

**DETERMINANTS OF VACCINATION UPTAKE
AMONG CHILDREN AGED 12-24 MONTHS IN AFGOI
TOWN, SOMALIA**

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**Determinants of Vaccination Uptake among Children aged 12-24
Months in Afgoi Town, Somalia**

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the Degree of Masters of Science in Public Health in the Jomo
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DECLARATION

This thesis is my original work, and has not been presented for a degree in any other university

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DEDICATION

This study is dedicated to my beloved family and mentors who showed devotion in guiding me during the process of this research. I specifically dedicated this study with respect to my mother, wife and beloved children who were very supportive throughout this research.

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My fore-most thanks go to Allah for having kept me alive and strong throughout the course of this study up to the end. I also thank in special way the lecturers of Jomo Kenyatta University of Agriculture and Technology for equipping me with the required skills to accomplish this Thesis.

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DEFINITION OF TERMS

Full immunization:	Full immunization is defined in this study as receiving all the required immunization vaccines (i.e. a dose of <i>Bacille Calmette Guerin</i> (BCG), four doses of oral polio (OPV), three doses of diphtheria, pertussis and tetanus (DPT) or Pentavelant and one dose of measles to child before the age of 12 months.
Herd immunity:	A form of indirect immunity that occurs when large percentages of population have become immune to an infectious disease, thereby providing a measure of protection for individuals who are not immune.
Immunization:	Is the process by which an individual's immune system becomes fortified against an agent (known as the immunogen).
Missed immunization opportunity	is when a child or a woman comes to a health facility or outreach site and does not receive any or all of the vaccine doses for which he or she is eligible.
Vaccination:	Is the administration of antigen material to stimulate an individual's immune system to develop adaptive immunity to a pathogen.

LIST OF ABBREVIATIONS

ANC	Antenatal care
BCG	Bacillus calmette Guerin
CARMMA	Campaign on accelerated reduction of maternal, newborn and Child mortality in Africa.
CDC	Center for disease control
CHD	Child health days
DPT	Diphtheria- pertussis-tetanus
EPI	Expanded program on immunization
GAVI	Global alliance for vaccine and immunization
HEP B	Hepatitis B
HepB	Hepatitis B
HIB	Hemophilus influenza
Hib	Haemophilus influenzae type B
HMIS	Health management information system
MCV	Measles containing vaccine
MICS	Multiple indicator cluster survey
NID	national immunization days
OPV	Oral polio vaccine
RIS	Routine immunization services
SDG	Sustainable development goals
TT	Tetanus toxoid
UNICEF	United Nations Children's Fund
WHO	World Health Organization

ABSTRACT

Vaccination is designed to confer to a person, immunity or resistance to an infectious disease. Vaccines stimulate the body's own immune system to protect the individual against subsequent infection or disease. It is a proven mechanism for eradicating life-threatening infectious diseases, and averting millions of deaths each year. Vaccination is one of the most cost-effective health interventions, with proven strategies that make it accessible worldwide. Despite their public health benefits, immunization programs face obstacles of negative public perception and poor planning. The aim of the study was to determine the proportion of vaccination uptake and factors influencing uptake of vaccination including access, awareness and cultural practices among caregivers in Afgoi town. A descriptive cross-sectional study design was used to obtain a clear picture of factors influencing vaccination uptake. Structured questionnaires were administered to mothers or caregivers to evaluate vaccination uptake and factors affecting it. The study populations of this study were all children aged between 12-24 months living in eligible households in Afgoi town. The town was demarcated based on its population and section-wise distribution. Simple random sampling was used to select four villages that is Balguri, Elqode, Bandar-jadid and Bulofolyo to represent the target population of the study. Household selection, systematic random sampling was used to select the eligible households who had children aged 12-24 months. Informed consent was obtained from the respondents prior to data collection. Data was analyzed using SPSS version 20 at 95% confidence. Data was subjected to descriptive, chi square and binary regression analysis. From the results of this study, full vaccination uptake of vaccine preventable diseases was less than 4.4 %, partial vaccination uptake was 69.7% while 25.9% of children had not been vaccinated. Health facility related factor found to significantly influence vaccination uptake were Care provider friendliness [(Crude OR = 0.27, 95% CI = 0.151 – 0.499, P <0.001)] and availability of vaccines [(Crude OR = 0.482, 95% CI = 0.323 – 0.720, P <0.001)]. Cultural and religious factors reported to significantly influence vaccination uptake were; cultural perception of vaccine safety [(Crude OR = 0.285, 95% CI = 0.195 – 0.417, P <0.0001)] and religious influence [(Crude OR = 0.671, 95% CI = 0.474 – 0.951, P = 0.025)]. Therefore, the Somali government and non-governmental organization should ensure quality health services are near the reach of people by ensuring hiring of professional health care providers and provide for use of mobile clinics. In addition, religious leaders should be involved in decision making regarding vaccination in the aim of meeting the national vaccination coverage targets and by extension targets of the 3rd sustainable development goal (SDG).

CHAPTER ONE

INTRODUCTION

1.1 Background

Childhood vaccination is the initiation of immunity through the application of vaccines (World Health Organization, 2005). It is considered important for improving child survival. This is because more than 10 million children in developing countries die every year partly because they do not access effective interventions such as immunization that could fight common preventable childhood illnesses (WHO, 2005).

Vaccination is one of the most cost-effective approaches to avert millions of infectious diseases, episodes, and deaths across the world (Ali *et al.*, 2010). Vaccines are preparations which when given, induce an immune response, which stimulates the generation of antibodies that help fight infectious agents (Lakshmi *et al.*, 2011). Vaccination is one of the affordable and safest methods of primary prevention. It safeguards the wellbeing of children below five years of age and remains the cornerstone for the achievement of the third sustainable development goal which aspires to ensure health and well-being for all by 2030 (Plotkin, Orenstein, & Offit, 2008).

The center for disease control (CDC) asserts that vaccination is among of the top ten achievements in the public health sphere in the twentieth century. Through “herd-effect”, not only does it protect the person, but also offers protection to the community thereby impeding the circulation of the infectious agent. Childhood vaccination has a long history of success. Studies have demonstrated the huge impact vaccination has had on the chief causes of infant mortality, and how largely it influences the trends of mortality among communities. Vaccination remains one of the most economical interventions with evidence of prevention of up to 24% of the 10 million annual deaths of children under five (Sanou *et al.*, 2009). Nevertheless, vaccination has always faced multiple adversities, the most recent being suspicions

that some vaccinations are an international conspiracy targeting specific communities, particularly those in developing countries (Renne & Elisha, 2006).

To benefit from its full potential, including the positive externalities for non-immunized children, the World Health Organization (WHO) recommended that there should be complete vaccination coverage for at least 90% and 80 % of children at the country level in sub-regions respectively by the year 2010. Such an ambitious objective is quite unattainable by most developing countries for several reasons. In the Netherlands for instance, the perception of risk of infection is a determining factor in the decision of Dutch parents to vaccinate their children (Paulussen *et al.*, 2006). In many developing regions, daily living conditions govern whether or not parents seek immunization for their children (Sanou *et al.*, 2009).

Vaccination programs unfortunately face a myriad of obstacles despite their public health benefits. One obstacle is the public view of the relative risks of vaccination. Vaccine scares and abrupt spikes in demand for vaccines remind us that the effectiveness of mass vaccination programs is determined by the public perception of vaccination (Reluga *et al.*, 2006). All individuals and families evaluate perceived benefits and dangers, reflect on the value of participation, and consider probable consequences of vaccination (Ali *et al.*, 2010)

WHO recommends that all children have a right to receive one dose of bacilli-calmette Guerin vaccine (BCG), three doses of Diphtheria-Tetanus-Pertussis vaccine (DPT), four doses of either oral polio vaccine (OPV) or inactivated polio vaccine (IPV), three doses of hepatitis B, vaccine, three doses of vaccine against infection with *Haemophilus influenza* type b and one dose of a measles vaccine. Further immunizations are suggested for healthcare workers, travelers, and high-risk groups, and people in areas where the risk of specific vaccine-preventable diseases is high (WHO, 2014c).

The expanded program on immunization (EPI) in Somalia was established in 1978. The strategy used then was the organization of mobile teams and outreach services in collaboration with WHO and UNICEF. In 1980 the Epi program was expanded to provide services in primary health care clinics. Conflict in the late 1980s had a

negative impact on the program ended up completely disrupted by the end of the decade. EPI service like other health services, was substantially affected by the conflict, and towards the end of year 1992, the international community, led by UNICEF, started providing immunization services (UNICEF, 2008).

In Somalia, the vulnerability of the Somali people to vaccine-preventable diseases, such as measles and polio, remains very high. Reported vaccination coverage has been historically low, particularly in central and southern Somalia where mass vaccination activities could not be conducted since 2009 due to terrorism restrictions. In 2013, 194 people were affected by polio and 3100 cases of suspected measles were reported (WHO, 2013). Measles, which remains one of the leading causes of death among children, is highly underreported in Somalia.

The introduction in Somalia of a new five-in-one vaccine (Pentavalent) in April 2013 was an important milestone to reduce the burden of diseases that can be prevented with a vaccine. Pentavalent vaccines protect children against several potentially fatal childhood diseases, including: Diphtheria, whooping cough, Tetanus, hepatitis B, and *Haemophilus influenza* type B, bacteria that can cause meningitis and pneumonia.

This study assessed vaccination uptake and factors influencing uptake of vaccination among children aged 12-24 months in Afgoi town of Somali such as awareness and cultural practices factors such as perception, community influence, socio-economic status, maternal education, utilization of other health services, gender role, religion, trust on care provider and quality of the services.

1.2 Statement of the problem

One major way to reduce child morbidity and mortality due to common vaccine-preventable diseases is immunization. Globally vaccine-preventable diseases were reported to cause more than 20 percent of deaths of children under-five years (Centers for Disease Control and Prevention, 2015). Millennium development goals (MDG) health-related indicators for Somalia are among the worst in the world (Transitional Federal Government, 2010). For instance, the infant mortality rate was estimated at 109 out of 1,000 live births in 2009, with the mortality rate of children

under-five at 224 for every 1,000 live births. Maternal mortality was estimated as high as 1,600 per 100,000 live births in 2009. In Somalia full vaccination coverage among children aged one year old was only 34% in 2011 (WHO/UNICEF, 2016).

Globally by the end of 2013, 21.8 million children under 1 year of age had not received the three recommended doses of vaccine against Diphtheria, Tetanus, and pertussis-containing vaccine (DPT3) while 21.6 million children in the same age group had failed to receive a single dose of measles-containing vaccine (CDC, 2014). Vaccination is an affordable means of protecting whole communities from disease and reducing poverty. Vaccination coverage for the six major vaccine-preventable diseases, Diphtheria-Pertussis-Tetanus, childhood Tuberculosis, Polio, and Measles has risen significantly since the expanded program on immunization began in 1974 in the world, (CDC, 2015)

According to the Somali National immunization policy, an infant is considered fully immunized when the child receives, one dose of BCG and measles each, four doses of OPV, and three doses of Pentavalent. All the eight vaccine-preventable diseases vaccines (BCG, Polio, Diphtheria, Pertussis, tetanus, HebB, Hib, and measles) are available, free of charge, and delivered through routine immunization, outreach services, and national immunization days (NIDs) by the support of UNICEF, WHO and other NGOs. At the same time, frequent and widespread vaccine-preventable disease outbreaks occur regularly, even in areas where vaccines are accessible and available leading to high child morbidity and mortality among Somali children (WHO, 2014c). This outcome could be attributed to low vaccination uptake.

However, the factors associated with failure to vaccination uptake are still unknown. A multiple indicator cluster survey (MICS) conducted in 2011 in Somaliland indicated that about 27 percent of children received BCG vaccination, 11 percent have received three doses of DPT and 17 percent have received three doses of polio vaccine by their first birthday (UNICEF Somalia & Somaliland Ministry of Planning National Development, 2014). Only about a quarter of the infants are vaccinated against measles by the time they are one-year-old. Somalia was polio free for six years, but a new outbreak started in April 2013 which is believed to have originated

from Nigeria, with 194 cases reported in 2013. Four cases of polio were also reported in June 2014 in Mudug region Somalia. This brings to 198 the total number of polio cases in Somalia since the outbreak of the disease was confirmed in May 2013 (WHO, 2014b).

The outbreak of measles continues to be reported in Somalia. Around 4000 suspected cases of measles were reported between January and June 2014 (WHO, 2014c). Results obtained from the multiple indicator cluster survey (The World Bank, 2013) indicate that the child mortality rate in Somalia is 86/1,000 live births, meaning that one in every 12 Somali children dies before reaching the age of one year. While there are limited data on the overall burden of diseases, estimates from surveillance data indicate measles as an important cause of childhood death in Somalia. There are more than 250 mother and child health (MCH) centers and about 600 health post that provide basic health and immunization service (Somalia EPI, 2011). The MCH /OPD are networks of close-to- client outlets of primary health care unit. Mother and child health centers are operational in Somalia mainly to provide routine immunization and medical supplies from UNICEF. There is adequate provision of all eight disease preventable vaccines in Somalia by the government and development partners. However, the MOH is incapable of coordination and monitoring the expanded program of immunization and as a result cases of measles, whooping cough and polio continue to be reported.

The people residing in Afgoi town have an access to all the eight vaccine preventable diseases vaccines (BCG, Polio, Diphtheria, Pertussis, Tetanus, HebB, Hib and measles). Vaccines are available, free of charge and delivered through routine immunization, outreach services and NIDs by the support of UNICEF, WHO and other nongovernmental organizations (NGOs). At the same time, frequent and widespread vaccine preventable disease outbreaks continue to be reported from Afgoi town, resulting high child morbidity and mortality rate (UNICEF, 2015).

1.3 Broad Objective

To determine factors influencing vaccination uptake among children aged 12-24 months in Afgoi town, Somalia.

1.3.1 Specific objectives

- 1.To determine the vaccination coverage of childhood vaccines among children aged 12- 24 months in Afgoi town, Somalia
- 2.To determine the knowledge of caregivers on the importance of vaccination of children aged 12- 24 months in Afgoi town, Somalia
- 3.To determine the socio-demographic characteristics influencing uptake among children aged 12-24 months in Afgoi town, Somalia.
- 4.To determine healthcare-related factors, cultural and religious aspects affecting uptake among children aged 12-24 months in Afgoi town, Somalia.

1.4 Research questions

1. What is the vaccination coverage of childhood vaccines among children aged 12- 24 months in Afgoi town, Somalia?
- 2.What is the level of caregivers on the importance of vaccination of children aged 12- 24 months in Afgoi town, Somalia?
- 3.What are the socio-demographic characteristics influencing uptake among children aged 12-24 months in Afgoi town, Somalia?
- 4.What are the healthcare-related factors, cultural and religious factors influencing uptake among children aged 12-24 months in Afgoi town, Somalia?

1.5 Conceptual Framework

The conceptual framework illustrates the variables to be studied. In this study, the independent variables are the vaccination coverage factor. Knowledge of caregivers, cultural beliefs, and practices while the dependent variable is vaccination uptake among children aged 12-24 months in Afgoi town, Somalia.

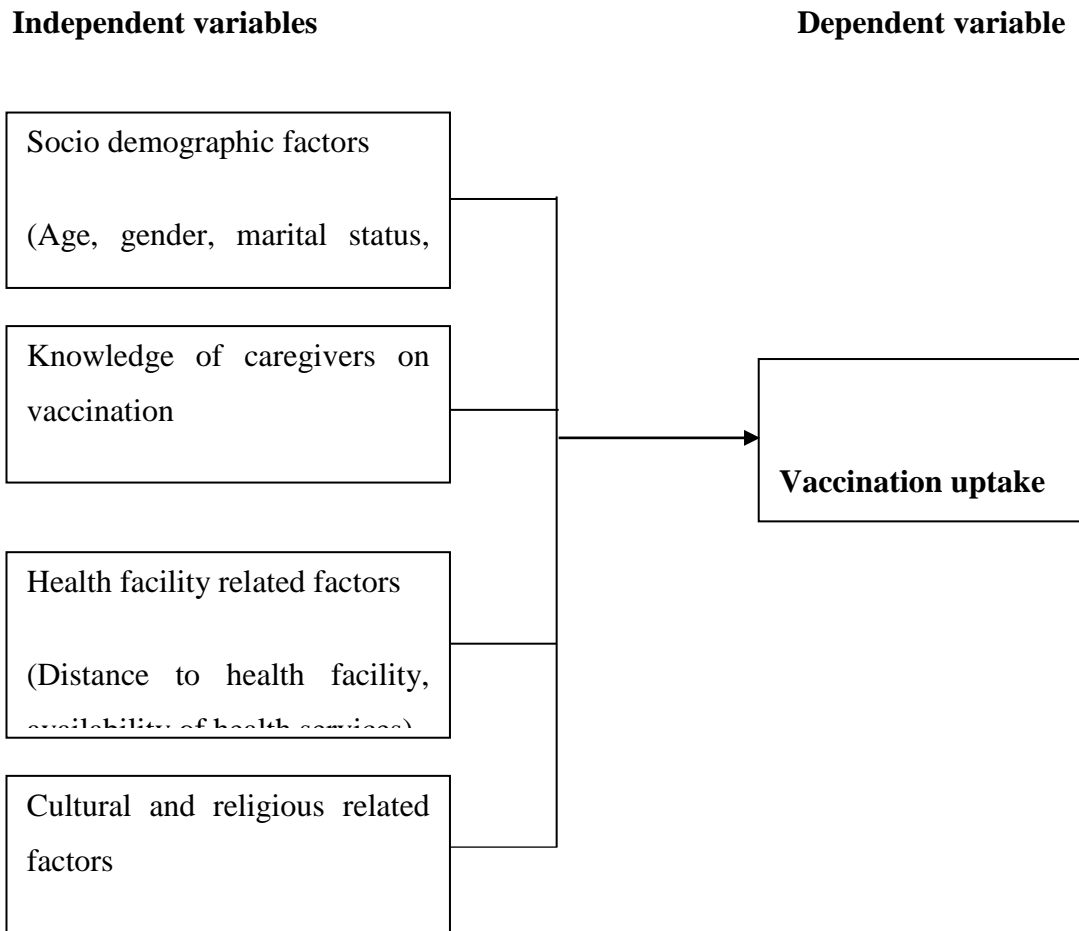


Figure 1.1: Conceptual framework, relationship between independent variables and vaccination uptake

1.6 Justification of the study

Vaccination is one of the most cost-effective public health interventions to date, saving millions of lives, and protecting countless children from illness and disability. Eradication of smallpox is directly attributed to vaccination and polio is on the verge of eradication because of vaccination. Deaths due to measles, a major cause of child mortality, declined by 71% globally and by 80% in sub-Sahara Africa between 2000 and 2011 (CDC, 2015). The gains attained by vaccination need to be maintained and enhanced through understanding the hindrances and enablers of vaccination uptake globally, regionally, nationally and community level.

This study provided information on vaccination uptake and factors influencing vaccination uptake which will be valuable to partners providing immunizations services in the area, to develop focused interventions in Afgoi and other areas of similar background. The finding of this study will provide policymakers and NGOs (non-governmental organizations) with relevant baseline information for future planning and interventions for appropriate strategies to promote and maintain optimal use of immunization. Also, the findings of this study will help as baseline data for those who are interested in carrying out further research with this regard.

1.7 Scope of the study

The study was limited to mothers/care-givers that have a child aged 12-24 months residing in Afgoi town. Households with at least one child aged 12-24 months were eligible for the study. In the case of twins, both children were included. Households without children aged between 12-24 months were not included. The study was carried out in Afgoi town beginning 1st May 2017 to 31st October 2017.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Vaccination is one of the safest modes of disease prevention. Through time, vaccines and the process of vaccination have evolved making the process more scientific, with lesser side-effects and more recipient friendly (Regmi, 2014). Immunization will become more effective if the child can receive the full course of recommended immunization doses. However, due to various circumstances, many children fail to complete the course of immunization, which will result in lowered effectiveness of the immunization program in reducing childhood morbidity and mortality.

2.1.1 History of Immunization

The history of immunization begins with Edward Jenner, a country doctor living in Berkeley (Gloucestershire), England, who in 1796 performed the world's first vaccination (Baxby, 1981, 2001). The foundation of modern vaccinology can be traced to Jenner's conclusions that cowpox infection could protect humans from smallpox (Jenner, 1978).

The eradication of smallpox was an outstanding display of concerted global action in a war against microbial invaders (WHO, 2005). The progress in expanding poliomyelitis and measles vaccination efforts and their elimination from many regions further demonstrate that vaccines are among the most powerful public health tools. National vaccination programs, which grew out of the smallpox eradication initiative, have developed in many countries through the administrative, technical, and financial support of UNICEF, WHO, and many bilateral or multilateral partner agencies (WHO, 2005). In its 1993 World Development Report, the World Bank classified vaccination as one of the most cost-effective public health interventions (Gordis, 2002). Moreover, vaccination programs have been said to provide one of the most equitable of public health programs, providing protection to the entire population when successfully implemented.

The WHO created the Expanded Program on Immunization (EPI) in 1974 as a means to continue the great success that had been achieved earlier with the eradication of smallpox. At that time less than 5 percent of the world's children in the developing world were receiving immunization. The six diseases chosen to be tackled under this new initiative were tuberculosis, diphtheria, tetanus, pertussis, polio, and measles. It was not until 1988 that the WHO recommended that the yellow fever vaccine be added to the national immunization programs of those countries with the endemic disease (WHO, 2005).

2.2 Overview of vaccination coverage

Globally vaccination coverage among children below one year is about 84% though there is variance across regions. For instance, the vaccination coverage in America, Europe and Western Pacific region is above 90%. In African countries such as Nigeria, Ethiopia, Democratic Republic of Congo, South Africa and Kenya lower the rates of vaccination coverage is very low (50%) (Harris, Gacic-dobo, Eggers, Brown, & Sodha, 2017).

In Somalia, all data available from national surveys and from national HMIS report indicate low EPI coverage among the children. A multiple indicator cluster survey MICS conduct in 2011 in Somaliland report indicated that about 27 percent of children received BCG vaccination, 11 percent have received three doses of DPT and 17 percent have received three of polio vaccine by their first birthday. Only about a quarter are vaccinated against measles by the time they are one- year-old (UNICEF Somalia & Somaliland Ministry of Planning National Development, 2014).

Another similar, EPI survey report conducted in 2008 in Somaliland intended to represent whole Somalia has revealed that BCG coverage was about 44 percent, DPT3 31 percent, Polio3 31 percent, and measles 29 percent. The survey has revealed a high drop-out rate in Somaliland immunization programs. The drop-out rate from DPT 1-DPT 3 (card +history) was 25.4% in routine EPI programs. The main reason noted for failure to immunize children was due to lack of vaccines, 37% were not immunized due to lack of vaccine, 11% were not aware of the need of

immunization, 8% either found vaccination place too far and an equal number of mothers were too busy to take their children for immunization (Somalia EPI, 2011).

2.3 Vaccination coverage factors

Various access factors may influence vaccination coverage of the children. Care provider trust, distance from the health facility, occupation and family income, staff attitudes, and service delivery. Social mobilization, place of birth, and geographical location of the vaccination site also have an impact on vaccination coverage. The role of access on vaccine uptake reflects in the impact of regular contact with the health care system. The following are predictor factors of vaccination coverage.

2.3.1 Socio-demographic factors

2.3.1.1 Age

Studies have documented that caregiver's age is likely to influence vaccination uptake. Caregivers with ages above 35 years seem to be more likely to vaccinate their children as compared to teen mothers (Chidiebere, Uchenna, & Kenechi, 2014). Younger mothers are not able to adhere to the vaccination schedule of their children since some could still be going to school or being overwhelmed by the burden of childcare (Anello *et al.*, 2017). Additionally, elderly caregivers are more likely to vaccinate their children as they have experience in childcare and knowledge on the importance of childhood vaccination which increases with age (Chidiebere *et al.*, 2014).

2.3.1.2 Gender

In some regions, gender discrimination in regard to child vaccination has been reported. For instance, in India, some households are more likely to vaccinate boys as compared to girls (Choi & Lee, 2006; Corsi *et al.*, 2009). Interestingly in other regions for instance Nigeria male children defaulted vaccination more as compared to female children (Azhar *et al.*, 2012). The gender discrimination in vaccination uptake is unfortunate and it could be associated with beliefs that boys are hardy and therefore need less of care as compared to girls while other communities hold boys in

high regard and thus discriminate against girls. Though this is still debatable more information is necessary to bring more light to this unfortunate occurrence in some regions and communities.

2.3.1.3 Marital status

The marital status of caregivers may influence their decision making regarding the following of their children's vaccination schedule (Anokye et al., 2018). For instance, based on a study done in Italy single mothers were reported to less likely to adhere to vaccinating their children (Anello et al., 2017). Other studies have also concluded that marital status significantly influences adherence to child vaccination (Falagas & Zarkadoulia, 2008). On the contrary other studies have reported marital status to have no significant influence on vaccination uptake (Azhar et al., 2012).

2.3.1.4 Parental education

Vaccination-related decisions along with other aspects of a child's health were generally made within the immediate family by one or both parents, commonly the mother given her role as the primary caregiver and the one who spends the most time with the child (Bingham et al., 2012).

Maternal education level is a vital factor governing parents perceive vaccination and hence its uptake. Studies have reported maternal education as one of the key factors associated with immunization uptake (Hu *et al.*, 2013; Maina *et al.*, 2013). For instance, studies conducted in the United States, India, and Nepal revealed that children from low socio-economic backgrounds and whose parents had low education levels had a lower likelihood of being vaccinated (Basel & Shrestha, 2012; Choi & Lee, 2006; Smith *et al.*, 2006). Ideally, parents with some level of education are able to understand the importance of vaccination. They are also able to understand explanations regarding vaccination schedules as well as plan for vaccination attendance.

2.3.1.5 Occupation and family income

The occupation of mothers as well as that of their partner is imperative in the realization of full childhood immunization. Children with parents who held white-color jobs had more advantage over those whose parents were in agriculture, blue color jobs, and service/sales (Bbaale, 2013). Overall, immunization coverage is lowest among the poor population and peripheral areas largely because of the inability to afford transportation to take the child to the immunization facility (Han et al., 2014; Streefland, 2003).

Studies indicate that parents of low socioeconomic status (low annual income and low level of education among others) were hardly likely to be up-to-date with newer vaccines and hence their children were less likely to get these vaccines (Bardenheier et al., 2004; Basel & Shrestha, 2012; Hu et al., 2013). Research done in the United States suggested that children from low socio-economic background and low paternal education level were less likely to be vaccinated as their parents were barely up-to-date with the vaccines compared to their wealthy counterparts (Smith et al., 2006). Similarly, according to Breiman et al. (2004), children in Bangladesh whose mothers had an asset score above the poorest had complete DPT immunization status by 9 months of age.

2.3.2 Health facility-related factors

2.3.2.1 Health education

Effective public health communication strategy is very crucial when it comes to public health-related issues such as vaccination. Educating caregivers on the importance of vaccination and adhering to vaccination schedules leads to behavior change and enhanced vaccination uptake. The use of mass media in channeling health information to people aids in shifting the public's perception of vaccination (Reluga et al., 2006). Additionally, information regarding vaccination is also passed to people by healthcare providers who are a core component of the healthcare system (Bbaale, 2013). For instance, studies have reported that caregivers who receive advice during their immunization visits are more likely to have their children fully

vaccinated (Maina et al., 2013). Likewise, in another study, community members cited lack of information regarding the specific vaccine, vaccination scheduling, and timing of services as some of the most common limitations to having a child vaccinated.

2.3.2.2 Knowledge of vaccination

Knowledge of the purpose and significance of vaccination substantially influences parents' decision making at the family level regarding vaccinating their children (Lorenz & Khalid, 2012). The information on the importance of vaccination should be passed to people by the health practitioners, additionally, the practitioners should be in the capacity to build a relationship based on trust with the patients (Peckham *et al.*, 1989). A trust-based relationship with patients will help to ensure effective communication. Studies have documented that inadequate knowledge of immunization by caregivers is a major factor associated with children defaulting vaccination (Abdulraheem *et al.*, 2011; Coreil *et al.*, 1989; Onyiriuka, 2009). Studies have also recommended that the deployment of vaccination teams in communities to raise awareness of the importance of vaccination could serve as a key strategy in enhancing vaccination uptake (Lorenz & Khalid, 2012).

2.3.2.3 Trust on care providers

The maternal trust of the care provider is another factor that motivates mothers to vaccinate their children. Friendly relationships, caring, and giving information regarding the vaccines will encourage mothers to use the service and immunize their children timely. Less skilled care providers and the negative attitudes of the staff discourage mothers from vaccinating their children.

A study investigating factors governing maternal decision making pertaining to their infant's vaccination reported that mothers who had an open and trusting relationship with their care providers were more likely to accept vaccination compared to mothers whose care providers could not address the maternal concern and offer ample time and information concerning vaccination to the mothers. In such instances, they were highly likely to reject vaccinations and be steered to alternative forms of medicine

such as homeopathy (Benin *et al.*, 2006). According to Smith *et al.* (2006), by building a trusting and respectful relationship with parents, health care providers can positively influence the parents towards having their children vaccinated specially when the parents express concerns about vaccine safety.

In an internet-based survey on parental attitude towards vaccination, most respondents named their pediatrician as the main source of information regarding vaccination (Heininger, 2006). This shows that health care providers play an enormous role in the uptake of vaccines and they should thus be encouraged to positively influence parents in matters vaccination of children by providing scientific information, addressing their concerns, and keeping an open channel for discussion.

2.3.2.4 Distance from the health facility

The distance of the vaccination site or health facility also affects vaccination coverage, especially, in the context of developing countries. Studies have concluded that proximity to health facilities significantly influences vaccination uptake among children (Breiman *et al.*, 2004). Furthermore, rural areas are also disadvantaged due to poor road networks which even become worse during rainy seasons hence further limiting access to health centers (Bbaale, 2013; Han *et al.*, 2014). Additionally, few healthcare facilities in rural areas contribute to long queues and long waiting times which discourages caregivers from vaccinating their children (Bingham *et al.*, 2012). In urban areas where there are potentially better healthcare facilities, children are more likely to get fully immunized (Choi & Lee, 2006).

2.3.2.5 Availability and accessibility of vaccination services

Access to health facilities such as antenatal and place of delivery are other factors that are associated with the immunization uptake of the children. Studies indicate that mothers who attend antenatal care (ANC) and give birth at a health facility are more likely to fully vaccinate their children as antenatal clinic is a means for women to be aware of immunization (Mutua *et al.*, 2011; Oyo-Ita *et al.*, 2011; Takum *et al.*, 2011). For example a child born in a health unit was significantly more likely to have been

vaccinated with BCG which is given immediately after birth, and to be up to date with their vaccination compared to a child delivered at home (Odiit & Amuge, 2003). Additionally, studies done in Nigeria and Columbia have reported that health care practitioner's advice to caregivers during antenatal care visits positively influences mothers to vaccinate their children (Adeyinka, 2012; Bigham *et al.*, 2006).

2.3.3 Cultural beliefs and practices factors

Culture has a big influence on human behavior and attitude towards childhood vaccination. Cultural beliefs will normally vary at the community, regional, and international levels. Studies have suggested that cultural forces in some communities result in a negative attitude towards vaccination (Browne *et al.*, 2015). For instance the polio controversy in Nigeria where Muslim children were not vaccinated due to cultural beliefs that Muslims should not be vaccinated and that those who die from the disease become martyrs resulted in the spreading of polio in Nigeria and neighboring countries (Lorenz & Khalid, 2012). Additionally, in some cultures fathers and paternal grandmothers are responsible for deciding if a child will be vaccinated or not and they thus become a focal point in vaccination promotion strategies (Dugas *et al.*, 2009).

2.3.3.1 Parental perception

Parental perception of vaccines normally influences parental attitudes towards vaccinating their children (Lorenz & Khalid, 2012). The outlook of parents pertaining vaccination plays a huge role in the decision to utilize a vaccination program. An intense desire to keep the children and the community healthy and protect them against diseases was a constant theme that drove people to have their children vaccinated (Bingham *et al.*, 2012). For instance, in a study conducted on National safety by the CDC it was shown that parents who perceive vaccines as safe were more likely to have their children vaccinated relative to those who were neutral and those who supposed that vaccines were unsafe (Allred *et al.*, 2005). Furthermore, parents who considered vaccines as safe had a higher likelihood of having their decision to vaccinate their children being influenced by the health care provider, compared to parents who believed that vaccines are not safe (Smith *et al.*, 2006).

Another research conducted in Mozambique indicated that the strong desire to uphold the health of children and the community at large as well as protecting them from diseases motivated caregivers to have their children vaccinated, as most of them understand that vaccinations significantly benefitted the child and family (Bingham *et al.*, 2012).

Despite the relatively low risk of vaccines compared to its benefits, parental fear is a huge obstacle to the optimal uptake of vaccines by the children (Tickner *et al.*, 2006). It was shown in a study that parents were more likely not to get children vaccinated because of the concerns about side-effects (Bardenheier *et al.*, 2004; Gust *et al.*, 2008).

2.3.3.1 Religion

Religion and spirituality are fundamental components of socio-demographics (rural cultural). They substantially influence how vulnerability to infection and severity to infection are perceived (Thomas *et al.*, 2015). People highly respect religious leaders and they can, therefore easily convince members of their congregation to accept or reject vaccination (Ruijs *et al.*, 2013). For instance, in 2003 in Nigeria, children from a Muslim background were not subjected to polio vaccine since the Muslim religion believed that polio drops were employed as a means for causing sterility in the children and had been disdained by community leaders. This contributed to a significant upsurge of polio cases in that region (Kapp, 2003). A similar was reported in Pakistan whereby several religious and tribal leaders voiced their concern that the polio campaign was a Western conspiracy to control the Muslim population (Khan, 2010; Lorenz & Khalid, 2012).

Studies carried out in India and Bangladesh have documented that non-Muslims are more likely to vaccinate their children as compared to Muslims (Ali *et al.*, 2010; Borooah, 2004; Breiman *et al.*, 2004; Choi & Lee, 2006). Likewise, a study conducted in the Netherlands showed that municipalities and geographical entities with Orthodox protestant denominations (OPD) had significant lower vaccination coverage than municipalities without OPDs (Ruijs *et al.*, 2011).

2.3.3.2Community support

In the declaration of Alma Ata on primary health care; which stated- “the people have right and duty to participate individually and collectively in planning and implementation of their health care”, community participation in promoting and sustaining health was advocated (WHO-Unicef, 1978). The perception and their participation of the community in vaccination programs positively reinforces parental perception. Concerns of parents concerning safety of vaccines occurs within the community context and may be shared by other parents in the same community (Smith *et al.*, 2006).

In Canada, an investigation showed that most of the people who were not vaccinated against H1N1 were incited by family members or friends. Participants who did not get vaccinated had family members or friends who discouraged them by giving negative information regarding vaccination (Boerner *et al.*, 2013). It was reported in another study that parents who had firsthand experience with children having Autistic disorder were less likely to immunize their children due to influence from family, friends, or work (Wroe *et al.*, 2005).

2.4 Critique of existing literature

In most of the developing countries, husband is the head of the family and he is the one who decides all issues of care-seeking, including immunization and treatment, where mothers have little chance to oppose or refuse any decision made by her husband, for example, the area of this study, all immunization refusals are believed being affected by the decision made by the father of the child where the mother does not have say at all concerning the vaccination and treatment of her child even if she wants to vaccinate her child. This is one of the challenges faced by the staff in vaccination centers. After reviewing dozens of studies and other publications related to this topic, all studies concentrate only on mothers and put all responsibility to the mother and ignore the role of the father in terms of decision making and resource management. It is that millions of children living in the third world especially in Africa are missing the opportunity of getting immunization due to the refusal of their fathers.

A nationwide, research done in Bangladesh in 2006, the researchers had used old secondary data only, which were extracted from demographic and health surveys previously conducted in Bangladesh. A similar study done from March 2010 until March 2013 in refugee camps of Afghan refugees in Kerman Iran, researchers had used only secondary data extracted from immunization records. In a research conducted in Lagos University teaching hospital in April 2009, the study design was descriptive but the researcher had used a convenience sampling technique instead of a probability sampling technique. In a study done in Yenopoya Hospital Mangalore India, and published in 2013, a small sample of 30 mothers was used.

The limitations of the studies reviewed are that they were based on secondary data which is at times obsolete, small, inaccurate, general, and vague and might therefore be inappropriate in decision making or giving recommendations. Additionally, some of the studies employed convenient sampling to collect data thus introducing some biases into the data.

2.5 Summary

The literature revealed that there is low vaccination coverage among children between 12-24 months in low economic countries such as Somalia. Studies from different countries cited key enablers and barriers to vaccination uptake to be; socio-demographic factors such as age, educational level, and marital status, health facility-related factors such as health education, distance to the health facility, and availability of health services. Furthermore, literature from a wide pool of studies documented cultural and religious believes as key barriers to vaccination uptake especially among the Muslim community which is the predominant religion in Somalia. Additionally, some studies also concluded that family members, friends, and community leaders had a significant influence on parent's perception towards vaccination.

2.6 Research gaps

According to the WHO immunization recommendation, all children should receive their scheduled doses before their first birthday. Determining immunization uptake is

very important to program planning and program performance measurement. Currently, there is no scientific study for immunization uptake done in Afgoi town. The only available data is on the national vaccination uptake in Somalia. Furthermore, the infant mortality rate in Somalia is still high which is further confounded by reports of measles outbreak. Additionally, the barriers and enablers of ensuring full vaccination in Somalia and more precisely Afgoi town are not well understood and documented. Therefore, this research will determine the level of immunization uptake and the factors influencing vaccination uptake among children aged 12-24 months in Afgoi town Somalia.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology refers to ways of obtaining, organizing and analyzing data and it dependent on the nature of research questions (Polit, 1999). This chapter presents the methodology that the study followed. It explained the research design; study area, population, sample size, sampling techniques and procedure; data collection instruments, method of testing the validity and reliability of instruments; the research procedure followed, and the data management and analysis techniques used in conducting the study.

3.2 Research design

A descriptive cross-sectional household-based study design was conducted to obtain a clear picture of vaccination coverage and uptake influencing factors. The benefit of using this design is that it is generally quick and cheap since fewer resources are required to run this study.

3.3 Study site

The study was conducted in Afgoi town, the administrative capital town of Afgoi district in the Lower Shabelle region. The town geographically lies along the Shabelle River. It is located 30 Km south-west of Mogadishu, the capital city of Somalia. It borders Mogadishu to the east, Wanlaweyn district to the north, Qoryoley district to the west, and Merka district to the south. Administratively, the town is divided into twelve sections. According to the 2014 UNDP population estimation, Afgoi town has a total population of 67,350 with the wealth breakdown of 40% poor, 50% middle, and 10% better-off. The town's inhabitant's main source of income includes livestock, small scale farming, and petty trade, remittances from abroad, self-employment, insignificant salaried jobs, and small-scale fisheries. Afgoi town is accessible by road and mainly linked to Mogadishu. The town has one district hospital and four MCHs run by local and international NGOs.

3.4 Study population

This study was conducted in Afgoi town with a study population of 2694 (4% of the total population living in Afgoi town). The study population was all children aged between 12-24 months permanently living in Afgoi town and out of these, 348 children were sampled. Then Mothers or caregivers were asked factors influencing vaccination coverage and uptake.

3.5 Sample size determination

The required sample size will be determined by using Slovin's formula as described by Stephanie, (2012). This formula is appropriate since it does not require prerequisite knowledge of the proportion of vaccination coverage in Afgoi town as compared to other formulas.

$$n = \frac{N}{1 + Ne^2}$$

Where:

n= Sample size

N= Population

e= desired margin of error (normally set at 5% or 0.05)

$$n = \frac{2694}{1 + 2694(0.05)^2}$$

n= 348

3.5.1 Sampling technique

The town was demarcated based on its population and section-wise distribution. In Afgoi town there are 12 sections with a study population of 2694 (4% of the population). Simple random sampling was used to select four sections from the 12 sections. Then, according to the population of each section, the probability per site

sampling was used. The number of caregivers/mothers interviewed in each of the sections is tabulated below:

Section	Number of caregivers/mothers
Balguri	126
Elqode	112
Bandar-jadid	57
Bulo-folyo	53

3.5.2 Sampling frame strategy

Figure 2 further shows how the sampling strategy was implemented

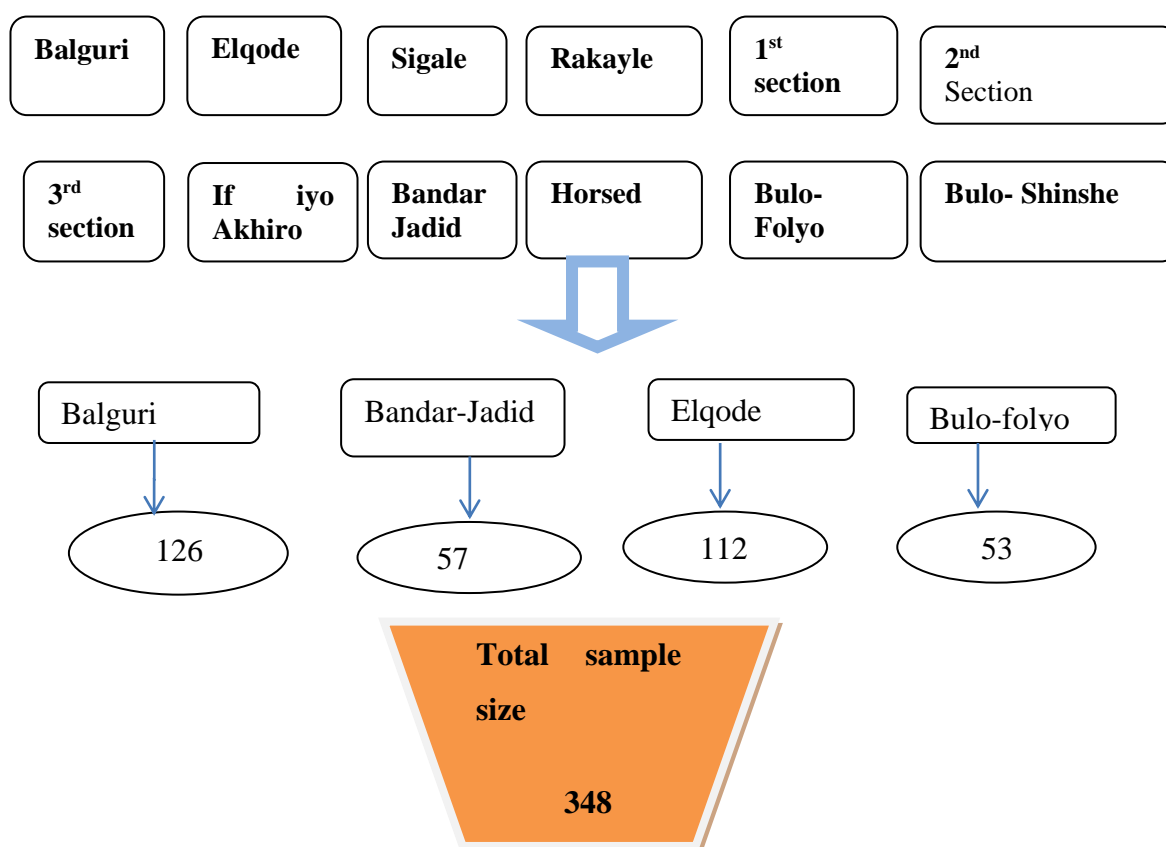


Figure 3.1: Study sample frame strategy

3.5.3 Selection of households

Systematic random sampling was used for selection of households. The sample interval was determined as follows.

$$\text{sampling interval} = \frac{N}{n}$$

Where;

N= population size

n= sample size

$$\text{sampling interval} = \frac{2694}{348}$$

Sampling interval = 8

The starting point was selected blindly, and then every 8th household was picked until required sample size is achieved.

3.6 Exclusion and inclusion criteria

3.6.1 Inclusion criteria

Participants in this study included all all children aged 12-24 months permanently living in Afgoi whose parents consented. Additionally, all established households with at least one child aged between 12- 24 months were also included.

3.6.2 Exclusion criteria

The study excluded all children aged 12-24 months who were visiting and were not residents in Afgoi town including children below 12 months or above 24 months of age. In addition, households with no 12-24 months of age children and cchildren aged 12-24 months whose parents did not consent were also excluded.

3.7 Data Collection Instruments

A structured questionnaire was designed under the guidance of the supervisors to collect information from the mother or caregiver (Appendix II). The structured questionnaire included both closed and open-ended questions and was translated into the Somali language to extract data from the selected respondents. The structured questionnaire was divided into 3 parts, greatly focusing on: vaccination coverage factors; knowledge factors and cultural beliefs and practices influencing vaccine uptake

3.8 Pilot test

Mugenda and Mugenda, (2003) Suggests that pre-testing allows errors to be discovered as well as acting as a tool for training of a research team before the actual collection of data begins. The research tool was pre-tested to increase the validity and reliability of the response. Expert views and suggestions of the supervisor were incorporated in the questionnaires. Pretesting was done on 40 respondents from the households of the target population, in one of the sections not selected for the study. As a result of the pilot test, a change in word selection, language, and other necessary changes were made to the questionnaires. Regular cross-checking, inspection, and scrutinizing of information on the research instrument was done to ensure accuracy, relevance, completeness, consistency, and uniformity of the data collected.

3.9 Data collection procedure

A questionnaire was administered to collect the data from the mother or caregiver by four experienced midwives who have knowledge of immunization and also conversant with the Somalia language. Prior to fieldwork, midwives were trained on the concept of the study and with a clear understanding of the questionnaire and data collection process. They were deployed to the selected sections. The midwives contracted to do the data collection started interviews with first explaining the reasons for the interview to respondents. Respondents who consented were then interviewed privately for about 15 to 20 minutes. At the end of the day, a debrief was

held between the principal investigator and the midwives. The recommendations from the debrief were used to improve the consecutive data collection process.

3.10 Data processing and analysis

Data obtained from respondents was cleaned, coded and data entry done. The data was analyzed using Statistical Package for Social Scientists SPSS (version 20). Descriptive statistics such as frequencies (percentages) was used to describe socio demographic characteristics. Chi square was also use to determine associations between knowledge and vaccination uptake. Binary regression analysis was also done to identify socio demographic factors, health facility related factors, religious and cultural factors having influence on vaccination uptake. Data was the presented using tables and a pie chart.

3.11 Ethical considerations

The ethical clearance for the study was sought from the Pwani University Ethical Review Committee through JKUAT Environmental Health and Disease Control Department. Permission was also sought from the Somali ministry of health.

Respondents were assured that their participation was voluntary and that they could withdraw from the study at any time. Informed consent was obtained before the administration of the questionnaire (Appendix I). Participants were informed that participation in the study would not have any risks, financial benefits and the interview would take approximately 15 to 20 minutes per participant. To ensure privacy and confidentiality, all in-depth interviews were carried out in designated private rooms. Completed study tools were stored under lockable cabinets. All data was saved under password-restricted computers. Only study-related personnel would have access to study materials.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter focuses on presentations and interpretations of the study findings. The main aim of the study is to determine vaccination uptake among children aged 12-24 months in Afgoi town Somalia as well as the socio demographic, health facility related factors, religious and cultural factors influencing vaccination uptake. This chapter details the data analysis and presents the discussion of the study findings. This study was carried out from September 2016 to March 2017.

4.2 Response rate

From the study, the target population was 348 out of which 343 respondents were interviewed. This constituted a response rate of 98.5% which was sufficient for the study.

4.3 Socio demographic characteristics of caregivers

Over 90 % of the respondents were over 18 years old, 22.2% of the respondents were 18- 24 years old, 36.4 % were 25- 34 years old and 38.5 % of the respondents were 34- 45 years old. A majority of the respondents that is 96.2 % were female while 3.8 % were males. Over two thirds of the respondents were married, 16.3 % were divorced, 4.7% were widowed and 5.2 % were single. Most of the respondents 79% had attained informal education, 17.5% and 3.5% had attained primary and secondary education respectively.

Table 4.1: Socio demographic characteristics of caregivers of children aged 12-24 months living in Afgoi town Somalia

Variables	Frequency	Percentage
Age of caregiver		
<18yrs	7	2.0
18-24yrs	76	22.2
25-34yrs	125	36.4
35-45yrs	132	38.5
>45yrs	3	.9
Gender		
Female	330	96.2
Male	13	3.8
Marital status		
Single	18	5.2
Married	253	73.8
Divorced	56	16.3
Widowed	16	4.7
Level of education		
Informal education	271	79
Primary	60	17.5
Secondary	12	3.5
Relationship of caregiver to the child		
Mother	285	83.1
Father	26	7.6
Grandmother	27	7.9
Sister	5	1.5
Age of the Child		
12 months	124	36.2
13-18 months	162	47.2
19-24 months	57	16.6
Occupation		
Housewife	162	47.7
Daily laborer	78	22.9
Farmer	68	20
Salaried employee	15	4.4
Business	17	5.0
Monthly income		
<50 USD	93	27.3
50-100 USD	119	34.9
100-200 USD	62	18.2
>200 USD	67	19.6

More than three quarters of the respondents (83.1%) were mothers to the children included in the study while 7.9 %, 7.6 % and 1.5 % of the respondents were grandmothers, fathers and sisters to the children included in the study. Close to half of the children studied were between 13-18 months old while 36.2% and 16.6% of the children were 12 months and 19-24 months old respectively. Approximately half of the caregivers were housewives, 22.9% were daily laborers, 20% were farmers, 4.4% were salaried employees and 5% were in business. A third of the caregivers had a monthly income of 50 to 100 USD while 27.3%, 19.6%, and 18.2% had a monthly income of less than 50USD, over 200 USD, and 100-200 USD respectively.

4.4 Vaccination coverage

Over two-thirds of the children were partially vaccinated, 25.6% had not received any vaccination and only 4.4% of the children were fully vaccinated.

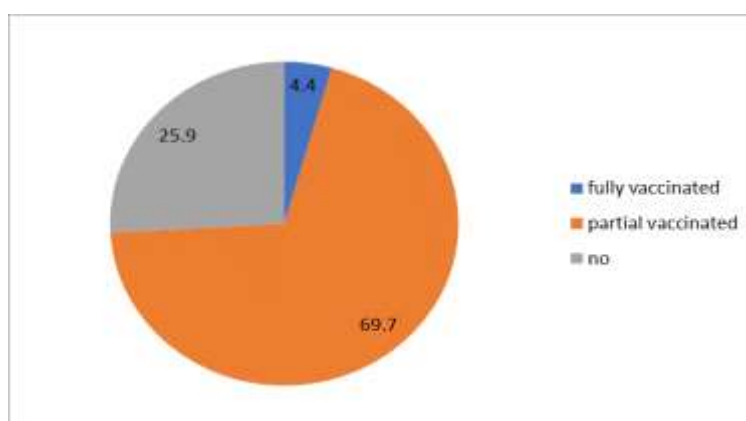


Figure 4.1: Proportion of vaccination uptake among children aged 12-24 months in Afgoi town Somalia

Caregivers' knowledge on vaccination

Almost all the caregivers that is 99.7% had heard about vaccines and vaccine preventable diseases. Over 80 % of the caregivers were aware that the purpose of vaccination was to avert particular diseases and for child health. However, 10.5 % of the caregivers were not cognizant of the importance of vaccination. Only 14.8 % of the caregivers were aware of all the vaccine preventable diseases

Table 4.2: Caregivers level of knowledge on vaccination of children aged 12-24 months

Knowledge on vaccination	Frequency	Percentage
Have you heard about vaccines and vaccine preventable diseases		
Yes	339	99.7
no	1	0.3
Importance of vaccination		
To prevent diseases	185	54.1
For specific diseases	81	23.7
For child health	40	11.7
I don't know	36	10.5
Vaccine preventable diseases		
Measles	83	54.1
Tetanus	16	4.7
Pertussis	2	0.6
Diphtheria	10	3.0
Polio	69	20.4
Tuberculosis	3	0.9
Hepatitis B	4	1.2
Homophelius influenza B	1	0.3
All of them	50	14.3
Age at which a child begins vaccination		
Immediately after birth	159	46.5
40 days after birth	55	16.1
Any time	37	10.8
After one year	84	24.6
I don't know	7	2.0

Over half of the caregivers (54.14 %) and 20.14 % of them were aware that measles and polio were vaccine-preventable diseases respectively. However, cumulatively less than 11% of the caregivers were aware that tetanus, pertussis, diphtheria,

tuberculosis, hepatitis B, and Haemophilus influenza B were vaccine-preventable diseases.

Table 4.3: Association of knowledge on vaccination with vaccination uptake among children aged 12-24 months

Characteristic	No vaccination (n = 89)	Partial vaccination (n= 239)	Full vaccination (n = 15)	P value
	n(%)	n(%)	n(%)	
Have you heard about vaccines and vaccine preventable diseases				0.238
Yes	87(25.7)	237(69.9)	15(4.4)	
no	1(100)	0(0)	0(0)	
Importance of vaccination				
To prevent diseases	44(23.8)	133(71.9)	8(4.3)	
For specific diseases	10(12.3)	67(82.7)	4(4.9)	<0.001
For child health	8(20)	30(75)	2(5)	
1 don't know	26(74.3)	8(22.9)	1(2.9)	
Vaccine preventable diseases				
Measles	33(18)	145(79.2)	5(2.7)	
Tetanus	4(25)	12(75)	0(0)	
Pertussis	2(100)	0(0)	0(0)	
Diphtheria	4(40)	6(60)	0(0)	<0.001
Polio	29(42)	36(52.2)	4(5.8)	
Tuberculosis	3(100)	0(0)	0(0)	
Hepatitis B	2(50)	2(50)	0(0)	
Homophelius	1(100)	0(0)	0(0)	
influenza B				
All of them	10(20)	35(70)	5(10)	
Age at which a child begins vaccination				
Immediately after birth	66(41.5)	84(52.8)	9(5.7)	
40 days after birth	3(5.5)	49(89.1)	3(5.5)	<0.001
Any time	14(37.8)	23(62.2)	0(0)	
After one year	0(0)	81(96.4)	3(3.6)	
1 don't know	6(85.7)	1(14.3)	0(0)	

Knowledge on importance of vaccination ($p < 0.001$), knowledge on vaccines and vaccine preventable diseases ($p < 0.001$) and knowledge of the age at which children begin vaccination ($p < 0.001$) were found to be associated with vaccination uptake.

4.5 Socio demographic factors influencing vaccination uptake

There was no socio demographic factor that was found to significantly influence vaccination uptake among children aged 12-24 months. There were therefore no sociodemographic barriers and facilitators of vaccination uptake.

Table 4.4: Socio demographic factors influencing vaccination uptake among children aged 12-24 months

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Caregivers age	.138	.160	.741	1	.389	1.148	.839	1.570
	Gender	-.242	.712	.116	1	.734	.785	.195	3.168
	Marital status	.285	.228	1.564	1	.211	1.330	.851	2.078
	Relationship to child	-.317	.168	3.555	1	.059	.729	1.524	1.913
	Age of child	.347	.191	3.294	1	.070	1.415	.973	2.059
	Level of education	.241	.308	.610	1	.435	1.272	.695	2.328
	Occupation	-.043	.103	.176	1	.675	.958	.783	1.172
	Monthly income	.168	.136	1.523	1	.217	1.183	.906	1.545
	Constant	-.535	.974	.302	1	.583	.586		

a. Variable(s) entered on step 1: Caregivers age, Gender, Marital status, Relationship to child, Age of child, level of education, occupation, income.

4.6 Health facility-related factors influencing vaccination uptake

Health facility-related factors that significantly influenced vaccination uptake among children aged 12-24 months were healthcare provider friendliness ($p < 0.001$) and availability of vaccines ($p < 0.001$). Women who reported that healthcare providers were not friendly were 73% less likely to take their children for immunization [(Crude OR = 0.27, 95% CI = 0.151 – 0.499)]. Women who reported vaccines were not available were 51.8% less likely to take their children for immunization [(Crude OR = 0.482, 95% CI = 0.323 – 0.720)]. Therefore, healthcare provider friendliness and unavailability of vaccines were significant health facility-related barriers to vaccination uptake.

Table 4.5: Health facility-related factors influencing vaccination uptake among children aged 12-24 months

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Place of delivery	.085	.224	.146	1	.703	1.089	.703	1.688
	Healthcare provider friendliness	-1.293	.305	17.966	1	.000	.274	.151	.499
	Healthcare provider information sensitization	-.375	.259	2.099	1	.147	.687	.413	1.142
	Availability of healthcare facilities	.240	.236	1.034	1	.309	1.271	.801	2.019
	Availability of vaccines	-.729	.205	12.697	1	.000	.482	.323	.720
	Time taken to reach health facility	-.155	.103	2.276	1	.131	.856	.699	1.048
	Constant	6.934	.991	48.991	1	.000	1026.440		

a. Variable(s) entered on step 1: Place of delivery, Healthcare provider friendliness, Healthcare provider information sensitization, Availability of healthcare facilities, Availability of vaccines, Time taken to reach health facility.

4.7 Cultural and religious factors influencing vaccination uptake

Cultural and religious related factors reported to significantly influence vaccination uptake among children aged 12-24 months were cultural perception of vaccine safety ($p < 0.001$) and religious leaders support ($p = 0.025$)

Caregivers who perceived vaccines to be unsafe were 71.5% less likely to subject their children to full vaccination [(Crude OR = 0.285, 95% CI = 0.195 – 0.417)]. Additionally, caregivers who reported that religious leaders were not supporting vaccination were 29% unlikely to take their children for vaccination [(Crude OR = 0.671, 95% CI = 0.474 – 0.951)]. Therefore, the cultural perception of vaccine safety and religious leaders' lack of support were cited as significant cultural and religious barriers to vaccination uptake.

Table 4.6: Cultural and religious factors influencing vaccination uptake among children aged 12-24 months

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 ^a								
Cultural perception of vaccine safety	-1.256	.195	41.624	1	.000	.285	.195	.417
Gender discrimination in vaccination	.000	1.428	.000	1	1.000	1.000	.061	16.420
Traditional leaders support	-.136	.219	.386	1	.534	.873	.568	1.341
Family members support	-.353	.181	3.823	1	.051	.703	.493	1.001
Religious leaders support	-.399	.178	5.043	1	.025	.671	.474	.951
Constant	5.265	1.554	11.476	1	.001	193.531		
a. Variable(s) entered on step 1: Cultural perception of vaccine safety, Gender discrimination, Traditional leaders support, Family members, support, Religious leaders support.								

CHAPTER FIVE

DISCUSSION

5.1 Vaccination coverage

Vaccination has been used globally as a strategy to reduce the burden of diseases; however tens of millions of children remain unprotected consequently resulting in about 1.5 million deaths annually from vaccine-preventable diseases (WHO, 2014a). Globally there has been an increase in vaccination coverage however, in low and middle-income countries the coverage is still below the herd immunity (Abdullahi et al., 2020). In Somalia, low rates of full vaccination uptake have been reported since the inception of the Expanded Program of Immunization (EPI) in 1980. In this study, the vaccination uptake was very low with only 4% of children between 12-24 months receiving all vaccines. The vaccination coverage in Afgoi town was lower than the rates reported for mother, child vaccination (MCV (75 %)) and diphtheria, pertussis, tetanus (DPT3 (77 %)) in Sub – Saharan Africa by Brown *et al.*, (2011). According to WHO, (2017), only 30% - 40% of the children were immunized against the six major childhood diseases in comparison to 80 % global coverage. Similarly, low levels of vaccination coverage were recorded in Ethiopia whereby immunization coverage of DPT 3 was 27 % (Mohamud *et al.*, 2014). The low vaccination uptake in Somalia and many low-income countries is associated with a complexity of factors that needs to be well understood and antagonized for purposes of amplifying efforts geared towards vaccination.

5.2 Association of knowledge with vaccination uptake

5.2.1 Maternal knowledge

The level of knowledge varies from education status, health knowledge which includes knowledge on vaccination. The level of knowledge has been documented to influence vaccination coverage. For instance, the low vaccination coverage against DPT 3 (27.5%) reported in Ethiopia was associated with inadequate knowledge among mothers/ caregivers (Mohamud *et al.*, 2014). Similarly based on a study done

in Madagascar parental knowledge level was reported to positively influence vaccination uptake (Clouston, Kidman, & Palermo, 2009). Maternal or paternal level of education has a significant influence on the behavior and lifestyle which consequently has an influence on vaccination uptake among children (Acerra *et al.*, 2009). Knowledge influences caregivers' understanding of the importance of adherence to vaccination schedules and also the ability to relate health outcomes in children as a result of vaccination. A lot of efforts are being put in place by the Somalia government and development partners to ensure that education is accessible to all and especially girls through the restructuring of the education system with the aim and hope of facilitating positive change and impact in the society (Ministry of Education Culture and Higher education Somalia, 2017).

5.2.2 Health education

In the present study caregivers were aware of the vaccine preventable diseases, for instance measles, tetanus, pertussis, polio among others. However, despite the knowledge vaccination coverage was still low. This is potentially because maternal health knowledge does not have significant influence on vaccination uptake. For instance, In Pakistan 83%- 98% of the caregivers interviewed had heard about vaccination yet there was low vaccination uptake (Cockcroft *et al.*, 2009). Equally a study concluded that maternal knowledge on vaccination was not an important determinant of vaccination coverage (Favin *et al.*, 2012). This confirms to some level that vaccination uptake may be a complex phenomenon being influenced by varying interrelated factors interacting in a complex manner.

Interestingly in a study conducted in Rwanda close to a third of mothers in rural areas and close to half of the mothers in urban areas could not name a single vaccine-preventable disease yet the vaccination coverage was 90% (Leach, 2008). However, in Ethiopia, it was speculated that inadequate knowledge among mothers/ caregivers about the importance of vaccination, the place and time of vaccination were reasons of low vaccination coverage (Mohamud *et al.*, 2014). Similarly, mothers who had knowledge on the vaccination schedule and the importance of vaccination were 6 times less likely to default child vaccination compared to mothers who did not have

the knowledge (Kidane et al., 2009). It is therefore clear that there are other factors that significantly influence vaccination coverage.

5.3 Influence of sociodemographic factors on vaccination uptake

Studies have reported varying socio-demographic factors influencing vaccination intake. For instance, this study did not identify any socio demographic factors influencing vaccination uptake. To the contrary studies have concluded that maternal education is a socioeconomic determinant that protects child health and it varies across regions and better vaccination coverage is associated with increased maternal education (Telles, Reddy, & Nagendra, 2019). Additionally, different studies have associated different socio-demographic characteristics with vaccination uptake among children. Some studies have shown that the age of caregivers at marriage and pregnancy highly influences vaccination. For instance, in North India (Pallikadavath, Foss, & Stones, 2004) and Nepal (Judith, 2016), age at marriage was positively linked to caregiver attendance to vaccination. Similarly, Tadesse, Deribew, & Woldie, (2009) reported that the age of the mother was a factor associated with vaccination defaulting among children in Southern Ethiopia. However, according to (Kidane et al., 2009) the age of the mother was not a significant factor influencing vaccine uptake. Similarly, in a study conducted in Mozambique marital status and age were documented to have no influence on child immunization (Jani et al., 2008). There is, therefore, a contrast in findings among studies on sociodemographic factors influencing vaccination uptake among children due to differences in study designs used, study population, location, and even periods when studies were conducted. Additionally, the uptake of vaccines has become a complex phenomenon influenced by varying factors interacting in a complex manner (Illongo, 2004).

5.4 Influence of health facility-related factors on vaccination uptake

Studies have documented that health-related factors significantly influence on vaccination uptake globally. This is because the health-related factors are directly associated with the quality of services provided in the health centers that consequently influence the uptake of vaccines. Some of these health-related factors include management of health facilities, shortages and commitments by health

workers, communication, quality of care, challenges with the supply chain of vaccines among others (Bos & Batson, 2000; Shengelia *et al.*, 2005).

In this study, healthcare provider, friendliness and availability of vaccines were found to significantly influence vaccination uptake. Studies have associated regional differences in vaccination coverage to challenging terrains, inadequate supply of vaccines and lack of infrastructure. For instance, a study conducted in Puntland Somalia reported an insufficient supply of vaccines and a lack of cold chain storages for vaccines (Abdullahi et al., 2020). Ideally, vaccines are provided for free in public health facilities but with the unavailability of vaccines and infrastructure in these centers then vaccination uptake cannot be realized.

The healthcare provider level of friendliness and professionalism creates trust between the healthcare provider and the patient. The trust will further amplify the level of uptake of health education provided by the healthcare provider to the patient and potentially positively influence vaccination uptake. A study conducted in Israel reported that caregivers were not willing to vaccinate their children due to the attitude associated with the healthcare providers (Maayan-Metzger, Kedem-Friedrich, & Kuint, 2005). Similarly, Favon et al., (2012) reported that caregivers or mothers who were abused or disrespected by healthcare providers refused to return their children to the health facility for vaccination. Equally, in 1990, a study conducted by LaFond in Somalia documented that humiliation of mothers at health facilities resulted in a high defaulting rate of vaccination in children (IMMbasics, 2009).

5.5 Influence of cultural and religious factors on vaccination uptake

5.5.1 Cultural factors

Culture has been documented to be a major factor affecting vaccination uptake (Roy, 2010). In some communities, instances of gender discrimination have been documented when it comes to vaccination. In Nigeria for example, male children are more likely to be vaccinated as compared to girls due to high regard being awarded to boys. Furthermore the gender differences spirals to other sectors such as the

education sector where boys are accorded more opportunities to access education (Anyene, 2014). Similarly, in this study culture significantly influenced child vaccination status. For instance, in some communities, mothers defaulted to vaccinate their children as they attended cultural functions such as weddings and funerals. In some traditional cultures, mothers did not take children for vaccination during the post-partum period (Favin *et al.*, 2012).

Studies have documented that caregivers refuse to vaccinate their children due to cultural perceptions of vaccines eliciting side effects in children after administration (Gauri & Khaleghian, 2002). Caregivers have reported that children develop side effects after vaccination such as swelling of legs and fever. However, the position by healthcare workers is that these claims are not factual and are associated with cultural beliefs and inadequate knowledge and awareness (Abdullahi *et al.*, 2020). In this study, the cultural general perception of the safety of vaccines was reported to significantly influence vaccination uptake ($p < 0.001$). Similarly, a study conducted among Somalis living abroad concluded that vaccination was important in protecting children against diseases, however over a third of the respondents associated measles vaccine with causing autism in children (Wolff & Madlon-Kay, 2014). Similarly, Armenian parents denied their children vaccination for fear of the perceived side effects (The World Bank, 2013). In Pakistan, caregivers reported that they failed to vaccinate their children due to pain and death as a result of vaccination (Cockcroft *et al.*, 2009). Similarly, Mohamud *et al.*, (2014) cited the fear of side effects as a reason for the low immunization coverage reported in Ethiopia.

5.5.2 Religious support

Religious and community leaders such as imams have a strong influence on decision making among communities (Padela *et al.*, 2011). For instance, religious objection to vaccination resulted in a high incidence of disease among children in Nigeria (Pallansch & Sandhu, 2006). Similarly, in Somalia, some religious sects have labeled vaccination as a sinful activity that negates the efforts being put by the government and NGOs to achieve herd immunity (Abdullahi *et al.*, 2020). Somalia's community has a strong oral tradition used to communicate with one another (Gahr *et al.*, 2014).

This strength could therefore be exploited in promoting vaccination uptake in Somalia.

In this study, the traditional and religious leader was reported to support vaccination. Furthermore, community and religious influence had a significance influence ($P = 0.025$) on vaccination uptake. The influence of imams and religious leaders in decision making could therefore be an important tool of ensuring higher immunization coverage in Somalia. For instance, the engagement of community and religious leaders (Imams) in Polio immunization campaigns contributed to the success of the vaccination program in Northern Nigeria (Nasir *et al.*, 2014).

5.6 Limitations of the study

Due to low card retention, mothers/caregivers had difficulties recalling when they vaccinated their children or how many scheduled visits their children had received which caused recall bias.

There is no birth registration in Somalia, due to that, mothers/caregivers were not able to recall the exact birth day of their child and thus children beyond the age of 24 months could have been included in the study.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Globally many factors have been documented to influence vaccination uptake. The control of these factors provides frameworks for establishing strategies by governments, non-governmental organizations, and other stakeholders interested to improve global vaccination coverage. This study established that there was out low vaccination coverage in Afgoi, with measles vaccine uptake having the highest vaccination coverage while other vaccine-preventable diseases had vaccination coverage below 15 % due to several factors. Some of the factors reported to have a significant influence on vaccination uptake among children 12 -24 months in Afgoi Somalia were; healthcare provider friendliness, availability and accessibility of vaccines, cultural perception of vaccines being unsafe, and religious influence. Other factors influencing vaccination uptake to a lesser extent included caregiver's education status, caregiver's knowledge on vaccination and vaccine-preventable diseases, and access to a health facility. However, these factors had no significant influence on vaccination uptake.

6.2 Recommendations

Based on the findings of this study, the researcher recommends that;

- i.Ethics and family health training for care providers to gain trust from mothers and caregivers.
- ii.Government and non-governmental organizations should reinforce timely and sufficient provision of vaccines supported through introduction of mobile clinics.
- iii.Government and non-governmental organizations involve religious leaders when strategizing on vaccination.
- iv.Awareness creation on need for vaccination be prioritized by the government and all stakeholders.

- v. Development of protocols and guidelines on vaccine preventable diseases be undertaken by relevant government ministries and other stakeholders.
- vi. Defaulter tracing and follow up mechanism be put in place to ensure that full vaccination coverage is attained.

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APPENDICES

Appendix I: Consent Form

DETERMINANTS OF VACCINATION UPTAKE AMONG CHILDREN AGED 12- 24 MONTHS IN AFGOI TOWN, SOMALIA

Dear participant,

The above study will be undertaken to determine factors influencing vaccination uptake among children aged 12-24 months. You are requested to answer questions verbally or by filling in the questionnaire. There will be no immediate benefit, but it is hoped that the findings of the study will enable planning for improvement of immunization uptake. You are free to accept or withdraw from the study any time during the study. The information given will be treated with highest confidentiality and used only for the purpose of the study.

Thank you for your cooperation.

.....

JAMA AHMED SAMAKAB

PRINCIPAL INVESTIGATOR

The principles and activities in this study have been explained to me in a language I understand. I hereby give my informed consent.

Name of participant Date..... Signature

Appendix II: Questionnaires

Section A: Demographic information

Mother or caregiver demographic information		
1.	Age of mother or caregiver	<input type="checkbox"/> <18 yrs. <input type="checkbox"/> 18 – 24 yrs. <input type="checkbox"/> 25-34 yrs. <input type="checkbox"/> 35-45 yrs. <input type="checkbox"/> > 45 yrs.
2.	Gender	<input type="checkbox"/> Female <input type="checkbox"/> Male
3.	Marital status	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced <input type="checkbox"/> Widowed
4.	Relationship to the child	<input type="checkbox"/> Mother <input type="checkbox"/> Father <input type="checkbox"/> Grandmother <input type="checkbox"/> Maid <input type="checkbox"/> Sister <input type="checkbox"/> Other (specify).....
5.	Age of the child	<input type="checkbox"/> 12 months

		<input type="checkbox"/> 13-18 months <input type="checkbox"/> 19-24 months
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Section B: Level of knowledge

Maternal Education		
6	Mother's Education Status	<input type="checkbox"/> Informal Education <input type="checkbox"/> Primary School <input type="checkbox"/> Secondary School <input type="checkbox"/> Tertiary and Above
Health Education		
7	Have you heard about vaccination and vaccine preventable diseases?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	If yes, from where did you hear about vaccination?	<input type="checkbox"/> Health personnel <input type="checkbox"/> Community Mobilizer <input type="checkbox"/> From friend <input type="checkbox"/> Religious leader <input type="checkbox"/> Traditional leader <input type="checkbox"/> TV <input type="checkbox"/> Radio

		<input type="checkbox"/> Other (specify).....
8	How often do you hear?	<input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Sometimes <input type="checkbox"/> Rarely
Mother's knowledge on vaccination		
9	What do you think is the importance of vaccination for your child?	<input type="checkbox"/> To prevent diseases <input type="checkbox"/> For specific disease <input type="checkbox"/> For child health <input type="checkbox"/> I don't know <input type="checkbox"/> Other, (Specify ----- -
1	Could you tell me vaccine preventable diseases that you know?	<input type="checkbox"/> Measles <input type="checkbox"/> Tetanus <input type="checkbox"/> Pertusis <input type="checkbox"/> Diphtheria <input type="checkbox"/> Polio <input type="checkbox"/> Tuberculosis <input type="checkbox"/> Hepatitis b <input type="checkbox"/> Homophiles influenza b <input type="checkbox"/> All of them

1	Could you tell me the age at which the child begins the first dose of immunization?	<input type="checkbox"/> Just after birth <input type="checkbox"/> Forty days after birth <input type="checkbox"/> Any time <input type="checkbox"/> After one year <input type="checkbox"/> I don't know <input type="checkbox"/> Other, (Specify) ----- -
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Section C: vaccination coverage factors

Access to health facility factors		
1	Have you ever attended antenatal care during your last pregnancy?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	If yes how many visits?	<input type="checkbox"/> One visit <input type="checkbox"/> Two visits <input type="checkbox"/> Three visits <input type="checkbox"/> Four visits
1	Where did you deliver your last baby?	<input type="checkbox"/> Hospital <input type="checkbox"/> Health center <input type="checkbox"/> Home
1	What are barriers for not receiving vaccines for your children?	<input type="checkbox"/> Distance from the health facility <input type="checkbox"/> Cost of transportation

		<input type="checkbox"/> Long waiting time <input type="checkbox"/> Lack of time <input type="checkbox"/> Staff attitude <input type="checkbox"/> Vaccine stock out <input type="checkbox"/> Security <input type="checkbox"/> Other, (Specify)-----
Care provider trust		
1	Has your child been vaccinated?	<input type="checkbox"/> Yes, fully vaccinated. <input type="checkbox"/> Some vaccines <input type="checkbox"/> Not at all
1	Do you have a card where vaccinations are written down	<input type="checkbox"/> Yes <input type="checkbox"/> NO
If yes, copy the immunization data from the card		<input type="checkbox"/> BCG Date: <input type="checkbox"/> OPV0 Date: <input type="checkbox"/> OPV1 Date: <input type="checkbox"/> OPV2 Date: <input type="checkbox"/> OPV3 Date: <input type="checkbox"/> Pentavelant1 Date: <input type="checkbox"/> Pentavelant2 Date: <input type="checkbox"/> Pentavelant3 Date: <input type="checkbox"/> Measles Date:
If no, please tell me if the child had any of the following vaccinations		<input type="checkbox"/> BCG Date: <input type="checkbox"/> OPV0 Date:

		<input type="checkbox"/> OPV1 Date: <input type="checkbox"/> OPV2 Date: <input type="checkbox"/> OPV3 Date: <input type="checkbox"/> Pentavelant1 Date: <input type="checkbox"/> Pentavelant2 Date: <input type="checkbox"/> Pentavelant3 Date: <input type="checkbox"/> Measles Date:
1	Who do you prefer most to vaccinate your child?	<input type="checkbox"/> Female vaccinator <input type="checkbox"/> Male vaccinator <input type="checkbox"/> Any of them
1	Are care providers friendly to you and listen you during vaccination sessions?	<input type="checkbox"/> Yes, always <input type="checkbox"/> Sometimes <input type="checkbox"/> Rarely <input type="checkbox"/> Not at all
1	Does your health provider explain you the benefits of vaccines clearly?	<input type="checkbox"/> Yes, always <input type="checkbox"/> Sometimes <input type="checkbox"/> Rarely <input type="checkbox"/> Not at all
2	Do you trust the vaccine advice your health care provider gives you?	<input type="checkbox"/> Yes, strongly <input type="checkbox"/> Partially <input type="checkbox"/> Not at all
Distance from the health facility		
2	Is there any health facility with vaccination services near to you?	<input type="checkbox"/> Yes <input type="checkbox"/> No

		<input type="checkbox"/> I don't know
	If yes which type of health facility?	<input type="checkbox"/> Hospital <input type="checkbox"/> Health center <input type="checkbox"/> Primary Health Unit
2	Does the health facility offer all routine vaccines?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I don't know
2	How long does it take you to reach the health facility (in minutes)?	<input type="checkbox"/> Less than 15 minutes <input type="checkbox"/> 15-30 minutes <input type="checkbox"/> 30- 1hour <input type="checkbox"/> . > 1 hour
Occupation and family income		
2	Occupation of the mother or care giver	<input type="checkbox"/> House wife <input type="checkbox"/> Daily laborer <input type="checkbox"/> farmer <input type="checkbox"/> Salaried employee <input type="checkbox"/> Business <input type="checkbox"/> Others, (Specify)----- -----
2	What is your family monthly income?	<input type="checkbox"/> \$ 50 <input type="checkbox"/> \$ 50-100 <input type="checkbox"/> \$100- 200 <input type="checkbox"/> > \$ 200

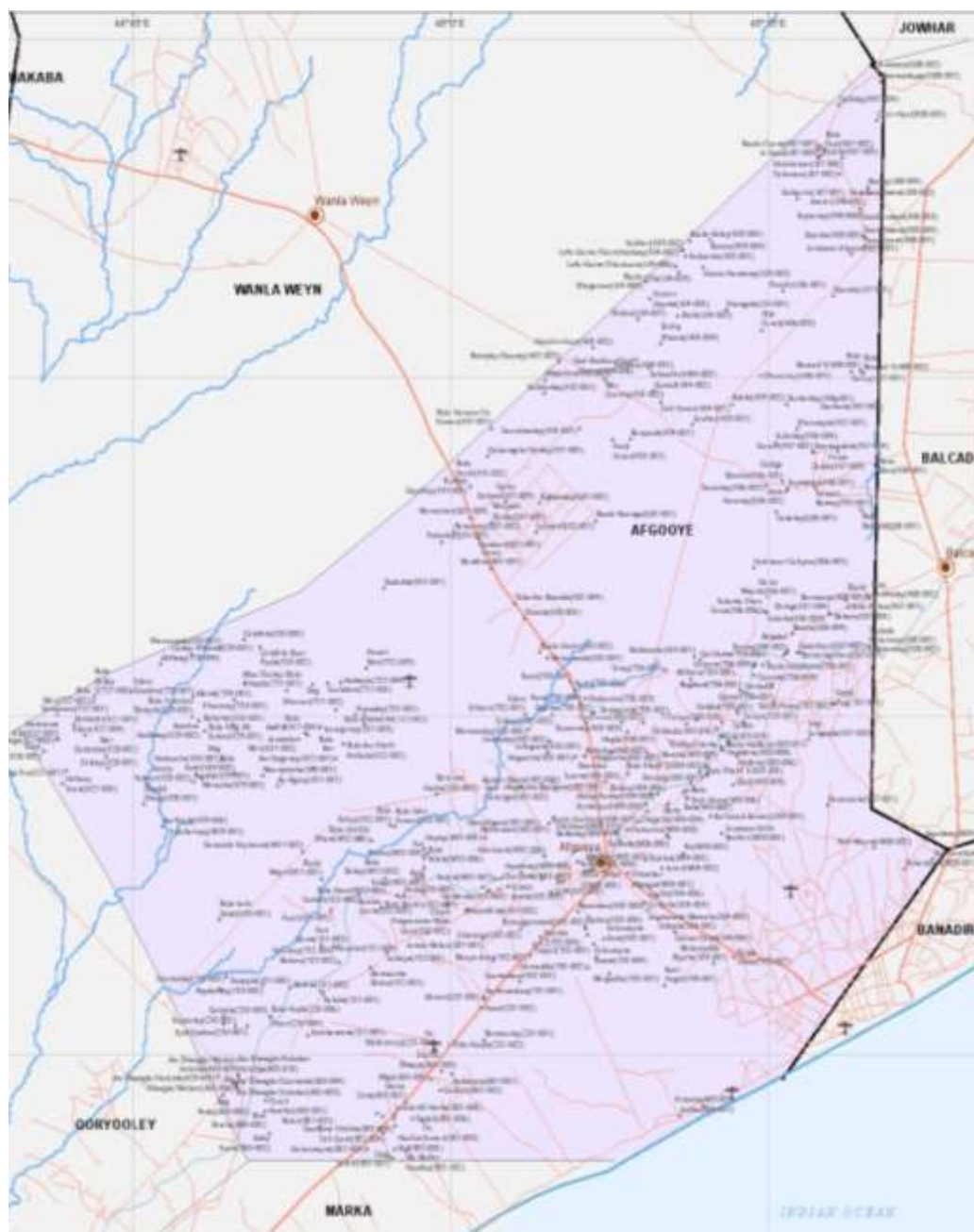
Section D: Cultural factors

General perception

2	Overall, what do you feel about childhood vaccination?	<input type="checkbox"/> Strongly support it <input type="checkbox"/> Support it <input type="checkbox"/> Don't care it <input type="checkbox"/> Not Sure <input type="checkbox"/> Against it <input type="checkbox"/> Strongly against it
2	Do you think that vaccines are safe for your child?	<input type="checkbox"/> Safe <input type="checkbox"/> Unsafe <input type="checkbox"/> Not sure
If answer is unsafe why vaccines are unsafe?		<input type="checkbox"/> Causes fever <input type="checkbox"/> Comes from western countries <input type="checkbox"/> Causes sterility <input type="checkbox"/> Has side effects
Gender based differences		
2	Do you vaccinate your male child and female equally?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If no, why?		<input type="checkbox"/> Boys have a special privilege <input type="checkbox"/> For cultural reasons <input type="checkbox"/> I don't know <input type="checkbox"/> Others, (Specify) ----- -----
Community influence		
2	Do traditional leaders in your community support vaccination?	<input type="checkbox"/> Strongly support it <input type="checkbox"/> Support it <input type="checkbox"/> Don't care it <input type="checkbox"/> Not Sure

		<input type="checkbox"/> Against it <input type="checkbox"/> Strongly against it
3	Do members in your household support vaccination?	<input type="checkbox"/> Strongly support it <input type="checkbox"/> Support it <input type="checkbox"/> Don't care it <input type="checkbox"/> Not Sure <input type="checkbox"/> Against it <input type="checkbox"/> Strongly against it
3	What is your community support towards vaccination?	<input type="checkbox"/> Strong support it <input type="checkbox"/> Support it <input type="checkbox"/> Don't care it <input type="checkbox"/> Not Sure <input type="checkbox"/> Against it <input type="checkbox"/> Strongly against it
Religion		
3	Are religious leaders support vaccination?	<input type="checkbox"/> Strongly support it <input type="checkbox"/> Support it <input type="checkbox"/> Don't care it <input type="checkbox"/> Against it <input type="checkbox"/> Strongly against it <input type="checkbox"/> Not sure

Appendix III: Map of Afgoi District



Appendix IV: Ethical clearance

NACOSTI ACCREDITED



ERC/MSc/015/2016R

ETHICS REVIEW COMMITTEE
ACCREDITED BY THE NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION (NACOSTI, KENYA)

CERTIFICATE OF ETHICAL APPROVAL

THIS IS TO CERTIFY THAT THE PROPOSAL SUBMITTED BY:

JAMA A. SAMAKAB

REFERENCE NO:
ERC/MSc/015/2016R

ENTITLED:
**Determinants of vaccination uptake among children aged 12 - 24 months in
Afgoi Town, Somalia**

TO BE UNDERTAKEN AT:
AFGOI TOWN, SOMALIA

FOR THE PROPOSED PERIOD OF RESEARCH
HAS BEEN **APPROVED** BY THE ETHICS REVIEW COMMITTEE
AT ITS SITTING HELD AT PWANI UNIVERSITY, KENYA
ON THE 3RD DAY OF NOVEMBER 2016

CHAIRMAN

SECRETARY

LAY MEMBER

Three handwritten signatures in blue ink, corresponding to the Chairman, Secretary, and Lay Member of the Ethics Review Committee.



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