES

ANNEXURE A: INFORMED CONSENT

An assessment of measles immunisation status and management in Engela District, Ohangwena region

Identification Number _____ (*please write this number on the questionnaire*)

Date of interview _____

Informed Consent

A greeting, my name is Ruth Nangobe, and I am doing a Master Science in Applied Epidemiology and Laboratory Management at the University of Namibia. This study and its procedures have been approved by the appropriate people and research committee of University of Namibia. I am also authorised by the Ministry of Health and Social Services to conduct the study in Engela health district, Ohangwena region.

The purpose is to collect information on factors associated with the frequent occurrence of measles outbreak. I would therefore, like to ask you some questions about your demographic information and measles immunisation status of your child, because you have particular knowledge and experience that may be important to the study. Although this study will not benefit you directly, the information obtained will help the decision-makers in the region to plan the improvement of the EPI. There should be no risks to you in sharing your information. Your identity will not be revealed when the study is

reported or published. Your participation in this study is totally voluntary. You have the right to withdraw at any time if you care to, without repercussion or penalty. Any information you give me will be confidential.

If you have any questions about the study, do not hesitate to ask me (Ruth Nangobe, (065) 263158 (home), 0812722551 (cell phone)).

I have discussed the above points with the subject.

Signature of the investigator

Date

I hereby freely consent to take part in this study

Signature of subject

Date

Dear Participant:

The aim of this study is to assess and describe the measles immunisation status and vaccine management in the Engela district in Oshana region

The Objectives of the study:**ANNEXURE B: Questionnaire**

Section A: To explore and describe the demographic data of the children

Section B: To assess and describe the measles immunisation status of children aged 9 to 59 months in the Engela district.

ANNEXURE C: Health facility checklist instrument

Section A: To assess the elements related to vaccine and cold chain management in the public health facilities in the Engela district.

Section B: To assess immunisation coverage and dropout rate in the public health facilities in Engela district

Instructions:

- (1) This questionnaire to be completed by researcher
- (2) Answer all questions in all sections
- (3) Please answer each question as truthfully as possible. This interview will take about 10-15 minutes
- (4) Identity number used to guarantee confidentiality and anonymity.
- (5) The results of this research will be available towards the end of January 2016.

Your participation in this research study is highly appreciated.

Yours,

Ruth Nangobe

ANNEXURE B: INTERVIEWED - ADMINISTERED QUESTIONNAIRE**Identification Number** _____**Name of nearest health facility** _____**Date of Interview** _____**SECTION A: DEMOGRAPHIC DATA OF THE CHILD**

1. How old is the child? _____
2. Sex of the child
 - a) Male ☐
 - b) Female ☐
3. What is the birth order of the child? _____
4. What is your relationship to the child
 - a) Parent ☐
 - b) Caregiver ☐
 - c) Son or daughter ☐
 - d) Brother or sister ☐
 - e) Grandchild ☐

SECTION B: IMMUNISATION STATUS OF THE CHILD

To assess and describe the measles immunisation status of children aged 9 to 59 months in the Engela district.

5. Does the child have a health passport?
 - a) Yes ☐
 - b) No ☐
6. Has the child received routine measles vaccination? (*check on passport*)
 - a) Yes ☐
 - b) No ☐
7. If yes, at which age _____
8. If No, why has the child not received routine measles vaccination _____

9. Did you receive some information during immunisation?

10. What information are you normally given during immunisation? (Tick what is applicable)

- a) What the antigen given is ☐
- b) What to do if fever or abscess develops ☐
- c) Follow up date for next visit ☐
- d) I do not remember ☐
- e) Nothing given ☐

11. How often are immunisation services provided at your health facility?

- a) Daily
- b) 2 times a week
- c) 3 times a week
- d) 4 times a week

12. How do you consider vaccination services provided by the clinic you send your child?

- a) Excellent ☐
- b) Good ☐
- c) Fair ☐
- d) Poor ☐
- e) Do not know

13. If poor, give reasons why you said so_____

14. Were the supplementary immunisation activities (SIAs) conducted in your area in the past three years?

- a) Yes ☐
- b) No ☐

15. Did your child receive measles supplementary immunisation?

- a) Yes ☐
- b) No ☐

16. How did the information on SIAs reach you (Tick what is applicable)

- a) Through radio
- b) HCWs
- c) Councillors
- d) Schools
- e) Other mentioned _____

17. Has your child suffered from measles?

- a) Yes ☐
- b) No ☐
- c) Do not know ☐

18. If yes, at what age in months? _____

19. What was the measles vaccination status of the child that time?

- a) Vaccinated ☐
- b) Unvaccinated ☐
- c) Not yet 9 months ☐
- d) Do not know ☐

20. How many doses of the measles vaccination were received by children who were diagnosed with measles?

- a) None
- b) One dose
- c) Two dose
- d) Three dose
- e) Four and more

Thank you very much for your time

ANNEXURE C: HEALTH FACILITY CHECKLIST INSTRUMENT

Name of the Health Facility _____ Target Population of children aged 9 – 59 months _____ Date of visit _____

SECTION A: VACCINE AND COLD CHAIN MANAGEMENT (including ordering, storage and usage)

Objective 2: To assess the elements related to vaccine and cold chain management in the public health facilities in the Engela district.

All clinics which are providing immunisation services should have the following functional cold chain equipment:

Availability of equipment	Options	
1.1 Are there measles vaccines in the refrigerator?	Yes	No
1.2 Are the vaccines correctly packed/arranged in the refrigerator	Yes	No
1.3 Is the number of available measles vaccine vials matching with the diluents?	Yes	No
1.4 Are there measles vaccine vials without labels in the fridge?	Yes	No
1.5 Does the facility have any expired measles vaccines?	Yes	No
1.6 How often does the facility order the measles antigen?	a) Weekly b) Monthly c) Quarterly	
1.7 Does the HF have a functioning fridge for vaccine storage?	Yes	No
1.8 What types of fridge do you have?	a) Electrical b) Gas c) Both electrical and gas	
1.9 Does the health facility have gas cylinder for back up in the event of electricity outage?	Yes	No
1.10 Are there cool boxes available to put vaccines for the day?	Yes	No

1.11 Are there vaccine storages to store vaccines during vaccination sessions?	Yes	No
1.12 Is there a thermometer inside the refrigerator?	Yes	No
1.13 Is the temperature inside the refrigerator between (+2°C and 8°C)?	Yes	No
1.14 Is the refrigerator temperature monitored twice a day? (check log book of refrigerator temperature)	Yes	No



SECTION B: FACILITY MEASLES COVERAGE

Objective 3: To assess immunisation coverage in the public health facilities in Engela district

Health Facility should achieve 80% and above on measles coverage and less than 10% on dropout

Items	Options	
2.1. What is the measles coverage for this facility for 2014 (in Percentage)	<hr/>	
2.2 What is the measles drop out for this facility for 2014(<i>in Percentage</i>)	<hr/>	
2.3 How many times in a week do you conduct immunisation services?	a)Daily b)Twice a week c)Three times a week	
2.4. Does the health facility have graphs for measles immunisation coverage for 2015?	Yes	No
2.5 Is there a cohort register at the health facility in which children are registered for immunisation follow ups	Yes	No
2.6 Does the health facility use cohort register correctly?	Yes	No
2.7 Are children who are being brought in for sick visits routinely screened for vaccination status (check in OPD registered)?	Yes	No

ANNEXURE D: ETHICAL CLEARANCE CERTIFICATE FROM UNAM

 UNAM UNIVERSITY OF NAMIBIA	
ETHICAL CLEARANCE CERTIFICATE	
Ethical Clearance Reference Number: SONPH/4/2015	Date: 10 February, 2015
<p>This Ethical Clearance Certificate is issued by the University of Namibia Research Ethics Committee (UREC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the Faculty/Centre/Campus Research & Publications Committee sitting with the Postgraduate Studies Committee.</p>	
Title of Project: An Assessment of the measles immunization status and management in Engela District, Ohangwena Region	
Nature/Level of Project:	Masters
Researcher: RUTH NANGOBE	
Student Number : 9312005	
Host Department & Faculty: School of Nursing and Public Health	
Main Supervisor : Prof L Small; (Main) Ms L Van Der Westhuizen (Co)	
Take note of the following:	
(a) Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the UREC. An application to make amendments may be necessary.	
(b) Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the UREC.	
(c) The Principal Researcher must report issues of ethical compliance to the UREC (through the Chairperson of the Faculty/Centre/Campus Research & Publications Committee) at the end of the Project or as may be requested by UREC.	
(d) The UREC retains the right to:	
(i). withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,	
(ii). request for an ethical compliance report at any point during the course of the research.	
UREC wishes you the best in your research.	
 Prof. I. Mapaure UNAM Research Coordinator ON BEHALF OF UREC	

ANNEXURE E: RESEARCH PERMISSION LETTER FROM UNAM

University of Namibia, Private Bag 13301, Windhoek, Namibia
340 Mandume Ndemufayo Avenue, Pioneerspark
☎ +264 61 206 3111; URL: <http://www.unam.edu.na>



19 February 2015

TO WHOM IT MAY CONCERN

RE: RESEARCH PERMISSION LETTER

1. This letter serves to inform that student: **Ruth Nangombe** (Student number: **9312005**) is a registered student in the School of Nursing and Public Health at the University of Namibia. Her research proposal was reviewed and successfully met the University of Namibia requirements.
2. The purpose of this letter is to kindly notify you that the student has been granted permission to carry out postgraduate studies research. The School of Postgraduate Studies has approved the research to be carried out by the student for purposes of fulfilling the requirements of the degree being pursued.
3. The proposal adheres to ethical principles.

Thank you so much in advance and many regards.

Yours truly,

Name of Main Supervisor: **Prof L Small**

Signed: _____

Dr. C. N.S. Shaimemanya

Signed: _____

Director: School of Postgraduate Studies

Tel: 2063523

E-mail: cshaimemanya@unam.na

ANNEXURE F: LETTER OF APPROVAL FROM MOHSS



REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 203 2510
Fax: 061 – 222558
E-mail: hnangombe@mhss.gov.na

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3

Enquiries: Mrs. H. Nangombe

Date: 07th July 2015

Ms. Ruth Nangombe
P.O. Box 13079
Eenhana
Namibia

Dear Ms. Nangombe

Re: An assessment of Measles Immunization status and management in Engela district, Ohangwena, Namibia.


1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
 - 3.1 The data to be collected must only be used for operational purpose;
 - 3.2 No other data should be collected other than the data stated in the proposal;
 - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;

- 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
- 3.5 Preliminary findings to be submitted upon completion of the study;
- 3.6 Final report to be submitted upon completion of the study;
- 3.7 Separate permission should be sought from the Ministry for the publication of the findings;

Yours sincerely,

2015-07-09


Andrew Ndishishi (Mr)
Permanent Secretary



ANNEXURE G: LETTER OF PERMISSION FROM OHANGWENA

REGIONAL HEALTH DIRECTORATE



REPUBLIC OF NAMIBIA
Ministry of Health and Social Services
DIRECTORATE OHANGWENA REGION
Office of the Regional Director
Private Bag 88006
EENHANA

Tel. 065 – 263239/263260/263261/263293

Fax. 065 – 263225

Email: opetuhango@yahoo.co.uk

Enq: John Hango

13 July 2015

To:

- District Coordinating Committee
- Engela, Eenhana, Okongo

Re: Mrs. Ruth Nangobe's thesis data collection in the Ohangwena region

Colleagues, please be informed that Mrs. Ruth Nangobe has been approved by the office of the Permanent Secretary of this ministry to conduct her research in Ohangwena region as per attached letter.

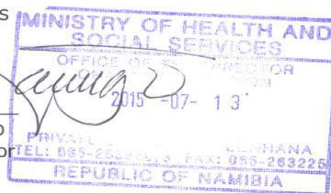
Kindly give any assistance she may be needing from your respective offices. She needs to collect data as partial fulfillment of the completion of Master degree.

I hope you found the content of this letter in order.

Thank you

Faithfully yours


John N. Hango
Regional Director



ANNEXURE H: LETTER OF CONFIRMATION FROM EDITOR

7th December, 2015

Dear Sir/Madam,

I hereby acknowledge that I have edited Mrs. R. Nangobe's thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in Applied Field Epidemiology, titled "An assessment of the measles immunisation status and management in Engela District, Ohangwena Region". The editing focused on the following areas: grammar; sentence order; clarity of ideas; punctuations; repetition of ideas/findings; and the overall organisation of the paper.

I trust you will find this in order.

Yours Sincerely,

Saara Mupupa

+ 264 81 362 0830

smupupa@gmail.com