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Factors Affecting Immunization Status of Children Aged 12-
23 Months in Ambo Woreda, West Shewa Zone of Oromia
Regional State

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TABLE OF CONTENTS

Acknowledgements.....	II
LIST OF TABLES.....	VI
Abbreviations.....	IX
Abstract.....	X
1. INTRODUCTION	1
1.1. Background.....	1
1.2. Statement of the problem	2
2. LITERATURE REVIEW	4
2.1. EPI target disease and vaccines.....	4
2.2. Immunization coverage in Ethiopia	4
2.3 Factors affecting immunization status of children	5
2.3.1. Maternal characteristics.....	5
2.3.2. Knowledge of care takers on immunization	6
2.3.3. Availability and accessibility of health care service	7
2.3.4. Maternal health care utilization	7
2.3.5. Sex of the child	8
2.3.6. Birth order.....	8
2.4 Reason for non immunization	8
3. OBJECTIVES.....	11
3.1 General objective.....	11
3.2. Specific objectives.....	11
4. METHODS.....	12
4.1. Study area and population.....	12
4.2. Study design	12
4.3 Source population.....	12
4.4 Study population	12

4.5 Study participants	12
4.6 Sample size determination	13
4.7 Sampling procedures	13
4.8. Study variables	15
4.9. Data collection instrument	15
4.10. Data collection.....	16
4.11. Training of data collectors and pre-testing.....	16
4.12. Data quality control	16
4.13. Operational definitions	17
4.14. Inclusion and exclusion criteria.....	17
4.15 Data processing and analysis.....	17
4.16. Ethical clearance	18
4.17. Dissemination of the results	18
5. RESULTS.....	19
5.1 Socio demographic characteristics of the study population	19
5.2 Family size, child ever born and experience of child death by the mothers	21
5.3 Antenatal care(ANC) follow up and TT status of mothers	21
5.4 Availability and accessibility of vaccination service	22
5.5 Knowledge on vaccination and vaccine preventable diseases	22
5.6 Characteristics of the child.....	25
5.7 Immunization coverage among children aged between 12-23 months	26
5.7.1 Immunization coverage by card plus recall	26
5.7.2 Immunization coverage by card only	28
5.8 Factors affecting immunization status of children	29
5.8.1 Socio-demographic characteristics of mothers.....	29
5.8.2 Antenatal care (ANC) follow up and TT status of mothers	31
5.8.3 Availability and accessibility of vaccination service	32

5.8.4	Mothers' knowledge on vaccination and vaccine preventable diseases.....	33
5.8.5	Knowledge of age begins, finish and session needed for immunization.....	34
5.8.6	Child characteristics	36
5.9	Factors affecting completion of immunization	37
5.9.1	Socio-demographic characteristics of mothers.....	37
5.9.2	Antenatal care(ANC) follow up and TT status of mothers	39
5.9.3	Availability and accessibility of vaccination service	40
5.9.4	Knowledge of mothers on vaccination and vaccine preventable diseases	41
5.9.5.	Knowledge of age begins, finishes and session needed for immunization.....	42
5.9.6	Child characteristics	44
6.	DISCUSSION.....	47
7.	STRENGTHS AND LIMITATIONS OF THE STUDY	52
8.	CONCLUSIONS AND RECOMMENDATIONS.....	53
9.	References	55
	ANNEX I- INFORMATION SHEET AND CONSENT FORM.....	58
	ANNEX II- QUESTIONNAIRES IN ENGLISH VERSION	60
	Annex III: Questionnaires in Afan Oromo version.....	64
	List of study kebeles	69

LIST OF TABLES

Table 1: - Socio demographic characteristics the respondents in Ambo Woreda, West Shewa Zone, January, 2011	20
Table 2: - Distribution of family size, child ever born and alive to mother, Ambo Woreda, West Shewa Zone January, 2011	21
Table 3: - Maternal health care utilization Ambo Woreda and town, West Shewa Zone, January, 2011	21
Table 4: - Vaccination service availability and accessibility in Ambo Woreda, West Shewa Zone, January, 2011	22
Table 5: - Respondents knowledge on vaccination and vaccine preventable disease, Ambo Woreda West Shewa Zone, January 2011	23
Table 6: - Mothers' response to age the child begins, completes and session needed to complete child immunization, Ambo Woreda, West Shewa Zone, January. 2011	24
Table 7:- Characteristics of the study children aged between 12-23 months in Ambo Woreda, West Shewa Zone January 2011	25
Table 8: - Frequency of immunization status of children aged 12-23 months by immunization history and vaccination card, Ambo Woreda West Shewa Zone, January, 2011	26
Table 9: - Immunization status of children aged between 12-23 months by socio demographic characteristics of mothers and children, Ambo Woreda, West Shewa Zone January, 2011 ...	30
Table 10: - Immunization status of children aged between 12-23 months by family size, child ever born and experienced child death by the mother, Ambo Woreda, West Shewa Zone, January, 2011	31
Table 11: - Immunization status of children aged between 12-23 months by ANC follow up and TT status of mothers, Ambo Woreda, West Shewa Zone January, 2011	32
Table 12:- Immunization status of children aged between 12-23 months by health care availability and accessibility, Ambo Woreda West Shewa Zone, January, 2011	33
Table 13: - Immunization status among children aged 12-23 months by the knowledge of vaccination and vaccine preventable disease, Ambo Woreda West Shewa Zone January, 2011	34
Table 14: - Immunization status of children aged between 12-23 months by knowledge of age at the child begins finishes and session needed to immunization, Ambo Woreda West Shewa Zone January, 2011	35

Table 15:- Immunization status of children aged between 12-23 months by characteristics of children, Ambo woreda, West Shewa Zone, January 2011	36
Table 16:- Completion of immunization among children aged between 12-23 months by socio demographic characteristics of mother, Ambo Woreda, West Shewa Zone January, 2011.....	38
Table 17:- Completion of immunization among children aged between 12-23 months by family size, child ever born and experienced child death, Ambo Woreda, West Shewa Zone, January, 2011	39
Table 18:- Completion of immunization among children aged 12-23 months by ANC follow up and TT status of mothers, Ambo Woreda West Shewa Zone January, 2011	40
Table 19:- Completion of immunization among children aged between 12-23 months by health care availability and accessibility, Ambo Woreda West Shewa Zone January, 2011 ..	41
Table 20:- Immunization completion of children aged between 12-23 months by the knowledge on vaccination and vaccine preventable disease, Ambo Woreda, West Shewa Zone, January, 2011	42
Table 21:- Immunization completion among children aged 12-23 by knowledge of mothers on age begin, finish and session needed for complete immunization Ambo Woreda, West Shewa Zone, January, 2011	43
Table 22:- Immunization completion among children aged between 12-23 month by characteristics of the child, Ambo woreda and town, West Shewa Zone January 2011	44
Table 23:- Reasons of mothers for defaulting from completing immunization, Ambo Woreda, West Shewa zone January 2011	45
Table 24:- Reasons given by mothers for not vaccinating their children Ambo Woreda, West Shewa Zone January 2011	46

List of Figures

Figure 1:- Conceptual framework for factors affecting immunization status of the children aged between 12-23 months.	10
Figure 2:- Sampling procedure frame work.....	14
Figure 3: - Immunization coverage among children aged 12-23 months by card plus history, Ambo Woreda, West Shewa Zone January 2011	27
Figure 4: - Immunization coverage among children aged between 12-23 months by card only, Ambo Woreda and town, West Shewa Zone January, 2011	28

Abbreviations

ANC	Ante Natal Care
AOR	Adjusted Odds Ratio
BCG	Bacillus Calmette- Guirin
COR	Crude Odds Ratio
CI	Confidnce Interval
DPT	Diphtheria, Pertussis and Tetanus
DHS	Demographic and Health Survey
EDHS	Ethiopian Demographic and Health Survey
EPI	Expanded Program on Immunization
HepB	Hepatitis B
MCV	Measles Containing Vaccine
MDG	Millennium Development Goal
OPV	Oral Polio Vaccine
OR	Odds Ratio
TT	Tetanus Toxoid
WHO	World Health Organization

Abstract

Background: Vaccination is a proven immunization tool in preventing and eradicating communicable diseases. Despite increase in global immunization coverage, many children around the world especially in developing countries still left unvaccinated. In 2007, approximately 27 million infants world wide were unvaccinated against common childhood diseases and 2-3 million children die of vaccine preventable diseases. About 1 million children in Ethiopia were unvaccinated in 2007 and only 20% of the countries children are fully vaccinated in 2005.

Objective: To assess immunization coverage and factors affecting immunization status of children aged 12-23 months.

Method: A cross-sectional community based study was conducted from January to February, 2011 in Ambo Woreda in West Shewa Zone of Oromia regional state using modified WHO EPI cluster sampling method. A total of 536 children of aged between 12-23 months from 536 households were selected from 8 rural and 2 urban kebeles. Data were entered in to the computer using EPI-Info version 3.5.1 and analyzed by SPSS version 16 statistical software package.

Results: About 96% of mothers heard about vaccination and vaccine preventable diseases and 79.5% knew correctly the benefit of immunization. About 36% of children were fully vaccinated by card plus recall, but only 27.7% were fully vaccinated by card alone and 23.7% children were unvaccinated. The study revealed that children are more likely to be vaccinated if the child is male (Adjusted Odds Ratio [AOR]=1.8: 95% CI: 1.1, 3.1), health institution born (AOR=2.3, 95% CI, mothers' followed ANC (AOR=2.4 95% CI: 1.2, 5) and mothers' knew the correct age at which begins (AOR=2.5 95% CI: 1.3, 4.7) and finishes (AOR=2.6 95% CI: 1.8, 5.7) the immunization. Similarly, children whose mothers attended ANC (AOR=2.1 95% CI: 1.03, 4), children born in the health facility (AOR=2.1, 95% CI: 1.3, 3.5), children whose mothers knew the age at which the vaccination begins (AOR= 2.4 95% CI: 1.5, 4) and completes (AOR=5.4, 95% CI: 2.6, 10) were significant predictors of full vaccination among children aged 12-23 months.

Conclusion: There is low immunization coverage among children aged 12-23 months in the study woreda. Antenatal follow up, institutional delivery and knowledge of mothers about the age at which child begins and finishes the vaccination are significant predictor of child immunization status. The Woreda should work to raise awareness of the community on immunization, antenatal care and institutional delivery utilizations and should increase ANC follow up and institutional delivery services which in turns increase the immunization coverage among children.

1. INTRODUCTION

1.1. Background

Immunization is a proven tool for controlling and even eradicating communicable diseases. An immunization campaign carried out by the World Health Organization (WHO) from 1967 to 1977 eradicated the natural occurrence of smallpox. When the program began, the disease threatened 60% of the world's population and killed every fourth victim. Also poliomyelitis is going to be eradicated. Since the launch by WHO and its partners of the Global Polio Eradication Initiative in 1988, infections have fallen by 99%, and some five million people have escaped paralysis. Between 1999 and 2003, measles deaths dropped worldwide by almost 40%, and some regions have set a target of eliminating the disease (1).

All countries have national immunization programmes, and in most developing countries, children under five years old are immunized with the standard WHO recommended vaccines that protect against eight diseases – tuberculosis, diphtheria, tetanus (including neonatal tetanus through immunization of mothers), pertussis, polio, measles, hepatitis B (HepB), and homophiles influenza (Hib). These vaccines are preventing more than 2.5 million child deaths each year. This estimate is based on assumptions of no immunization and current incidence and mortality rates in unimmunized children (2).

The Ethiopian health policy had given emphasis to the prevention and control of major communicable diseases. Thus, in Ethiopia expanded program on immunization (EPI) was initiated in 1980. The objective of the National Immunization Policy was to reduce mortality and morbidity in children from the EPI target diseases through the immunization of all children under the age two in the first five year, but later after 1986 it was revised to focus children under one year of age in order the child exposure time to natural infection. The program had been planned to make immunization services available to 10% of the population in 1980 and to increase immunization access by 10% each year and reach to 100% coverage (3).

1.2. Statement of the problem

Vaccination has been shown to be one of the most effective public health interventions worldwide, through which a number of serious childhood diseases have been successfully eradicated. Small pox was eradicated by the immunization campaign carried out by WHO from 1967 to 1977 (4).

The WHO recommends vaccination against a number of serious infectious diseases, including diphtheria, tetanus, pertussis, HepB, invasive Hib disease, and measles for all children, and against pneumococcal disease, yellow fever, and rotavirus disease for children in some areas as part of their EPI. However, many infants and children still die every year from these diseases. It has been shown that in 2007 approximately 27 million infants are not vaccinated against common childhood diseases, such as measles or tetanus. As a result, 2–3 million children are dying annually from easily preventable diseases, and many more fall ill (4). But in the same year, 24 million children are not being reached with vaccines and over 10% of children under one year old in developing countries were not receiving even one dose of DTP vaccine, compared with 2% in industrialized countries (2).

An estimated 2.1 million people around the world died in 2002 of diseases which can be prevented by widely used vaccines. This toll included 1.4 million children under the age of five years. Among these childhood deaths, over 500 000 were caused by measles; nearly 400, 000 by Hib; nearly 300, 000 by pertussis; and 180, 000 by neonatal tetanus (1). It has been also recognized that vaccine preventable diseases are responsible for 16% of under five mortality in Ethiopia (5).

Although estimated global routine vaccination coverage with the first dose of measles containing vaccine (MCV) reached 82% in 2007, nearly 23.2 million of children missed the vaccine of which 15.3 million (65%) resides in eight countries of Africa and south Asia. From these 1 million of them live in Ethiopia (6).

Despite the increased report immunization coverage of measles in Ethiopia, the disease has continued to be the main childhood health problem in the country. It attributed to 4% of child and infant deaths in 2004 which was highest of the world (4). Immunization is one of the national child survival strategies in Ethiopia to reach DPT3/measles vaccination coverage of

90% in 2010, which planned to decrease mortality under five ages of year by 2% (7) and immunization is the key to achieving the millennium development goals (MDG) specially to reduce the child mortality (2) and proportion of children immunized against measles is one of the indicator of health MDG 4 target 4 for decreasing the child mortality and morbidity from measles (8). But in Ethiopia the incidence of measles has increased from 3.19/100,000 (1964 confirmed cases) in 2009 to 7.35/100,000 (3121 confirmed cases) in 2010 (9).

According to the Ethiopian Demographic and Health Survey (EDHS) 2005, only 20% of children 12-23 months of age were fully vaccinated and 24% of children did not receive any vaccination. Accordingly, children are more likely to be vaccinated the first doses of vaccination than the third and the fourth doses in which 60% of children received Bacillus Calmette- Guirin (BCG) and from these only 35% of them receive measles vaccine which is the last vaccine dose in EPI program of Ethiopian. This shows that there is a high rate of drop out from vaccination (10).

According to the 2006 national EPI survey in Ethiopia, only 50% of the children were fully immunized, with wider variations from on region to another. This shows, half of the children were not fully protected (11). The study done in Ambo Woreda in 2003 showed that immunization coverage by routine vaccination was less than 20% with card and less than 50% with card and history (12). In Ethiopia, low access to services, inadequate awareness of caregivers, missed opportunities, and high dropout rate are major factors contributing to low immunization coverage(13). Therefore, the aim of this study was assess factors affecting the immunization status among children 12-23 months of age in Ambo Woreda and to generate data that could be used for better planning and strengthening of immunization services.

2. LITERATURE REVIEW

2.1. EPI target disease and vaccines

The EPI has six most common vaccine preventable diseases which greatly affects the children. These include tuberculosis, measles, poliomyelitis, whooping cough, diphtheria and tetanus. According to the endemicity and resource of the country other disease were also added to the EPI program. These include yellow fever and hepatitis. Currently, the EPI administers eight vaccines: BCG (tuberculosis vaccine), oral polio vaccine (OPV), diphtheria-pertussis-tetanus (DPT) vaccine, hepatitis B (HepB) vaccine, measles vaccine, yellow fever vaccine, and *heamophilus influenza type b* and tetanus toxoid (TT) vaccines (14). In Ethiopia, currently the EPI program has eight vaccine preventable diseases. These are HepB and Hib in addition to the six known EPI program disease.

In Ethiopia, vaccination is given on routine and outreach bases. The routine vaccinations services are given starting from birth, should be completed before one year of life by all children. BCG and OPV0 are administered at birth, while three doses of OPV and pentavalent vaccines are given at interval of four week duration; at 6, 10 and 14 weeks, and measles vaccine is give at the age of nine months. If the children did not start immunization at birth, the first doses will be given at the 6th week and the child will not take OPV0 vaccine (15, 16)

2.2. Immunization coverage in Ethiopia

Data sources for immunization coverage in Ethiopia are frequently obtained from the Ministry of Health and surveys. The National Demographic and Health Survey of 2000 and 2005, provides the immunization status of the children. According to the DHS 2005 only 20% of children aged 12-23 months were fully vaccinated and 60% had received the BCG vaccination, and 35% had been vaccinated against measles. About 32% DPT3 and 24% of them not took any vaccination(10). In national survey conducted in 2006, 83.4% children age 12-23 months received BCG, 84.3% received DPT1, 54.3% received measles and only 50% are fully immunized(11).

According to 2007/08 health and health related indicators of Ethiopian, the DPT3/pentavalent and measles coverage was 76% and 66% respectively. While the coverage for full immunization of children was 54%. In Oromia region the DPT3/pentavalent coverage was 84.6%; and measles was; 73.6% while 60.4% was fully vaccinated (17).

2.3 Factors affecting immunization status of children

Various socioeconomic and demographic factors may influence immunization coverage of children. Maternal characteristics, sex of child and birth order of the child, place of delivery and antenatal care (ANC) follow up, household income/economic status, knowledge about immunization and vaccine preventable disease, and residence are the main factors associated with immunization coverage among children.

2.3.1. Maternal characteristics

Maternal characteristics are the most known determinant factors of child immunization. A comparative study done among slum and non slum dwellers in Bangladesh children age of 12-23 months of age in three zone of Dhaka demonstrated that complete coverage is associated with educational status of the mother, income and living conditions (11). The study revealed that mothers with lowest education, households with limited monthly income and people living in slum area were less likely to complete a child immunization. It also indicated that children whose mothers were born in a rural area or an urban slum, and those whose mothers were aged less than 30 years are 0.35 and 0.43 times less likely to be fully immunized respectively(18). But in Kenya young age of mothers was associated with high immunization coverage as compared with the older mother (19).

In other cross sectional study done in Burkina Faso children of educational status of mother significantly associated with complete immunization. It also showed children of polygamous parent were less likely to be completely immunized than that of monogamous. Religion also shows significant association with the immunization status of the children in which children of non Muslim followers were 1.8 times more likely to complete immunization than other religion(20). A study done in 2004 from reanalysis of the DHS data of Bangladesh compares the educational status of mothers of children less than five year of age indicated that mothers who had primary, secondary and higher education were more likely to fully immunize their children than those with no education (14). In the study also age of the mother was also

another determinant of child immunization status in which children of middle age mothers are more likely to be fully immunized than children of youngest and oldest mothers (21).

A case control study done in Wanago Woreda Southern Ethiopia in 2008 identified monthly income as the only factor associated with defaulting from immunization (22). But other socio demographic factors such as family size, age of the mother or immediate care taker, occupational status, ethnicity, religion, parity, and educational status does not show an association with defaulting. In contrast to this study from Tikrit city indicates that urban resident (being urban or rural), educated mothers and those who have 2 and less children were more likely to complete the recommended vaccine (23). Also mothers age and mothers job were significantly associated with complete vaccination.

Caring for multiple children can create barriers to vaccination. Study in the USA found that mothers with 2 to 3 children were 20% less likely and those with 4 or more children were 40% less likely to have vaccinated children than those with only 1 child (24). In another case control study in 2003 in USA, children were less likely to be fully vaccinated if their mothers were black or Hispanic, were 19 to 29 years of age, were unmarried, had less than a college education, had multiple children, or were living near or below the federal poverty level (24)

In cross sectional study done in Ethiopia in Tigray region Tselemti Woreda in 2000 indicates that, fully vaccinated coverage among children 12-23 months was higher for literate compared to illiterate mothers (card plus history), 17 (94.4%) vs 66 (71.7%), $p=0.041$. Fully vaccinated coverage was higher in rural than in urban areas, 56 (80%) vs. 27 (67.5%), $p=0.143$. The difference in the coverage of the various EPI vaccines among the four groups of mothers of 12-23 months old children increased with time. In the study area of rural residence and maternal education significantly predicted vaccination compliance among 12-23 months old children (25). In contrast to these in Sudan urban residence are 7.4 times more likely to complete immunization of their children than rural residence (26).

2.3.2. Knowledge of care takers on immunization

Knowledge is another factor which affects the immunization status of the child. These include knowledge and attitude toward vaccination and vaccine preventable disease. Study done in Nigeria on determinants of immunization status children in rural area showed that mothers of higher knowledge score more fully immunize their children. Also more than half

of mother can correctly calls the symptoms of vaccine preventable disease. And 99% the mothers felt immunization is good for the child(27).

2.3.3. Availability and accessibility of health care service

Health facility is another factor which contributed to full immunization of the child. Different studies showed the importance of availability and accessibility of health facility in immunization coverage. Families nearer to the health facility are more likely to complete the immunization than those far from it. Cross sectional study done in India, Assam district showed that immunization status of the children was significantly higher where the distance of the health centre was <2km compared with those residing in remote inaccessible areas with a distance of >5km to the health centre (28).

In the study of Bangladesh mothers near to health facility (<1km) were 2.11 times more likely to fully vaccinate than those who were far away from health facility (21). In contrast, a study done in rural Mozambique showed that accessibility to health facility in terms of distance and need of transport to get vaccination site doesn't significantly associate with the complete immunization (29).

In another cross sectional study done in Sudan showed that walking time to the nearest place of vaccination strongly influenced the correct vaccination status of the child. Children of mothers who have better access to vaccine services (less than 30 minutes walking time to the nearest place of vaccination) were 3.4 times more likely to have had the correct vaccinations than were children of mothers who have to walk 30 minutes or longer (26).

2.3.4. Maternal health care utilization

Maternal health utilization like antenatal care, TT status of mother and place of delivery are those factors that are associated with the immunization status of children. Studies indicate that mothers who follow ANC and give birth at health facility are more likely to fully vaccinate their children. Some studies also show that attendant at birth has an impact on the immunization status of children. For example study done 2001 in rural Mozambique shows that home delivered children have a 2.27 times higher risk of not completing their vaccination program (29).

In another study done in India mothers who received ANC services and also vaccinated their children was two to three times higher than the percentage of those who did not receive any antenatal care. And mothers who received ANC service from a trained or traditional birth attendant appeared to be aware of child immunization. Also mothers who received tetanus toxoid vaccination during pregnancy more likely to complete immunize their child (30). In Bangladesh, number doses of doses tetanus toxoid immunization mother received associated with full immunization of the child (21).

In institutional based study done in Uganda, 68% of the children were fully vaccinated for age. A child born in a health unit was significantly more likely to have been vaccinated BCG, and to be up to date with their vaccination compared to a child born at home. However, vaccine drop-out rate was similarly high irrespective of whether the children were born at home or in health units (31).

2.3.5. Sex of the child

Studies have showed that sex of the child found to predict the immunization status of the child in the societies in which gender inequality is prevalent. A review done in India from 1996- 2006 showed girls were found to have significantly lower immunization coverage than boys for BCG, DPT, and measles (32). In done in Bangladesh also females are 0.84 times less likely to be fully vaccinated than male children (14). But another study done Nigeria in 2003 showed no any significant sex difference(33). In 2006 Ethiopian EPI survey also showed that no statistically significant difference between girls and boys with regard to their immunization status (11).

2.3.6. Birth order

Birth order has a close relationship with vaccination coverage. According to the EDHS 2005 vaccination coverage generally decreases as birth order increases, 27% of first-born children have been fully immunized, compared with 18% of children of birth order six and above (10).

2.4 Reason for non immunization

Different reasons are given by mothers/caretakers not to immunize their children. These include parental lack of knowledge of benefit of immunization and immunization schedules, health facility related problems, cultural and religious reasons, maternal and children illness' are identified by many studies. In Bangladesh it was showed that programmatic factors are linked to drop out from immunization. In the study lack of information about schedule of

session and non holding of session according to schedules were commonly cited reasons for dropouts. The other reasons identified were no idea about doses, vaccinator did not inform about subsequent doses, refusal by health professionals due to lost card or vaccine exhausted (34). In study done in Nigeria on the reason for defaulting child illness and perceived contraindication by the health worker are the significant reason given by the care takers for defaulting (35).

Knowledge on the benefit of immunization is also an important reason for the defaulting and non immunization. For instance in southern of Ethiopia Wanago Woreda mothers who had poor knowledge about the benefit of vaccines were 6 times more likely to have defaulted than mothers who had good knowledge, also mothers who had negative perception towards health institution support were 2.3 times more likely to have defaulter children than mothers with positive attitude (22).

According to Eyob Tsegaye 1988, the reasons for defaulting from immunization are, mother had not enough time (17.6%), sickness of the child (37.2%), missed appointment time (41.8%) are the most mentioned by mothers (36).

A base line survey done in Ethiopia in 2008 by core group polio project indicated that, a reason for not immunization were, health workers did not come and give vaccine at the village (28.2%) followed by lack of awareness about vaccination (25.9%), absence of health facility in the locality (19.1%), vaccination is of no use (7.7%), and vaccination hurts children (5.0%). Also reasons for defaulting are reported absenteeism of vaccinators (23.8%), vaccination time is inconvenient (18.7%), lack of awareness on the importance of vaccination (15.2%) and vaccination site is far away (10.9%), not knowing whether to come back for second and third vaccination (9.8%) are the main reason identified (37).

CONCEPTUAL FRAMEWORK

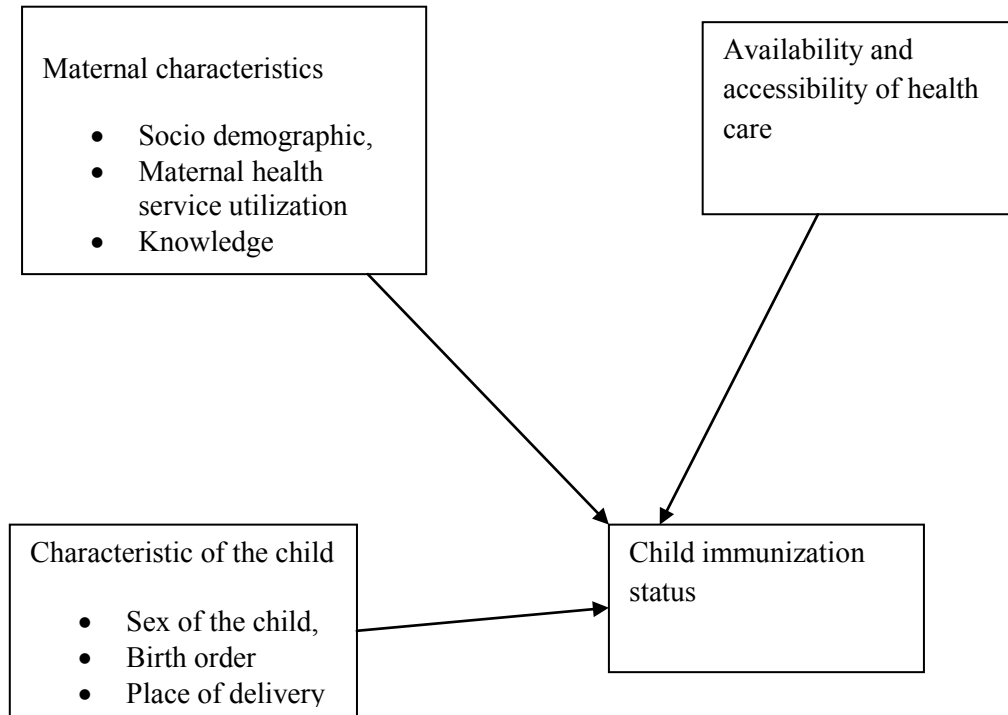


Figure 1:- Conceptual framework for factors affecting immunization status of the children aged between 12-23 months.

3. OBJECTIVES

3.1 General objective

- To assess immunization status and factors affecting it among children aged 12-23 months old in Ambo Woreda of West Shewa Zone Oromia Regional State

3.2. Specific objectives

- To determine the immunization coverage among children of aged 12-23 months old towards eight vaccine preventable disease.
- To assess demographic, socio economic and health service factors affecting immunization status among children aged 12-23 months
- To assess the knowledge of the mother/caretakers on immunization and vaccine preventable disease
- To see the effect of knowledge of mothers/caretakers on the immunization status of children

4. METHODS

4.1. Study area and population

The study was conducted from January to February 2011 in 10 kebeles Ambo Woreda of West Shewa zone Oromia regional state. Its capital town is 114 km to the west of Addis Ababa, the capital of Ethiopia. The Woreda and town are independent by management of each other and the capital of the woreda is the town itself. According to 2007 Ethiopia national census Ambo town and Woreda have population of 50,267 and 110,796 respectively. There are 38 kebeles; 4 urban and 34 rural kebeles. There are different private and public health institutions found in the woreda. According to the health office, all kebeles have their own health post and there are 2 health centers. In Ambo town also there is one zonal hospital, 2 health centers and different private clinics. The main road from Addis Ababa to the western Ethiopia crosses Ambo Woreda.

4.2. Study design

The cross-sectional community-based study design was conducted. Quantitative data was collected from mother/caretakers who had children aged 12-23 months to assess the immunization status and factors affecting it.

4.3 Source population

All household with children of 12-23 months residing in Ambo Woreda constitutes the source population of the study.

4.4 Study population

The study population of this study was all children in the age group of 12-23 months of age living within eligible household in 10 randomly selected kebeles in the woreda. Mothers'/caretakers were also studied about their knowledge on the child immunization.

4.5 Study participants

Children of 12-23 months of age and their mothers/caretakers in the selected eligible households

4.6 Sample size determination

Sample size was calculated based on the proportion of fully immunized children aged between 12-23 months which is 20% with 95% confidence interval and precision level of 5%(10). The sample size was taken after multiplying by design effect 2

$$N = \frac{(Z_{\alpha/2})^2 p (1-p) * DE}{d^2} = 492$$

After addition of 10% contingency to the calculated sample size, the total of 541 children aged between 12-23 months was targeted for the study for the study.

4.7 Sampling procedures

The modified 2005 WHO EPI cluster sampling method was used and numbers of clusters were decided before data collection (38). Each kebele was considered as one cluster and 50 households were selected from each of eight rural kebeles and the rest of households were selected from the two urban kebeles. First the Woreda was stratified to rural and urban, and the rural kebeles were stratified again by their direction from Ambo town. Then the lists of all kebeles were taken from the administrative bodies of Woreda and town. After that, 10 kebeles were selected randomly from five strata.

The lists and number of households for each kebele could not be found for all selected kebeles. In each kebele the first household was selected by randomly chosen from the central location of kebele, then counting the households along the directional line to the edge of kebele area and selecting randomly one. The subsequent households were selected, according to the inclusion criteria, based on the principle of the next nearest household. Equal number of household was taken from rural kebeles. For the kebeles in urban, they were considered having crowded household, so more children were taken from urban kebeles. Depending on these 50 households was taken from each kebeles of rural household and 147 household was taken from two urban kebeles from Ambo and Meti town.

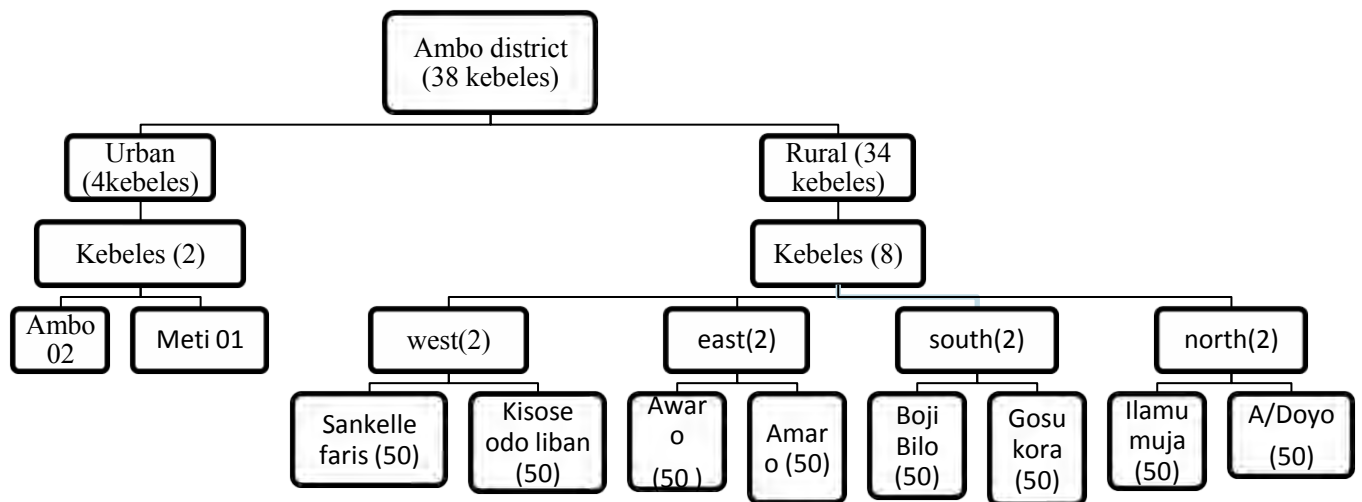


Figure 2:- Sampling procedure frame work

4.8. Study variables

4.8.1. Dependent variable

- Immunization status of children aged between 12-23 months

4.8.2. Independent variable

- Socio demographic characteristics of mothers/caretakers
- Sex of child
- Knowledge of mothers/caretakers
- Family size
- Number of child ever born
- Experience of child death
- Birth order
- Residence
- Time of travel to reach the nearest health facility
- Place of delivery
- Maternal tetanus toxoid immunization
- ANC follow up
- Family income

4.9. Data collection instrument

The questionnaires were developed in English and then translated into Afan Oromo and translated back to English for accuracy and consistency (annex III & IV). In addition to immunization histories of children, information on socio-demographic characteristics, economic status, sex of the child, ANC follow up, place of delivery, maternal immunization, accessibility and availability of vaccination service, family size and knowledge of mothers or immediate caretakers on immunization were included. In addition reasons for defaulting and not immunizing were also added into the questionnaire.

4.10. Data collection

Data on immunization history was collected in two ways, based on the availability of immunization card and mothers/caretakers verbal report. After a child aged between 12-23 months was identified from the household, mothers/caretakers of the child were asked for the presence of child's immunization card. For the child with immunization card, the information on the doses and types vaccine received by the child was copied from the card. If immunization card was unavailable for the child, the mothers/caretakers were asked for immunization history. The number of doses the child took and how (the route of vaccine administered) the child took the vaccine was the way by which immunization history was asked. Information on other variables was asked directly from the child's mother/caretaker.

4.11. Training of data collectors and pre-testing

Ten nursing graduated data collectors and one supervisor were recruited and received two days intensive training before data collection. Training was given by Afan Oromo on how to ask and fill the question, selection criteria of households and children, and how to approach the mothers/caretakers.

Questionnaires were pretested for completeness and appropriateness to the local context on 20 house holds in one of the kebeles not selected for the study. Based on the results of the pre-test some questions were modified.

4.12. Data quality control

The questionnaire used for study was adopted from demographic health survey (DHS) and from the prior researches done in other places, and then developed according to the local context. Every day filled questionnaires were checked in the field for completeness by both data collectors and supervisors before they return from field. Data collectors were asked to return and complete for the incomplete questionnaires. Every questionnaire was checked by principal investigator every day after data collection before data entry.

4.13. Operational definitions

Fully vaccinated- A child between 12-23 months old who received one BCG, at least three doses of Pentavalent, three doses of OPV and a measles vaccine

Partially vaccinated- a child who misses at least one doses of the eight vaccine

Unvaccinated- a child who does not receive any dose of the eight vaccine

Vaccinated- a child who take at least one dose of the eight vaccine

Coverage by card only: Coverage calculated with numerator based only on documented dose, excluding from the numerator those vaccinated by history.

Coverage by card plus history: Coverage calculated with numerator based on card and mother's report

Knowledge of immunization: If mother have awareness about immunization, knows objectives, age at the child begin, finishes immunization and session to complete immunization considered as knowledgeable.

Knowledge of vaccine preventable disease: awareness of the disease preventable by vaccination

Immunization coverage: proportion of children took vaccination

Immunization status: being fully/partially vaccinated or unvaccinated

4.14. Inclusion and exclusion criteria

4.14.1. Inclusion criteria

Households with at least one living children of aged between 12-23 months were eligible for the study. In case of two or more children the youngest child by age was selected and in case of twin both children were included. But no twins were found during the study period.

4.14.2. Exclusion criteria

Households without children aged between 12-23 months not included.

4.15 Data processing and analysis

Data were coded and entered into computer by using EPI Info version 3.5.1 and exported to SPSS version 16 for analysis. Univariate analysis was used to describe the data using percentage. Binary logistic regression was employed to determine the odds ratio for both multivariate and bivariate analysis. Bivariate analysis was used to assess the association between independent and dependent variables. Then all variables that showed statistical

significant in the bivariate analysis were included in multivariate logistic regression to determine the factors associated with immunization coverage among children aged between 12-23 months. The result of the study was presented by tables and charts.

4.16. Ethical clearance

Ethical clearance for the study was obtained from Addis Ababa University School of Public Health Institutional Review Board. And official support letter from the school of public health was written to administrative body of Ambo Woreda and town. Data collection was under taken after permission is obtained from the Woreda health office and Ambo town municipality. Study participants were asked for their consent before asking for any information and written and oral informed consent was taken from every study participants. Objectives of the study were explained for the every study participants and they asked for information only after they give their consent. No person was obligated to participate to study without his/her consent. Information sheet and informed consent in English and Afan Oromo versions found in Annex II.

4.17. Dissemination of the results

The finding of the study will be submitted to the school of graduate studies and the school of public health at Addis Ababa University in partial fulfilment of the requirements for the degree of the master of public health. The thesis will also be submitted to the Oromia Regional State Health Bureau and Ambo Woreda Health Office. The finding will also be presented for different work-shops and seminars and will be published in a peer reviewed journal.

5. RESULTS

5.1 Socio demographic characteristics of the study population

A total of 536 mothers of children aged between 12-23 months old were interviewed from 10 kebeles, with the response rate of 99%. About 73% of the respondents were from rural areas, while the remaining 27% were from Ambo and Meti towns. All respondents were mother of the children aged 12-23 months.

The age of the mother participated in this study was ranged from 17 to 50 with mean and median of 27.63 and 26 respectively.

From the total of mothers participated, 47.9% were illiterate followed by those educated primary school (37.5%) and 14.6% educated secondary and above. Majority the mothers were married (88.1%), followed by single (5.4%) and the rest were widowed and divorced. Also, 44.8% were farmers in occupation followed by house wife (19.4%), 14.4% were daily labourers and 14.4% were merchants and about 95% are Oromo and 5.4% of are Amahra in ethnicity.

Majority of them were Orthodox Christian (61.8%), followed by Protestant Christians (29.9%) and 8.4% are belonged to other religion such as Muslim, catholic and Wakefata. Majority of the house holds, 68.5% had the average monthly in come of less than 500 Ethiopian birr (Table 1).

Table 1: - Socio demographic characteristics the respondents in Ambo Woreda, West Shewa Zone, January, 2011

Variables	Rural (n=389)	Urban(n=147)	Frequency (n=536)
Educational status			
Illiterate	214(39.9%)	43(8%)	257(47.9%)
Primary	152(28.4%)	49(9.1%)	201(37.5%)
Secondary and above	23(4.3%)	55(10.3%)	78(14.6%)
Marital status			
Unmarried	21(3.9%)	8(1.5%)	29(5.4%)
Married	345(64.4%)	127(23.7%)	472(88.1%)
Divorced	12(2.2%)	6(1.6%)	18(3.4%)
Widowed	11(2.1%)	6(1.6%)	17(3.2%)
Occupation			
House wife	58(10.8%)	4(8.6%)	104(19.4%)
Gov. employee	10(1.9%)	40(7.5%)	50(9.3%)
Merchant	33(6.2%)	32(6%)	65(12.1%)
Daily labourer	63(11.8%)	14(2.6%)	77(14.4%)
Farmer	225(42%)	15(2.8%)	240(44.8%)
Ethnicity			
Oromo	376(70.2%)	131(34.4%)	507(94.6%)
Amhara	13(2.4%)	16(3%)	29(5.4%)
Religion			
Orthodox	236(44%)	95(17.7%)	331(61.8%)
Protestant	115(21.5%)	45(8.4%)	160(29.9%)
Other	38(7.1%)	7(1.3%)	45(8.4%)
Mothers/caretakers age			
<20	45(8.4%)	14(2.6%)	59(11.0%)
21-30	242(45.1%)	109(20.3%)	351(65.5%)
31-40	90(16.8%)	24(4.5%)	114(21.3%)
40-50	12(2.2%)	0	12(2.2%)
Income			
<500	279(52.1%)	88(16.4%)	367(68.5%)
500-1000	51(9.5%)	44(8.2%)	95(17.7%)
>1000	59(11%)	15(2.8%)	74(13.8%)

5.2 Family size, child ever born and experience of child death by the mothers

The average family size of the study population was 5.5 ranging from 2 to 15, in which most families had less than 5 members (59.3%), on average a mother had born 3.47 children and a maximum of 11. Also majority of them had 1 child and the average children alive to mother is 3.30 with median of 3 children is alive to mother and only 11.9% of were experienced child death (Table 2).

Table 2: - Distribution of family size, child ever born and alive to mother, Ambo Woreda, West Shewa Zone January, 2011

Variables	Frequency	Percent
Family size		
≤4	318	59.3
≥5	218	40.7
Child alive		
1	107	20
2-4	293	54.7
≥5	136	25.3
Experienced child death		
Yes	64	11.9
No	472	88.1

5.3 Antenatal care(ANC) follow up and TT status of mothers

About 63% of mothers had followed at least one ANC follow up during their pregnancy of the child selected for this study and most of them received two or less ANC service. In addition, 65.3% of them ever took one or more doses of TT vaccine, from these 56.6% took more than two doses (Table 3).

Table 3: - Maternal health care utilization Ambo Woreda and town, West Shewa Zone, January, 2011

Variables	Frequency	percent
Antenatal care		
Yes	337	62.9
No	199	37.1
No. of ANC taken (n=337)		
≤2	266	78.9
≥3	71	21.1
Tetanus Toxoid immunization		
Yes	350	65.3
No	186	34.7
No. of TT received (n=350)		
≤2	152	43.4
≥3	198	56.6

5.4 Availability and accessibility of vaccination service

The availability and accessibility of vaccination service was assessed by presence of the service and average walking time to the health facility. About 87% of the respondents were reported that they had access to the health facility that provides immunization services and majority of the reported (61.2%) that they were more access to health post followed by health centre (25.5%). For majority respondent (45.5%) the average walking time to the nearest health facilities was 15 minutes. (Table 4)

Table 4: - Vaccination service availability and accessibility in Ambo Woreda, West Shewa Zone, January, 2011

Variables	Frequency	Percent
Presence of health service		
Yes	467	87.1
No	69	12.9
Type of health institution present (n=467)		
Health center	119	25.5
Hospital	50	10.7
Health post	286	61.2
Private clinic	12	2.6
Average walking time to reach nearest vaccination service (n=467)		
<15 minutes	211	45.2
15-30 minutes	120	25.7
30-60 minutes	81	17.3
>60 minutes	55	11.8

5.5 Knowledge on vaccination and vaccine preventable diseases

Knowledge of mothers/caretakers on the vaccination and vaccine preventable disease is another factor assessed in this study, from the total respondents about 96% of the heard about vaccination and vaccine preventable disease, of these 61.3% heard from health professionals, 26.3% from radio, 5.3% from their friends, 5.1% from television and 1.9% from school. Majority of the respondent (79.5%) mentioned the objective immunization is to prevent disease, 12.1% responded it is for healthy child, 7.8% said they do not know and 0.6% mentioned it is for other reason like for diarrheal disease (Table 5).

The respondents were also asked the number of vaccine preventable disease they know and majority of the respondent, 76.7%, knew less than or equal to 3 vaccine preventable disease and only 8.4% of them knew four or more vaccine preventable disease and 9.1% do not know any of the disease. In addition to these, most of them knew 3 vaccine preventable diseases and in average one care takers knows 2 vaccine preventable diseases. And only 9(1.7%) respondents knew all (8) target vaccine preventable diseases (Table 5). From eight target vaccine preventable disease, majority the respondents (85.8%) knew measles followed by polio (59.5%) and tetanus (33.2%) as vaccine preventable disease. In contrast to these, 9.1% of them did not know any vaccine preventable disease.

Table 5: - Respondents knowledge on vaccination and vaccine preventable disease, Ambo Woreda West Shewa Zone, January 2011

Variables	Frequency	Percent
Heard about vaccination and VPD*		
Yes	514	95.9
No	22	4.1
Heard about vaccination and VPD* from (n=514)		
Radio	135	26.3
Television	26	5.1
Friends	27	5.3
From school	10	1.9
Health professionals	315	61.3
Other	1	.2
Objective of vaccination mentioned		
To prevent disease	426	79.5
For healthy child	65	12.1
I don't know	42	7.8
Other	3	.6
Number vaccine preventable disease know		
≤ 2	411	76.7
3-4	80	14.9
≥ 5	45	8.4

*VPD=vaccine preventable disease

Respondents' were asked for their knowledge on age at the child begins immunization, session needed for completion of immunization and age of completion of immunization. About 38% of them said age at the child begins immunization is 45 days after birth and 6.7% said just after birth, 14% at one month, 10.6% at 40 days and 21.6% said they do not know the age at which the child should begin immunization. Also on the session needed to complete immunization 31.9% answered three, 25.6% said four, 23.4% responded do not know. On age complete immunization 67.5% responded nine months, followed by 21.1% said they do not know, 4.1% said one year, 2.1% five year and 5.2% of them answered others. (Table 6)

Table 6: - Mothers' response to age the child begins, completes and session needed to complete child immunization, Ambo Woreda, West Shewa Zone, January. 2011

Variables	Frequency	Percent
Response to age begin immunization		
After birth	36	6.7
At 45 days	205	38.2
One months	75	14.0
At 40 days	57	10.6
I don't know	116	21.6
Others	47	8.8
Response to session needed to complete immunization		
Three	171	31.9
Four	137	25.6
I don't know	125	23.3
Five	31	5.8
One	23	4.3
Others	49	9.2
Age to complete immunization mentioned		
Nine months	362	67.5
One year	22	4.1
Five year	11	2.1
I don't know	113	21.1
Other	28	5.2

These responses were classified to the correct or incorrect; accordingly 45% of respondent answered correctly for age begin immunization which is just after birth and at 45 days, 67.5% gave correct answer for the age at complete immunization and only about one fourth the respondents answered correct answer for session needed to complete immunization.

5.6 Characteristics of the child

A total of 536 children of aged between 12- 23 months were included and most of them were 12 months of age. The mean and median children age was 16.75 and 16 respectively. About 51% of them were males and 48.9% were female children. Also about 36% were born at health institution, while 64.2% of them at home and majority children were third and above birth orders. In addition, majority the children were ever took one or more doses of vaccine, from these about 55% of them had vaccination card during the study. (Table 7)

Table 7:- Characteristics of the study children aged between 12-23 months in Ambo Woreda, West Shewa Zone January 2011

Variables	Frequency	Percent
Sex		
Male	274	51.1
Female	262	48.9
Place of delivery		
Home	344	64.2
Health institution	192	35.8
Birth order		
First	102	19
Second	110	20.6
Third and above	324	60.4
Ever vaccinated		
Yes	409	76.3
No	127	23.7
Had vaccination card(n=409)		
Yes	224	54.8
No	185	45.2

5.7 Immunization coverage among children aged between 12-23 months

From total of 536 children aged 12-23 months selected and included in this study, 409(76.3%) of them were ever took one or more of the eight recommended vaccine and 127(23.7%) are unvaccinated. Out of vaccinated, 224(54.8%) mothers showed a vaccination card. Also, 191(35.6%) children finished all recommended vaccination and 218(40.7%) of them took one or more vaccine but did not finish the recommended doses (Table 5).

Table 8: - Frequency of immunization status of children aged 12-23 months by immunization history and vaccination card, Ambo Woreda West Shewa Zone, January, 2011

Variables	Frequency	Percent
Vaccinated(card plus recall)		
Yes	409	76.3
No	127	23.7
Vaccination card (n=409)		
Yes	224	54.8
No	185	45.2
Immunization status (card plus recall)		
Fully vaccinated	191	35.6
Partially vaccinated	218	40.7
Unvaccinated	127	23.7

5.7.1 Immunization coverage by card plus recall

According to the vaccination card and mothers recall, about 76% of the children was took any doses of vaccine. From eight vaccines taken, OPV is in general the most taken vaccine. Particularly, OPV1 is taken by the majority of children (74.6%) followed by BCG (71.1%) and pentavalent3 was the least taken (Figure 2) with 16.9% pentavalent drop out rate and 22.8% BCG to measles vaccine dropout rate. The coverage showed a decrement from the first doses of vaccine to the last doses.

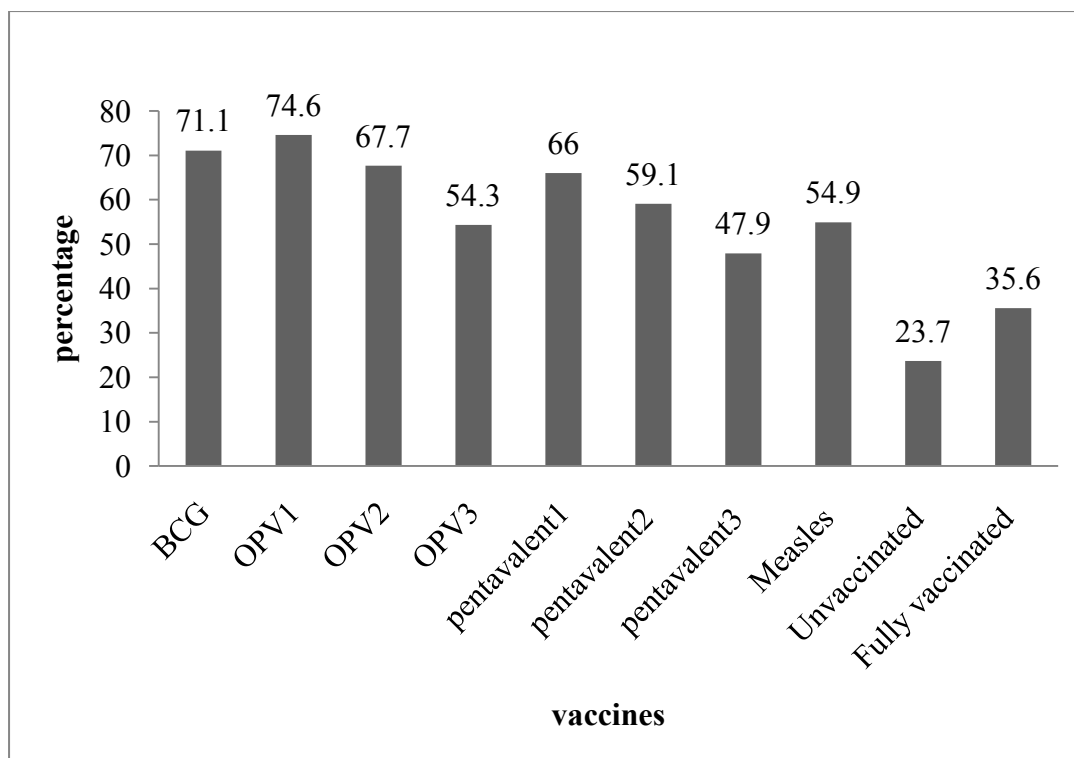


Figure 3: - Immunization coverage among children aged 12-23 months by card plus history, Ambo Woreda, West Shewa Zone January 2011

5.7.2 Immunization coverage by card only

The card retention rate was 54.8% and coverage by card only was calculated by taking children who had vaccine card as a numerator. From total, 40.3% took OPV1 and BCG vaccines which is followed by OPV2 (38.4%). Pentavalent1 was also taken by 36.9% children, 35.6% took pentavalent3 vaccine. Measles vaccine was taken by 29.9% of children and 27.8% were fully vaccinated by card only during the study period (Figure 3).

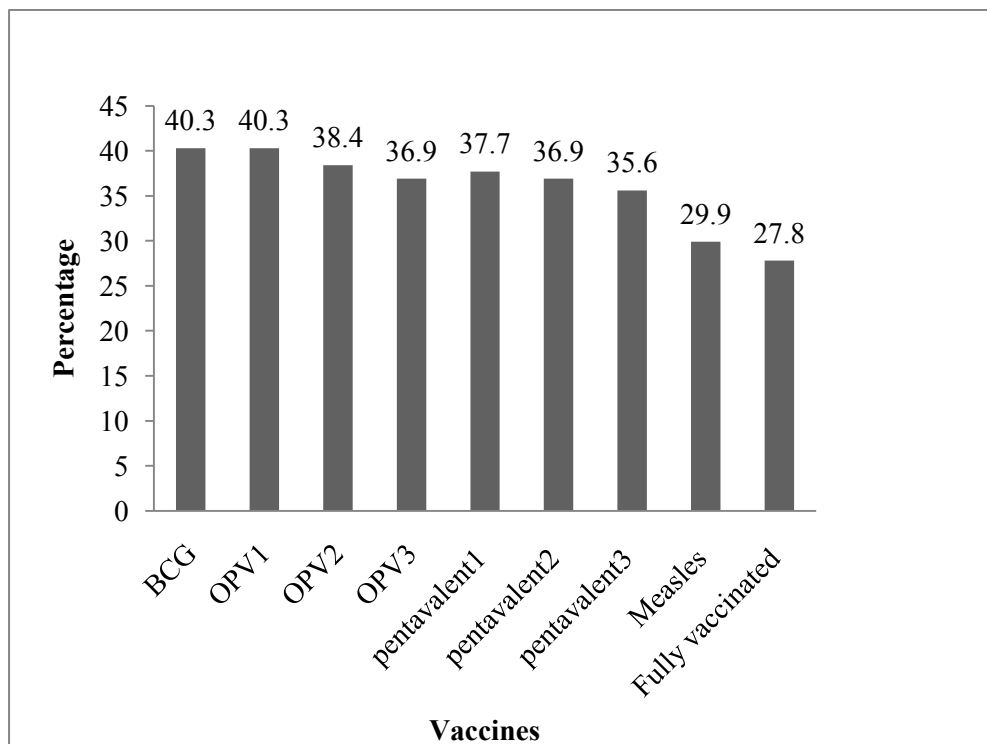


Figure 4: - Immunization coverage among children aged between 12-23 months by card only, Ambo Woreda and town, West Shewa Zone January, 2011

5.8 Factors affecting immunization status of children

Different variables are assumed to be associated to immunization status of the children were included in the study. These include socio demographic characteristics of mothers and child, maternal health care utilization; child characteristics and knowledge of care takers about vaccination were included. Factors associated with child immunization and completion of immunization was seen using logistic regression.

5.8.1 Socio-demographic characteristics of mothers

The association of mothers' socio demographic characteristics with immunization status of the children was assessed using biviriate and multivariate analyses by logistic regression analysis.

Mothers' educational status was the first factors that shows a significant association by bivariate analysis, from 47.9% children of illiterate mothers two third of their children were vaccinated and one third are not vaccinated. Also, from 37.5% of children mothers who attended primary school, 31.2% were vaccinated, whereas 6.3% were not vaccinated which is 2.6 (95% CI: 1.6, 4.01) times more likely to be vaccinated than illiterates. From total of study population, 14.6% of those who educated secondary and above, in which 13.6% were vaccinated and only 0.9% were not vaccinated which is 7.6(95% CI: 2.9, 19.5) more likely to vaccinate their children than illiterate mothers. Regarding the mother's occupation, government employee are 5(95% CI: 1.1, 22) more likely to vaccinate their children, but farmers are 0.4(95% CI 0.23, 0.71) times less likely vaccinate than housewife. But being the children of merchant and daily labourer have no difference with those of housewife.

On the other hand, children of urban residents were 1.97(95% CI: 1.2, 3.2) more likely to be vaccinated than their rural counter parts But, age of the mother and average monthly income of the household did not show any significant association with the whether the child is vaccinated or not by both bivariate and multivariate analyses. After further analysis was done none the mothers' socio demographic characteristics show significant association with the immunization status of the children. (Table 9)

Table 9: - Immunization status of children aged between 12-23 months by socio demographic characteristics of mothers and children, Ambo Woreda, West Shewa Zone January, 2011

Variables	Vaccinated		Odd ratio(95% CI)	
	Yes	No	Crude	Adjusted
Educational status				
Illiterate	169(31.5%)	88(16.4%)	1	1
Primary	167(31.2%)	34(6.3%)	2.6(1.6, 4.01)*	0.98(0.5, 1.7)
Secondary and above	73(13.6%)	5(0.9%)	7.6(2.9, 19.5)*	1.7(0.5, 5.9)
Marital status				
Unmarried	23(4.3%)	6(1.1%)	1	
Married	361(67.4%)	111(20.7%)	0.85(0.34, 2.13)	NI
Divorced	13(2.4%)	5(0.9%)	0.68(0.17, 2.7)	NI
Widowed	12(2.2%)	5(0.9%)	0.63(0.16, 2.5)	NI
Religion				
Orthodox	251(46.8%)	80(14.9%)	1	1
Protestant	133(24.8%)	27(5.0%)	1.57(0.97, 2.5)	1.9(0.9, 3.6)
Others	25(4.7%)	20(3.7%)	0.4(0.2, 0.76)*	1.5(0.6, 3.6)
Residence				
Rural	285(53.2%)	104(19.4%)	1	1
Urban	124(23.1%)	23(4.3%)	1.97(1.2, 3.2)*	0.91(0.4, 1.9)
Mother's occupation				
House wife	86(16%)	18(3.4%)	1	1
Gov. employee	48(9.0%)	2(0.4%)	5(1.1, 22)*	1.1(0.2, 6)
Merchant	55(10.3%)	10(1.9%)	1.2(0.5, 2.3)	1.1(0.3, 3)
Daily labourer	62(11.6%)	15(2.8%)	0.85(0.4, 1.8)	2.3(0.7, 6.5)
Farmer	158(29.5%)	82(15.3%)	0.4(0.23, 0.71)*	0.9(0.4, 1.9)
Mother's age				
<20	46(8.6%)	13(2.4%)	1	
21-30	263(49.1%)	88(16.4%)	0.84(0.4, 1.6)	NI
31-40	92(17.2%)	22(4.1%)	1.2(0.5, 2.6)	NI
41-50	8(1.5%)	4(0.7)	0.6(0.1, 2.2)	NI
Av. monthly income				
<500	277(51.7%)	90(16.8%)	1	
501-1000	70(13.1%)	25(4.7%)	0.9(0.5, 1.5)	NI
>1001	62(11.6%)	12(2.2%)	1.7(0.8, 3.3)	NI

* Significant at 95% CI

NI-not included

The associations of family size, child ever born and experience of child death by the mother were also seen using bivariate analysis. None of these have statistically significant association with the child immunization. Those who have family size ≥ 5 are 1.75(95% CI: 0.7, 1.6) times more likely to vaccinate their children than those with less family members also those had history of child death 1.12(95% CI: 0.2, 2) times more likely to vaccinate their children than who do not. In contrast these, mothers who born more than two children are less likely to vaccinate their children. (Table 10)

Table 10: - Immunization status of children aged between 12-23 months by family size, child ever born and experienced child death by the mother, Ambo Woreda, West Shewa Zone, January, 2011

Variables	Vaccinated		Odds ratio(95% CI)
	Yes	No	Crude
Family size			
≤ 4	241(45%)	77(14.4%)	1
≥ 5	168(31.3%)	50(9.3%)	1.75(0.7, 1.6)
Child ever born			
1	86(16%)	21(3.9%)	1
2-4	220(41%)	73(13.6%)	0.72(0.4, 1.3)
≥ 5	103(19.2%)	33(6.2%)	0.76(0.4, 1.4)
Experienced child death			
Yes	359(67%)	113(21.1%)	1.12(0.6, 2)
No	50(9.3%)	14(2.6%)	1

5.8.2 Antenatal care (ANC) follow up and TT status of mothers

Maternal health care utilization like ANC follow up and maternal tetanus toxoid status were another factors assessed in this study if they have an association with child immunization coverage. Numbers of ANC follow up and doses of tetanus toxoid received also included. Bivariate analysis shows children of mothers who had followed antenatal care during their pregnancy the child selected for these study were 8.7(95% CI: 5.5, 13.8) times more likely to be immunized than those who do not, but the number of times the mother received the care has no significantly association (Table 11).

Beside this, children of mothers who had received 1-2 doses of tetanus toxoid vaccine were 3.7(95% CI: 2.25, 6.2) and those of received three or above doses were 11.1(95% CI: 5.9, 20.5) times more likely to be vaccinated than whose mother did not received. After adjustment, only antenatal care follow up shows a significant association with child immunization by adjusted odds ratio of 2.4(95% CI: 1.2, 5). (Table 11)

Table 11: - Immunization status of children aged between 12-23 months by ANC follow up and TT status of mothers, Ambo Woreda, West Shewa Zone January, 2011

Variables	Vaccinated		Odds ratio (95% C.I)	
	Yes	No	Crude	Adjusted
Antenatal follow up				
Yes	305(56.9%)	32(6.0%)	8.7(5.5,13.8)*	2.4(1.2, 5)*
No	104(19.4%)	95(17.7%)	1	1
No. of ANC(n=337)				
≤ 2	239(70.9%)	27(8%)	1	
≥ 3	66(19.6%)	5(1.5%)	1.49(0.6, 4)	
TT immunized				
Yes	308(57.5%)	42(7.8%)	6.2(4, 9.5)*	1.46(0.8, 2.9)
No	101(18.8%)	85(15.9%)	1	1
TT status of mother				
None	101(18.8%)	85(15.9%)	1	1
1-2	124(35.4%)	28(8%)	3.7(2.3, 6.2)*	1.2(0.6, 2.5)
≥ 3	184(52.6%)	14(4%)	11.1(5.9, 20.5)*	2.2(0.9, 5.2)

**significant at 95% CI*

5.8.3 Availability and accessibility of vaccination service

The presence and accessibility by average walking time to reach to the health facility were also another factors assessed in this study for the association with child immunization status. From 87.1% households near to the health service 70% were vaccinated and 17.2% were not vaccinated but half of children of household who reported not access to health facility were unvaccinated. But it is not statistically significant after adjustment for other variables (AOR=0.6; 95% CI: 0.3, 1.4).

Regarding to the average walking time to reach the nearest health facility, the there is no statistically significant difference in child immunization among those who reported walking of less than 15 minutes and those take above. (Table 12)

Table 12:- Immunization status of children aged between 12-23 months by health care availability and accessibility, Ambo Woreda West Shewa Zone, January, 2011

Variables	Vaccinated		Odds ratio(95% CI)	
	Yes	No	Crude	Adjusted
Presence of vaccine service				
Yes	375(70.0%)	92(17.2%)	1	1
No	34(6.3%)	35(6.5%)	0.23(0.14, 0.4)*	0.6(0.3, 1.4)
Average walking time take to reach to the vaccine service (n=467)				
<15 minutes	175(37.5%)	36(7.7%)	1	
15-30 minutes	98(21.0%)	22(4.7%)	0.9(0.5, 1.6)	NI
30-60 minutes	60(12.8%)	21(4.5%)	0.59(0.3, 1.2)	NI
>60 minutes	42(9.0%)	13(2.8%)	0.67(0.3, 1.3)	NI

**significant at 95% CI*
NI-not included

5.8.4 Mothers' knowledge on vaccination and vaccine preventable diseases

In this study association of mothers' knowledge on vaccination and vaccine preventable disease with child immunization status was also assessed by bivariate and multivariate analysis. The result from bivariate analysis shows that, mothers who did not heard about vaccination and vaccine preventable disease and who says the objective of vaccination is for healthy child and I don't know were less likely to vaccinate their children. The result of multivariate also shows that, mothers who did not heard about vaccination 0.13(95% CI: 0.02, 0.9) times less likely to vaccinate their children than those who heard. In contrast to this, mothers' knowledge of objective of immunization and number of vaccine preventable disease known by the mother did not showed statistically significant association with the child immunization status (Table 13).

Table 13: - Immunization status among children aged 12-23 months by the knowledge of vaccination and vaccine preventable disease, Ambo Woreda West Shewa Zone January, 2011

Variables	Vaccinated		Odds ratio(95% CI)	
	Yes	No	Crude	Adjusted
Heard about vaccination and vaccine preventable disease				
Yes	406(75.7%)	108(20.1%)	1	1
No	3(0.6%)	19(3.5%)	0.042(0.01,0.15)*	0.13(0.02, 0.9)*
Objective of immunization mentioned				
To prevent disease	352(65.7%)	74(13.8%)	1	1
For healthy child	45(8.4%)	20(3.7%)	0.47(0.3, 0.8)*	0.9(0.4, 1.9)
I don't know	10(1.9%)	32(6%)	0.07(0.03, 0.13)*	0.4(0.14, 1.3)
Other	2(0.4%)	1(0.2%)	0.42(0.03, 4.7)	0.8(0.05, 14)
Number vaccine preventable disease know				
≤2	304(56.7%)	107(20%)	1	
3-4	65(12.1%)	15(2.8%)	1.5(0.8, 2.8)	1.3(0.6, 2.6)
≥5	40(7.5%)	5(0.9%)	2.8(1.1, 7.3)*	2.1(0.7, 6.3)

**significant at 95% CI*

5.8.5 Knowledge of age begins, finish and session needed for immunization

In this study association of mothers' correct knowledge on immunization schedule and child vaccination was assessed, shows that children whose mothers know the correct age at the child begin and finish immunization was more likely to be vaccinated than who did not.

Children of mothers who know correct age at begin immunization were 2.5(95% CI: 1.3, 4.7) time likely to be vaccinated than who did know and those of who know the correct age of finishing immunization were also 3.2(95% CI: 1.8, 5.7) time more likely to be vaccinated. But the correct knowledge of session needed to complete immunization did not show a significant association with child vaccination after adjustment for other variables. (Table 14)

Table 14: - Immunization status of children aged between 12-23 months by knowledge of age at the child begins finishes and session needed to immunization, Ambo Woreda West Shewa Zone January, 2011

Variables	Vaccinated		Odds ratio(95% CI)	
	Yes	No	Crude	Adjusted
Know Correct age of begin immunization				
Yes	223(41.6%)	18(3.4%)	7.3(4.3, 12.4)*	2.5(1.3, 4.7)*
No	186(34.7%)	109(20.3%)	1	1
Know correct session needed to complete immunization				
Yes	121(22.6%)	16(3%)	2.92(1.7, 5.1)*	1.08(0.5, 2.2)
No	288(53.7%)	111(20.7%)	1	1
Know the correct age of complete immunization				
yes	324(60.4%)	38(7.1%)	8.9(5.7, 13.9)*	3.2(1.8, 5.7)*
No	85(15.9%)	89(16.6%)	1	1

**significant at 95% CI*

5.8.6 Child characteristics

The associations of child characteristics like sex, place of delivery and birth order with the immunization status of child were assessed by both bivariate and multivariate analyses. About 41.2% of male and 35.1% female children were vaccinated. Bivariate analysis shows that male children were 1.64(95% CI: 1.1, 2.5) times more likely to be vaccinated and children born at health institution were 7.5(95% CI: 4.03, 14.08) time likely to be vaccinated.

Multivariate logistic regression analysis also shows that males and children born at health institution were more likely to be vaccinated by adjusted Odds ratio 1.8(95% CI: 1, 3.1) and 2.3(95% CI: 1.1, 4.9) respectively. But birth order of the child did not have statistically significant association with the child immunization status. (Table 15)

Table 15:- Immunization status of children aged between 12-23 months by characteristics of children, Ambo woreda, West Shewa Zone, January 2011

Variables	Vaccinated		Odds ratio(95 CI)	
	Yes	No	Crude	Adjusted
Sex				
Male	221(41.2%)	53(9.9%)	1.64(1.1, 2.5)*	1.8(1.1, 3.1)*
Female	188(35.1%)	74(13.8%)	1	1
Place of delivery				
Home	229(42.7%)	115(21.5%)	1	1
Health institution	180(33.6%)	12(2.2%)	7.5(4.03, 14.08)*	2.3(1.1, 4.9)*
Birth order				
First	82(15.3%)	20(3.7%)	1	
Second	79(14.7%)	31(5.8%)	0.6(0.3, 1.8)	NI
Third and above	248(46.3%)	76(14.2%)	0.8(0.5, 1.4)	NI

**significant at 95% CI*

NI-not included

5.9 Factors affecting completion of immunization

In this study factors associated with completion of child immunization were also assessed separately. These factors include socio demographic characteristics of mothers and child, maternal health care utilization, health care availability and accessibility and knowledge of care takers on vaccination and vaccine preventable disease were included in the analysis.

5.9.1 Socio-demographic characteristics of mothers

Socio-demographic characteristics of mother/caretakers were first factors assessed for their association with the completion of immunization using both multivariate and bivariate analyses. Results from bivariate analysis indicates that, maternal socio demographic characteristics such as educational status, religion, occupation, place of residence and average monthly income were the factors that have shown to increase completion of immunization among children aged between 12-23 months. Regarding educational status, taking illiterate as a reference children of mothers' who attended primary school were 2.12(95% CI: 1.4, 3.2) times more likely to be fully vaccinated as well as those of attended high school and above were 5.74(95% CI: 3.3, 9.9) times more likely to be fully vaccinated than those of illiterate.

Religion and occupation of the mothers were also the other factors showed a significant association with completion of immunization by children. Children whose mothers' were other religions rather than orthodox and protestant were 0.3(95% CI: 0.1, 0.69) times less likely to be fully vaccinated when compared with children of orthodox. In addition, when we compare children of mothers other occupation with children of housewife, children of government employee were 5.5(95% CI: 2.5, 12) times more likely to complete immunization and those of farmers were 0.3(95% CI: 0.24, 0.6) times less likely to be fully vaccinated. But no significant difference children of daily labourer and merchant compared to housewife children.

Place of residence (being urban or rural) and average monthly income of household were the third variables that have an association with completion of immunization in this study. Children who reside in urban areas were 2.99(95% CI: 2, 4.4) times more likely to complete immunization than those rural residence. Beside this, households who have an average monthly income of greater than 1000 Ethiopian birr and between 500-1000 birr were 3.2(95% CI: 1.9, 5.3) and 2.5(95% CI: 1.5, 3.9) times more likely to fully vaccinate when

compared who had less than average monthly income of 500 birr. But marital status and age of the mother did not show an association with the completion child immunization. After adjusting for other variables, none of these socio-demographic characteristics of mother have significant associated with completion of immunization. (Table 16)

Table 16: - Completion of immunization among children aged between 12-23 months by socio demographic characteristics of mother, Ambo Woreda, West Shewa Zone January, 2011

Variables	Fully vaccinated		Odds ratio (95% CI)	
	Yes	No	Crude	Adjusted
Educational status				
Illiterate	61(11.4%)	196(36.5%)	1	1
Primary	80(14.9%)	121(22.6%)	2.12(1.4, 3.2)*	1.3(0.7, 2.1)
Secondary and above	50(9.3%)	28(5.2%)	5.74(3.3, 9.9)*	1.02(0.5, 2.2)
Marital status				
Unmarried	7(1.3%)	22(4.1%)	1	
Married	172(32.1%)	300(56%)	1.8(0.8, 4.3)	NI
Divorced	6(1.1%)	12(2.3%)	1.6(0.43, 5.8)	NI
Widowed	6(1.1%)	11(2.1%)	1.7(0.5, 6)	NI
Religion				
Orthodox	126(23.5%)	205(38.2%)	1	1
Protestant	58(10.8%)	102(19%)	0.9(0.6, 1.4)	1(0.5, 1.8)
Others	7(1.3%)	38(7.1%)	0.3(0.13,0.69)*	1.56(0.4, 5.3)
Residence				
Rural	111(20.7%)	278(51.9%)	1	1
Urban	80(14.9%)	67(12.5%)	2.99(2, 4.4)*	0.7(0.3, 1.4)
Mother's occupation				
House wife	44(8.2%)	60(11.2%)	1	1
Gov. employee	30(7.5%)	10(1.9%)	5.5(2.5, 12)*	2.7(0.99, 7.5)
Merchant	31(5.8%)	34(6.3%)	1.2(0.7, 2.3)	1.2(0.5, 2.8)
Daily labourer	239(4.3%)	54(10.1%)	0.6(0.3, 1.1)	0.94(0.4, 2.4)
Farmer	53(9.9%)	187(34.9%)	0.3(0.24, 0.6)*	0.8(0.4, 1.4)
Mother's/caretaker age				
<20	23(4.3%)	36(6.7%)	1	NI
21-30	132(24.6%)	219(40.9%)	0.9(0.5, 1.7)	NI
31-40	35(6.5%)	79(14.7%)	0.7(0.4, 1.3)	NI
41-50	1(0.2%)	11(2.1%)	0.14(0.02, 1.2)	NI
Av. monthly income				
<500	103(19.2%)	264(49.3%)	1	1
501-1000	47(8.8%)	48(9%)	2.5(1.5, 3.9)*	0.8(0.4, 1.6)
>1001	41(7.6%)	33(6.2%)	3.2(1.9, 5.3)*	1.9(0.99, 3.9)

*significant at 95% CI

NI- not included

The association of completing vaccination of children with family size, child ever born to mother, and experience of child death by mother were assessed by bivariate analysis shows that, these variables do not have significant association with completion of vaccination. But as the odds ratio show children of households with greater than four family members, mother who give birth more than four and mother who doesn't experienced the child death were less likely to completely vaccinate their children (Table 17).

Table 17: - Completion of immunization among children aged between 12-23 months by family size, child ever born and experienced child death, Ambo Woreda, West Shewa Zone, January, 2011

Variables	Fully vaccinated		Odds ratio(95% CI)
	Yes	No	Crude
Family size			
≤4	115(21.5%)	203(37.9%)	1
≥5	76(14.2%)	142(26.5%)	0.95(0.7, 1.4)
Child ever born			
1	38(7.1%)	69(12.9%)	1
2-4	111(20.7%)	182(34%)	1.17(0.7, 1.7)
≥5	42(7.8%)	94(17.5%)	0.8(0.4,1.4)
Experienced child death			
Yes	45(8.4%)	19(3.5%)	0.7(0.4, 1.3)
No	300(56%)	172(32.1%)	1

5.9.2 Antenatal care(ANC) follow up and TT status of mothers

In this study ANC follow up and tetanus toxoid status of mother are the second factors assessed for their association with completion of child immunization. In bivariate analysis ANC follow up and mothers TT status showed a significant association with completion of vaccination among children aged between 12-23 months.

Mothers who had followed ANC check up during their pregnancy of the selected child for this study were 6.8(95% CI: 4, 10) times more likely to vaccinate their children fully than who did not. But number of ANC follow up that mother had took has no association with full vaccination of children. In addition to this, children of mothers who ever took tetanus toxoid vaccine were 4.9(95% CI: 3.1, 7.7) times more likely to be vaccinated than those who did not vaccinated. Doses of tetanus toxoid that mother took have also a significant association with

completion of child vaccination of their children. Children of mothers who took one to two doses of tetanus toxoid were 3.02 (95% CI: 1.7, 5.9) and of those took three doses and above 7.1(95% CI: 4.3, 11.5) times to be fully vaccinated than children of mothers who did not took any doses of the vaccine.

The association this factors was also assessed by using multivariate logistic regression analysis. It showed that only ANC follow up have the significantly associated with the completion of vaccination by adjusted odds ratio of 2.1(95% CI: 1.03, 4). (Table 18)

Table 18: - Completion of immunization among children aged 12-23 months by ANC follow up and TT status of mothers, Ambo Woreda West Shewa Zone January, 2011

Variables	Fully vaccinated		Odds ratio (95% C.I)	
	Yes	No	Crude	Adjusted
Antenatal follow up				
Yes	165(30.8%)	172(32.1%)	6.8(4, 10)*	2.1(1.03, 4)*
No	26(4.9%)	173(32.3%)	1	1
No. of ANC(n=337)				
≤2	130(38.6%)	135(40.4%)	1	
≥3	35(10.4%)	36(10.7%)	1.1(0.6, 1.7)	NI
TT immunized				
Yes	163(30.4%)	187(34.9%)	4.9(3.1, 7.7)*	1.2(0.6, 2.5)
No	28(5.2%)	158(29.5%)	1	1
Doses of TT received				
None	28(5.2%)	158(29.5%)	1	1
1-2	53(15.1%)	99(28.3%)	3.02(1.7, 5.9)*	0.8(0.4, 1.8)
≥3	110(31.4%)	88(25.1%)	7.1(4.3, 11.5)*	1.9(0.9, 4.8)

* Significant at 95% CI

NI-not included

5.9.3 Availability and accessibility of vaccination service

The associations of health care availability and accessibility with the completion of vaccination also seen by using bivariate and multivariate analysis. Children of households of no access to health facility which provides vaccination service were 0.02(95% CI: 0.003, 0.16) times less likely to be fully vaccinated than those of household have access to the vaccination service. Also when we compare those with no health facility provides vaccination service with those different walking time to reach the health facility the likely hood of the children to be fully vaccinated is decrease as the walking time to reach health facility

increase. But no significant difference between for those of takes more than one hour and no vaccination service near to their locality.

After adjustment for another variables presence of health service is has no difference to be fully vaccinated. Regarding walking time to reach health facility, after taking a reference those who had no access for health facility provides vaccination services there is no significant difference between those who had access of health facilities with different average walking time. (Table 19)

Table 19: - Completion of immunization among children aged between 12-23 months by health care availability and accessibility, Ambo Woreda West Shewa Zone January, 2011

Variables	Fully vaccinated		Odds ratio (95% CI)	
	Yes	No	Crude	Adjusted
Presence of vaccine service				
Yes	190(35.4%)	277(51.7%)	1	1
No	1(0.2%)	68(12.7%)	0.02(0.003, 0.16)*	0.7(0.3, 1.4)
Time take to reach to the vaccine service				
None	1(0.2%)	68(12.7%)	1	1
<15 minutes	108(23.1%)	103(22.1%)	13(4.7, 38)*	1.17(0.5, 2.9)
15-30 minutes	50(7.8%)	70(15%)	9(3, 26.8)*	1.5(0.6, 3.9)
30-60 minutes	28(6%)	53(11.3%)	6(2.2, 20)*	1.6(0.6, 4.4)
>60 minutes	4(0.9%)	51(10.9%)	0.2(0.02, 1.7)	1.9(0.7, 5.5)

**significant at 95% CI*

5.9.4 Knowledge of mothers on vaccination and vaccine preventable diseases

Association of mothers' knowledge about vaccination and vaccine preventable disease with the completion of immunization was the fourth factor assessed in this study. The results from bivariate analysis shows, children of mothers who heard about vaccination were 5.8(95% CI 1.3, 25) likely to be fully vaccinated than those haven't heard. In addition, mothers who responded that immunization is for healthy child and I don't know the objective of vaccination were also less likely to fully vaccinate their children than those mentioned it is to prevent disease. But the number of vaccine preventable disease known by the respondents did not show a significant association with completion of immunization by children.

Despite the results of bivariate, multivariate analysis shows that these two factors did not have significant association with completion of immunization among children (Table 20).

Table 20: - Immunization completion of children aged between 12-23 months by the knowledge on vaccination and vaccine preventable disease, Ambo Woreda, West Shewa Zone, January, 2011

Variables	Fully vaccinated		Odds ratio(95% CI)	
	Yes	No	Crude	Adjusted
Heard about vaccination and vaccine preventable disease				
Yes	189(35.2%)	325(60.6%)	5.8(1.3, 25)*	1.2(0.2, 9.7)
No	2(0.4%)	20(3.7%)	1	1
Objective of immunization mentioned				
To prevent disease	176(32.8%)	250(46.6%)	1	1
For healthy child	11(2.1%)	54(10.1%)	0.3(0.15, 0.6)*	.8(0.4, 1.6)
I don't know	3(0.6%)	39(7.3%)	0.1(0.03, 0.4)*	.4(0.13, 1.2)
Other	1(0.2%)	2(0.4%)	0.7(0.06, 7.9)	1.4(0.04, 38)
Number vaccine preventable disease know				
<2	146(27.2%)	265(49.4%)	1	
2-4	31(5.8%)	49(9.1%)	1.15(0.7, 1.9)	NI
>4	14(2.6%)	31(5.9%)	0.8(0.4, 1.6)	NI

*significant at 95% CI

NI-not included

5.9.5. Knowledge of age begins, finishes and session needed for immunization

The associations of mothers' correct knowledge on age at the begins, finishes immunization and session needed for complete immunization were seen using bivariate and multivariate analyses after categorizing the responses into the correct and incorrect answer for the immunization schedules. Both analyses, i.e. bivariate and multivariate, show that at 95% CI the correct knowledge of age at begin and finish vaccination are related to the fully vaccination status of children. Children of mothers who know correctly age at the child should begin and finishes immunization were 2.4(95% CI of 1.4, 5.2) and 3.3(95% CI of 1.8, 6) times more likely to be fully vaccinated than respectively.

Regards to session needed for immunization, bivariate analysis shows that mother who know correct sessions needed for the immunization were 1.7(95% CI: 1.12, 2.5) time more likely to complete child immunization, but after adjustment for other variables there was no significant association with completion of vaccination and knowledge of mother about number of sessions needed to complete immunization (Table 21).

Table 21: - Immunization completion among children aged 12-23 by knowledge of mothers on age begin, finish and session needed for complete immunization Ambo Woreda, West Shewa Zone, January, 2011

Variables	Fully vaccinated		Odds ratio(95% CI)	
	Yes	No	Crude	Adjusted
Know correct age of begin immunization				
Yes	137(25.6%)	104(19.4%)	5.9(3.9, 8.7)*	2.4(1.5, 4)*
No	54(10.1%)	241(45%)	1	1
Know correct sessions needed to complete immunization				
Yes	61(11.4%)	76(14.2%)	1.7(1.12, 2.5)*	1.2(0.6, 2.6)
No	130(24.3%)	269(50.2%)	1	1
Know the correct age at complete immunization				
Yes	176(32.8%)	186(34.7%)	10(5.7, 17.7)*	5.4(2.6, 10)*
No	15(2.8%)	159(29.7%)	1	1

Note: *significant at 95% CI

5.9.6 Child characteristics

Association of child characteristics like sex of the child, place delivery and birth order of the child with completion of child immunization were another variable assessed by this study. From these variables place delivery was showed the significant association with completion of immunization by both multivariate and bivarite analysis. Children those born in health institution were 2.1(95% CI: 1.3, 3.5) times likely to be fully vaccinated than those who born a home after adjustment for another variable (Table 22).

Table 22:- Immunization completion among children aged between 12-23 month by characteristics of the child, Ambo woreda and town, West Shewa Zone January 2011

Variables	Vaccinated		Odds ratio(95 CI)	
	Yes	No	Crude	Adjusted
Sex				
Male	93(17.4%)	181(33.8%)	0.86(0.6, 1.2)	NI
Female	98(18.3%)	164(30.6%)	1	
Place of delivery				
Home	81(15.1%)	263(49.1%)	1	1
Health institution	110(20.5%)	82(15.3%)	4.4(2.9, 6.4)*	2.1(1.3, 3.5)*
Birth order				
First	37(6.9%)	65(12.1%)	1	
Second	42(7.8%)	68(12.7%)	1.08(0.6, 1.9)	NI
Third and above	112(20.9%)	212(39.9%)	0.9(0.6, 1.5)	NI

**significant at 95% CI*

NI-not included

5.10. Reasons for vaccination failure among partially or unvaccinated children

The respondent who were not completing and not vaccinated their children asked for reasons of failure. From the reasons given for not completing immunization majority of the respondents said the vaccination time is inconvenient (25.2%), 17.9% of them said they do not know whether to come back for subsequent doses, 17% of them gives other reasons plus no reasons, 14.8% defaulted because of vaccination is site is far away from them and the last given reason was lack of awareness about vaccination among 1.4% of the respondents (Table 23).

Table 23:- Reasons given by mothers for defaulting from completing children's immunization, Ambo Woreda, West Shewa zone January 2011

Reasons	Frequency	Percent
Vaccination card lost	5	2.3
Vaccination time inconvenient	55	25.2
Absence of vaccinators	30	13.8
Lack of awareness about vaccination	3	1.4
Don't know time and place of vaccination	3	1.4
Unaware of need to return for subsequent doses	39	17.9
Child sick	8	3.7
Vaccine not available	6	2.8
Others	37	17.0

In addition to this, reasons for not vaccinating their children were also asked the respondents whose children were not vaccinated. Among the reason given majority of the respondents said that health professionals who give vaccination do not come to our kebele (28.3%), 19% of the respondents do not give any specific reason, 12.6% said vaccination have no use for the children and 9.4% of them lack awareness about vaccination and absence of health facility which give vaccination service around their localities (Table 24).

Table 24:- Reasons given by mothers for not vaccinating their children Ambo Woreda, West Shewa Zone January 2011

Reasons	Frequency	Percent
Health professionals don't come and give vaccination at our kebele	36	28.3
vaccination no use	16	12.6
vaccination hurts children	12	9.4
religion and cultural refute	1	.8
lack of awareness about vaccination	12	9.4
fear of side effect	7	5.5
Vaccination time inconvenience	6	4.7
Other	25	19.7

6. DISCUSSION

This study tried to assess the coverage of immunization and factors associated with it among children aged between 12-23 months old residing in selected 10 kebeles of Ambo Woreda found in West Shewa Zone, Oromia regional state of Ethiopia.

Immunization coverage was assessed using the availability of vaccination card and maternal recall. Based on immunization card and recall, 35.4% children were fully vaccinated, and 23.7% were unvaccinated. The pentavalent3 coverage was 47.9% and 54.9% took measles. The OPV vaccine coverage was slightly higher than the coverage of the pentavalent vaccine which is given each other according to the EPI schedule. Also the measles coverage is higher than the pentavalent3 coverage. But it is expected that the pentavalent3 coverage should be higher because of drop out and the time gap between the two vaccines, in which the mother can forgot the measles vaccine. Measles and OPV coverage is higher may be due to the frequent national campaign usually focus on the two vaccines.

When we compare the immunization coverage of Ambo district with EDHS 2005, the percent of fully vaccinated is higher by 15%, but proportion of unvaccinated children is similar (10). It is higher than the 2006 immunization coverage survey in the country which is about 19.9% of children fully vaccinated by card only (11). This figure is also lower than the immunization coverage reported of 2008 health and health related indicators. This may be due to the health and health related indicators report accompanies area of high and low coverage. Also there may be over reporting from some areas (17).

From the total interviewed households, 224(41.8%) them able to show the vaccination card. From these most the children took BCG and OPV1 vaccines but only 27.8% of finished the immunization. The coverage by card only is also less than that of health and related indicators. Also, percent of fully vaccinated was about 8% higher than EDHS and 2006 EPI survey coverage (10, 11, 17)

Mother/immediate care takers knowledge on vaccination and vaccine preventable disease was also assessed in this study. About 96% mothers/immediate care takers were heard about immunization and vaccine preventable disease. But only 79.5% of them mentioned that vaccination is to prevent disease, which is the correct objective of vaccination. Also, only a fifth of respondents knew more than three vaccine preventable disease. Regards to correct

knowledge of mothers age at the child begins and finishes the immunization, less than half of the respondents knew the correct age at the child begin immunization, only a fourth knew session needed to complete immunization and only 67.5% of them knew the correctly the age at the child should finish vaccination. This finding is consistence with the study done in Nigeria in which, more than half of mothers knew the objective and the schedule of immunization (27)

This study also tried to assess factors affecting the immunization status of the children by classifying the status of the children into two categories vaccinated or not and whether the child is fully vaccinated. Factors affecting these two variables were analyzed separately and factors related to them were identified by bivariate and multivariate analysis using binary logistic regression.

Based on the bivariate analysis educational status, place of residence, occupation and religion of the mother showed significant association with the immunization status of the children. Mothers attended school were more likely to vaccinate their children and those attend high school and above were more likely to vaccinate their children than those of primary school. Urban residents and governmental employees were also more likely to vaccinate their children. But rural residents and farmers were less likely to vaccinate their children. This is consistence with the study done in Burkina Faso(20). But average household's monthly income, age of mother/caretakers and marital status had no association with child immunization status.

Studies from another places showed that, family size is the important factor for child immunization status but, in this study there is no significant difference in immunization status of children among those who have many and small number of children. Studies also showed that, younger and middle aged mother are also more likely to vaccinate their children than the older mothers (18-20). This also did not have a significant association in this study.

From characteristics of the child, sex and place delivery show an association child immunization status. Health institution born children were 7.5 times more likely to be vaccinated and 4.4 times more likely to complete vaccination than home born children, which is consistent with studies from other places (29-31). Male children were 1.64 times more likely to be vaccinated but, no significant difference between both sexes on completion of

vaccination. But birth order of the child did not show significant association with the immunization status of children aged between 12-23 months.

Antenatal care (ANC) follow up and TT status of the mother also showed a significant association with the child immunization status by bivariate analysis. Mother who had followed ANC was 8.7 times more likely to vaccinated and 6.8 times to complete vaccination. Also those one and more doses of TT vaccine were more likely to be vaccinated this is consistence with the study done in Bangladesh (21).

Children of households not access to the vaccination services were 0.23 time less likely to be vaccinated and 0.02 times less likely to complete immunization. No significant difference for household nearest and far away for child to be vaccinated by average walking time. But, for completion of immunization households near to vaccination service were more likely to be vaccinated than those far away. This is consistence with the study in Sudan (26).

Awareness about vaccination and vaccine preventable disease had significant association with child immunization status. Children of mothers those not heard about vaccination and vaccine preventable were 0.042 times less likely to be vaccinated and those heard were also 5.8 times more likely to be fully vaccinated. Those who did not mentioned the immunization benefit less likely to be vaccinated as well as complete the vaccination. But number of vaccine preventable disease known by the respondents has no significant association with the child vaccination.

Variables that showed significant association by bivariate analysis were included multivariate logistic regression analysis for further analysis. From variables included in the model characteristics of the child like sex and place of delivery, ANC follow up and knowledge of mothers' on age at the child begins and finishes immunization were those factors found to be associated with child immunization.

Sex of child is found to be associated with child immunization, males were 1.8 times more likely to vaccinate than female children, and i.e. the proportion of unvaccinated children is higher among female children. This shows their sexual discrimination between male and female children. This similar to the study done in India and Bangladesh in which male children were more likely to vaccinated than the female children(21, 32). But, there is no sex difference for the completion vaccination which is consistence with 2006 national EPI survey

and study done in Nigeria (11, 33). Which indicates female children were more likely to be unvaccinated than males rather than completing the vaccination. However after they begin vaccination mothers/caretakers are tends to finish the immunization. This indicates families are more motivated to take the male children for vaccination.

In this study educational status, occupation, place of residence and religion of the mothers/caretakers did not show the significant association with the immunization status of children aged between 12-23 months after adjustment for other variables. This is similar with the case control study done in Wanago Woreda, Southern Ethiopia in which only average monthly income showed a significant association defaulting from the immunization (15). But Study from other places indicates that these factors have a significant association with child immunization status (12, 23, 25, 26).

Place of delivery is another child characteristic which showed a significant association with the immunization status of children aged between 12-23 months by multivariate analysis. Health institution born children were 2.3 times more likely to vaccinated and 2.6 times to complete vaccination. This similar with study done at Mozambique in which home delivered are 2.27 times risk of incomplete immunization(29). These indicate that, mothers who delivered at health institution are more aware about the benefit of vaccination than mother who delivered at home. The explanation related to this may be mothers who give birth at health institution are more near to the health service and when they giving birth at health institution, most of the time the first doses of vaccination are given after birth at health institution. So immunization begins in health institution by health professionals. But mother who delivered at home, delivered by non health professionals those who do not know the even about immunization so, the immunization is just started by the mother motivation. If the mothers lack awareness about vaccination, then children left unvaccinated or may not complete the vaccination.

ANC follow up and TT status of mothers is maternal health care utilization were variables included in the multivariate analysis. ANC follow up was showed having significant association with child immunization status. Children of mother who followed ANC were 2.4 times more likely to be vaccinated and 2.1 times to complete vaccination than those with no follow up, which is consistence with the study done in India(30). Also study done in

Bangladesh shows that both of these factors have a significant association with completion of immunization (21).

In this study presence of health facility provide immunization service did not show a significant association with the child immunization status. But even if not significant statistically, half the children not access to vaccination service were unvaccinated and only one child is fully vaccinated. In addition, accessibility in terms of average walking time to nearest health facility also did not have a significant association with the immunization status of the children which is similar with the study of Mozambique in which need of transport and availability in terms of need of transport and average distance from the health facility (29). But it is not similar with the study in Sudan, which studies availability in terms of average walking time (26)

Studies indicated that, lacks of awareness about immunization contribute to low immunization coverage in Ethiopia (13). The findings of this study also indicate that lack of knowledge on vaccination and vaccine preventable disease, and age at the child begins and finishes the immunization, and is related with the immunization status of children aged 12-23 months. Mother those not heard about vaccination and vaccine preventable disease were less likely to vaccinate their children. But, there is no significant difference in completion of immunization. This indicates that, those who have no information are not begun the immunization for their children. Mother who know correctly the age at which the child begins and finish immunization are more likely to vaccinate as well as finish immunization of their children than those who did not know correctly. These finding is consistence with the study in other place of Ethiopia (11, 22). But knowledge of objective of vaccination have no association, this is may be mother going to vaccinate their child if they felt that it is good, in addition it can be social influence.

Different reasons were given by the respondent for not immunizing and defaulting. The reasons like absence of health professionals; health facility is far away from them, lack of time by mothers and other say they are not told to come back again for the second and third doses which are similar with base line done by core polio group in Ethiopia (37).

7. STRENGTHS AND LIMITATIONS OF THE STUDY

7.1. Strengths

- Selecting children aged between 12-23 months, which measures the recent immunization program performance and those complete the immunization, also may reduce the recall bias.
- The mothers/caretakers of children who have the correct information on the child's immunization history were interviewed.
- Nurses were used as data collector
- Use of logistic regression for analysis of data to control for possible confounders

7.2. Limitations

- Immunization coverage by report of mother may under/over report the immunization coverage because mothers may not remember doses that child took due to recall bias
- This study did not consider validity of the doses of vaccines child takes
- Attitude of the mothers/caretakers was not studied, which may have an impact on immunization.
- The sampling process is susceptible to selection bias
- Health facility from the health system perspectives not addressed
- Qualitative method was not included to answer why question
- Being cross sectional study, does not show the temporal relationship (cause effect relationship).

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

- There is low immunization coverage among children age 12-23 months in the woreda. In which only 35.3% were fully vaccinated and nearly one fourth (23.7%) of the children are unvaccinated.
- About 96% mothers heard about vaccination and vaccine preventable disease, from these 79.5% them can correctly mention the objective of immunization
- Less than half of the mother knows the age at the child begins immunization, 67.9% knows correctly the age at the child finishes vaccination, and only one fourth them knows the session needed to be fully vaccinated
- Mothers' awareness on age at the child begins and finishes immunization, ANC follow up and institutional delivery services were the significant independent predictors full immunization status of children age 12-23 months. For the child to be vaccinated sex child also significantly associated in addition to the predictors of full vaccination.
- Children are defaulted mostly because of absence of health professional, inappropriate time of vaccination and lack of information when to come back again for the sequent doses
- Children are unvaccinated mostly because of absence of health professionals who give vaccination from their locality and mothers not believe the use of vaccination.

8.2 Recommendations

Based on the finding of the study the following recommendation are forwarded

- The Woreda health office should work to raise the awareness by designing proper health education targeting the mothers/caretakers on benefit, correct age the child should begins and finishes as well as session needed for complete immunization
- The health office and health workers of the Woreda should work to increase the ANC follow up and institutional delivery which is also used to increasing the immunization coverage
- Appropriate vaccination time should be arranged for the mothers/caretakers, like farmers and daily labourer, who do not have enough time during the working day after assessing the need.
- Proper information on the doses and timing of the vaccination should be given for the mother coming for immunizing their child by health profession working on immunization service
- Vaccines should be available all time in the health institution giving vaccination service with appropriate storage materials
- The Woreda health office should control absence of health worker

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ANNEX I- INFORMATION SHEET AND CONSENT FORM

Information sheet

Hello! My name is _____. We are working to assess factors affecting immunization status of children in this woreda. This study tries to identify which factors are contributed to immunization status of your child and if the child not immunized why your child does not immunized.

I am one the data collectors and I am asking you some questions about yours and your child's immunization status. Would you please cooperate in responding the following questions? Your participation indirectly contributed in improving the problem of immunization in your communities and your children's.

Your response never be exposed to any party without your consent and it is possible not tell your name and the interview take only 30 minutes. There is no obligation to participate in the study. You have full right to refuse participation, refrain during interview and decline from answering to some or more of the question if you don't like to answer them.

Yes _____ No _____

Consent form

I have been briefly informed about the study and clearly understood the objective of the study. So I here approve my consent with my signature to take part in the study.

Signature _____ Date _____

INFORMATION SHEET AND CONSENT IN AFAN OROMO

Ibsaa qo'anna

Akkam jirtu? Maqaan koo _____. Aanaa kana keessatti wantootni talaalli daa'imma wajjin waal qabatan maal akka ta'e addan baasuuf qo'aannaa adeemsisaa jirra. Qo'annan kun maaltu akka haalaa talaalli ijoolle keessani wajjin wal qabatu qorachuu fi yoo mucaan keessan kan hin talaalchifamne ta'e/taate immo maalif akka mucaan keessan hin talsifamin addan baasuuf adeemsisaa jirra.

Ani warra daataa funaan keessa tokkodha. Gaaffilee tokko tokko waa'ee keessani fi waa'ee talaalli mucaan keessan isin gaafachuufan dhufe. Hirmaachu keessanif jecha midhan isin irratti dhufu tokkole hin jiru, deebii isin kenitaniif jecha fayyidan isin irra hir'atus hin jiru. Garuu, hirmaanan keessan rakko talaalli ijoolle fi hawwaasa keessanii fayyesuf waan nu gargaruuf, deebiin keessan bay'ee barbachisaadha. Deebiin isin kennitan fedhii keessanin ala

eeeynumattu dabarfamee hin himamu, akkasumas, maqaa keessan himuun isin hin barbachisu. Itti dabalatanis qo'anna kana irratti hirmaachuun dirqama miti, gaaffi barbaaddan debisuu dhisuu ni danda'ama. Irratti hirmachuf fedhii qabduu?

Eeyyee _____ Lakki _____

Unka walii galtee

Waa'een qo'anna kana sirritti na galeeraa, kayo isaas hubadheeraa. Kanaaf irratti hirmaadhee deebii kennu koo mallatto koo tin mirkaneessera.

Mallattoo _____ Guuyyaa _____

Gaaffi yoo qabatan teessoo kanaan wal qunnamuu dandeessu.

Balaachoo Ittaanaa

Mob. +251910075158

E-mayili. belachewetana@yahoo.com

ANNEX II- QUESTIONNAIRES IN ENGLISH VERSION

1. Child birth date ____day____month _____ year/
Or Age of child in months_____
2. Sex of the child 1= male 2= female
3. Number of children's older siblings_____
4. Family size_____
5. Mother's age_____
6. Mother's marital status
1= single 2= married 3= separated 4= divorced

5= widowed
7. Mothers educational status
1=illiterate 2=read and write 3= grade 1-8 4= grade 9-12

5=college/university
8. Number of children ever born by the mother_____
9. Number of children alive _____
10. What is occupation of the mother
1= House wife

2=government employee

3=merchant

4= daily laborer

5= others, specify_____
11. What is your family monthly income per month? _____
12. Ethnicity
1=Oromo

2=Amhara

3=Others
13. What is your religion?
1=orthodox

2= protestant

3=catholic

4= Muslim

5= other specify_____
14. Have you attended antenatal care during your last pregnancy?

1= Yes 2= No
15. If yes, how many times did you attend? _____

16. Have you received tetanus vaccination during your last pregnancy?

2=Yes 2= No

17. If yes, how many injections did you received? _____

18. Where did you deliver your last baby?

1= at home

2= at health institution

3=other _____

Access to vaccination service

19. Is there any health facility which vaccination service near to you?

1=Yes 2=No

20. If yes to above question which health facility is near to you?

A. health center

B. hospital

C. health post

D. private clinic

21. How does it take you to reach there in minutes?

A. Less than 15 minutes

B. 15-30 minutes

C. 30-1hour minute

D. > 1 hour

Questions on immunization

22. Do you heard about vaccination and vaccine preventable disease?

2=Yes 3=No

23. If yes to above question, from where do you heard about the vaccination and vaccine preventable disease?

1=Radio

2=Television

3= from friends/peers

4=from school

5=Health personnel

6=other, specify _____

24. Do you mention the objective of vaccinating a child?

1=to prevent the disease

2=for specific disease

3=for child health

4=don't know

5=other, specify _____

25. How many vaccine preventable diseases do you know? _____

a. Measles

- b. Tetanus
 - c. Pertusis
 - d. Tuberculosis
 - e. Diphtheria
 - f. Polio
 - g. Hepatitis b
 - h. Homophiles influenza b
26. How many vaccination sessions are needed for a child to be fully protected?
 2= one
 3= repeated
 4= five
 5= don't know
27. Do you tell me the age at which the child begins immunization?
 1= just after birth
 2= one month after a birth
 3=any time
 4=after one year
 5= I don' know
 6=other specify_____
28. At what age the child should complete immunization? _____
29. Do you think vaccination will make your child sick?
 1= Yes 2=No 3= don't know
30. Do you bring a sick child for vaccination?
 1=Yes 2=No
31. Does your child take any vaccination?
 1=Yes 2=No
32. Do you have a card where vaccinations are written down?
 1= Yes 2= No
33. Copy the immunization data from the card.

Vaccine taken	Day	Month	Year
BCG			
OPV0			
OPV1			
OPV2			
OPV3			
Pentavalent1			
Pentavalent2			
Pentavalent3			
Measles			

34. Has a child had any vaccinations that are not recorded on this card, including vaccinations given in a national immunization day campaign?
 1=Yes 2= No

35. If question above question is no, did a child ever have any vaccinations to prevent him/her from getting diseases, including vaccinations received in a national immunization day campaign?

1= Yes

2=No

3= don't know

36. Please tell me if the child had any of the following vaccinations

a. A BCG vaccination against tuberculosis, that is, an injection in the arm or shoulder that usually causes a scar

Yes _____

No _____

b. Polio vaccine, that is, drops in the mouth?

Yes _____

No _____

c. Was the first polio vaccine given in the first two weeks after birth or later?

Yes _____

No _____

How many times was the polio vaccine given _____

d. A pentavalent vaccination, that is, an injection given in the thigh or buttocks?

Yes _____

No _____

How many times Pentavalent vaccination is given? _____

e. A measles injection that is, a shot in the arm at the age of 9 months or older – to prevent him/her from getting measles?

Yes _____

No _____

f. Does the child have a BCG scar on his/her upper left arm? Observe Yes__ No __

If the child does not receive any vaccination ask the following

37. What are the reasons for the not receiving any vaccine? If the child has not received any vaccine yet

- a. Absence of health facility in the locality
- b. Health workers did not come and give vaccine at our village
- c. Vaccination is of no use
- d. Vaccination hurts children
- e. Religion and culture refute vaccination
- f. Lack of awareness about vaccination
- g. Fear of side effect
- h. Others

38. What are the reasons for defaulting? If child is a defaulter)

- a. Vaccination site is far-away
- b. Vaccination time is inconvenient
- c. Absenteeism of vaccinators
- d. Lack of awareness on the importance of vaccination
- e. Not knowing vaccination time and site
- f. Not knowing whether to come back for second and third vaccination
- g. Others

Annex III: Questionnaires in Afan Oromo version

Guyya _____

Ganda _____

Universitii Finfinnetti,

Mana barnoota fayya hawaasaa

Af-gaffii wantoota talaalli da'imanii anaa Amboo fi magalaa Amboo keessajiratanii, umurii isaanii ji'a 12-23 jiddu jiraan irratti dhiibbaa fidan qo'achuuf qopha'ee.

Amaajjii, 2011

Ibsaa qo'anna

Akkam jirtu? Maqaan koo _____. Aanaa kana keessatti wantootni talaalli daa'imma wajjin waal qabatan maal akka ta'e addan baasuuf qo'aannaa adeemsisaa jirra. Qo'annan kun maaltu akka haalaa talaalli ijoolle keessani wajjin wal qabatu qorachuu fi yoo mucaan keessan kan hin talaalchifamne ta'e/taate immo maalif akka mucaan keessan hin talsifamin addan baasuuf adeemsisaa jirra.

Ani warra daataa funaan keessa tokkodha. Gaaffilee tokko tokko waa'ee keessani fi waa'ee talaalli mucaan keessan isin gaafachuufan dhufe. Hirmaachu keessanif jecha midhan isin irratti dhufu tokkole hin jiru, deebii isin kenitaniif jecha fayyidan isin irra hir'atus hin jiru. Garuu, hirmaanan keessan rakko talaalli ijoolle fi hawwaasa keessanii fayyesuf waan nu gargaruuf, deebiin keessan bay'ee barbachisaadha. Deebiin isin kennitan fedhii keessanin ala eeynumattu dabarfamee hin himamu, akkasumas, maqaa keessan himuun isin hin barbachisu. Itti dabalatanis qo'anna kana irratti hirmaachuun dirqama miti, gaaffi barbaaddan debisuu dhisuu ni danda'ama. Irratti hirmachuf fedhii qabduu?

Eeyyee _____ Lakki _____

Unka walii galtee

Waa'een qo'anna kana sirritti na galeeraa, kayo isaas hubadheeraa. Kanaaf irratti hirmaadhee deebii kennu koo mallatto koo tin mirkaneessera.

Mallattoo _____ Guyyaa _____

Gaaffi yoo qabatan teessoo kanaan wal qunnamuu dandeessu.

Balaachoo Ittaanaa

Mob. +251910075158

E-mayili. belachewetana@yahoo.com

Kutaa 1^{ffa}. Odeefanno walii galaa

1.	Guyyaan dhaloota mucaa yoomi?	Guyya____, ji'a____ bara____/ Umurii ji'aan_____
2.	Saalli mucaa maali?	1=Dhiira 2=Dhala
3.	Mucaa kana dura ijoolle meeqatu dhalate?	_____
4.	Baay'inni maatii keessani meeqa?	_____
5.	Umuriin haadhaa meeqa?	_____
6.	Halaa fudhaafi heerumaa hadhaa?	1=Kan hin heerumin 2=Kan herumtee 3= Kan wal hiikan 4=Kan irra du'e
7.	Sadarkaan barnoota haadhaa hagami?	1=Hin baranne 2=Dubbisuu fi bareessuu 3=Kutaa 1-8 4=Kutaa 9-12 5=Koollejjii/ Universitii
8.	Haati mucaa ijjoole hangam deesse?	_____
9.	Isaan keessa hangamtu jira?	_____
10.	Hoojiin idilee haadhaa maalii?	1=Haadha mana 2=Hojattu moottumma 3=Daldala 4=Hooji guyya 5=Qotee bulaa 6=Kan biroo, ibsi, _____
11.	Galii ji'aa giddu galeessaa(qarshiidhaan) hangami?	_____
12.	Sabumma	1=Oromoo 2=Amaaraa 3=Kan biroo, ibsi, _____
13.	Amantii	1=Ortodosii 2=Proteestantii 3=Katolikii 4=Musliimaa 5=Kan bira ibsi_____
14.	Bakka jireenyaa	1=Baadiyya 2=Magaalaa

Kutaa 2^{ffa} Gaaffi tajajila fayyaa ilaallatu		
15.	Ulfaa kee isa booda kana irratti tajaajila hordoffi ulfaan duraa fudhatetta?	1=Eeyyee 2=Lakki
16.	Gaaffi 15 ^{ffa} Eeyyee yoo jette si'a meeqa debitee tajaajila fudhatte?	_____
17.	Haatii mucaa talaallii dhukuba tetaanusii fudhateetti?	1=Eeyyee 2=Lakki
18.	Gaaffi 17 ^{ffa} Eeyyee yoo jette, si'a meeqa fudhatte	_____
19.	Mucaa kee isa/ishee dhuma eessatti deesse?	1=Manatti 2=Mana yaalaatti 3=Kan biraa ibsi
20.	Dhaabbanni fayyaa tajajila talaallii kennuu naannoo keessan jira?	1=Eeyyee 2=Lakki
21.	Gaaffii 20 ^{ffa} Eeyyee yoo jette, isaa kamtu sitti dhi'ata	1=Buufata fayyaa 2=Hospitaala 3=Keella fayyaa 4=Kiliinika dhunfaa 5=Kan biraa, ibsi
22.	Bakka tajajila fayyaa talaalli kennani ga'uuf milaan hangam sitti fudhata?	1=Daqiiqaa 15 gad 2=Daqiiqaa 15-30 3=Daqiiqaa 30-sa'aatii tokko 4=sa'aatii 1 ol
Kutaa 3^{ffa} Gaaffii talaallii ilaallatu		
23.	Waa'ee talaalli da'immanii dhageessee beektaa?	1=Eeyyee 2=Lakkii
24.	Yoo gaaffii 23 ^{ffa} Eeyyee jette, eessaa dhageesse	1=Raadiyoorra 2=Televisiyoona 3=Hiriyyoota koo irra 4=Mana barnootaati 5=Ogeessa fayyaa irra 6=Kan bira, ibsi _____
25.	Fayyidaan talaallii maliidha jette yaadda?	1=Dhukkuba ittisuuf 2=Daa'imaaf fayyaadhaaf 3=Hin beeku 4=fayidaa hin qabu 5=Kan bira, ibsi _____
26.	Dhukuba talaallin ittifaman meeqa beekta?	_____
27.	Dhukkuba talaallin ittifamu kamfaa beekta?	1=Gifira 2=Tetanusii

		3=Dipteriyaa 4=Dhukkuba somba 5=Tiktikii 6=Poliyoo 7=Hepatitis b 8=Infulu'enzaa																																								
28.	Da'imni tokko umurii meeqatti talaalli egaluu qaba/di?	_____																																								
29.	Da'imni tokko gutummatti talaalfamuuf si'a meeqaa talaalsifamuu qaba/di?	_____																																								
30.	Yeeroo umurin saa/she hangam ta'e daa'iimni tokko talaalfamee/te xumuruu qaba/qabdi?	_____																																								
31.	Talaalfamuun mucaa kee ni dhukubsachiisaa?	1=Eeyyee 2=Lakki 3=hin beeku																																								
32.	Mucaa dhukube talaalchisuuf fiddaa?	1=Eeyyee 2=Lakki																																								
33.	Mucaan kee kun talaalsifameeraa?	1=Eeyyee 2=Lakki ➔ 39																																								
34.	Yoo gaaffii 33 ^{ffa} Eyye jette kaardii irratti talaallin mucaa barreefamu qabda?	1=Eeyyee 2=Lakki ➔ 37																																								
35.	Yoo kaardii qabaatte daataa wa'ee talaalli kardii irra galmeessi	<table><tr><td>Talaalli fudhatame</td><td>Guyya fudhatame</td><td>Ji'a</td><td>Bara</td></tr><tr><td>BCG</td><td></td><td></td><td></td></tr><tr><td>OPV0</td><td></td><td></td><td></td></tr><tr><td>OPV1</td><td></td><td></td><td></td></tr><tr><td>OPV2</td><td></td><td></td><td></td></tr><tr><td>OPV3</td><td></td><td></td><td></td></tr><tr><td>Pentavalent1</td><td></td><td></td><td></td></tr><tr><td>Pentavalent2</td><td></td><td></td><td></td></tr><tr><td>Pentavalent3</td><td></td><td></td><td></td></tr><tr><td>Measles</td><td></td><td></td><td></td></tr></table>	Talaalli fudhatame	Guyya fudhatame	Ji'a	Bara	BCG				OPV0				OPV1				OPV2				OPV3				Pentavalent1				Pentavalent2				Pentavalent3				Measles			
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Pentavalent3																																										
Measles																																										
36.	Mucaan kun talaalli kardii kana irratti hin galmeeffamin kan bira fudhateeraa/tti?	1=Eeyyee 2=Lakki																																								
37.	Yoo gaaffii 34 ^{ffa} Lakki jette mucaan kun talaalli dhukuba irraa isa/ishee ittisu fudhatee beekaa/ti, duulaa talaalli biyyoleessa dabalatee?	1=Eeyyee 2=Lakki 3=Hin beekuu																																								
38.	Yoo kaardii talaalli hin qaban ta'e, Talaalli mucaan fudhate/tte halaa armaan gadiitin gaafadhu.																																									
	BCG talaalli dhukuba sombaa irra ittisuu, kan irre irra gar oli waraannamu, yeroo bay'ee godannisa ijjoolllee irratti basuu fudhateeraa/tetti?	1=Eeyyee 2=Lakki																																								
	Talaallin BCG hangamittii kennameef																																									

	Talaalli poliyoo, isa afaanitti cobsamu?	1=Eeyyee 2=Lakki
	Talaallin poliyoo dhalatee/tte torban lam kessatti moo isa booda kennameefi?	_____
	Talaallin poliyoo si'a meeqa kennameefi?	_____
	Talaalli "pentavaleentii" kan tafa gubba waraannamu fudhateera/tti?	1=Eeyyee 2=Lakki
	Talaalli "pentavaleentii" si'a meeqa fudhate/tte?	_____
	Talaalli dhukuba Gifiraa, kan ji'a salgaffa fi isaa olitti kennamu, kan irre gubaa waraannamu?	1=Eeyyee 2=Lakki
	Godaannisa BCG mucaa irra ilaali	1=Jira 2=Hin jiru
Yoo mucaan talaalfamuu baate/tte ykn addaan kute/tte gaaffi armaan gadii gaafaadhu		
39.	Mucaan maliif osoo hin talaasfamiin hafe?	1=Tajaajjilli fayya taalaalii kennu hin jiru 2=Hojjatotni fayyaa dhufaanii talaalli hin kennine 3=Daa'iima talaalchisuun hin barbachisuu 4=talaallin ijoolle irratti midhaa waan fiduuf. 5=Amantii fi adaan keenya talaalli ni dhorka 6=Wa'ee talaalli hin dhageenye/hin beekuu. 7= talaallin midhaa waan fiduf 8=kan biraa ibsa
40.	Mucaan maaliif talaalli addan kute	1=bakki talaallin itti kennamu fagoodha 2=yeroon talaallin kennamu mijataa miti 3=warrii talaalli kennan hin jirani 4=babachsumma talaalli hin beekuu 5=bakka fi yeroo talaallin itti kennamu hin beeku 6=akkan debi'ee dhufuu qabu hin beekne 7=Kan biraa, ibsaa

List of study kebeles

1. Awaro
2. Amaro
3. Kisose oddo Liban
4. Ilamu Muja
5. Abebe Doyo
6. Sanqalle Faris
7. Boji Bilo
8. Gosu Qora
9. Meti
10. Ambo 02

DECLARATION

I, the under signed, declared that this thesis is my original work, and has not been presented for a degree in any other university and that all source of material used for this thesis and all people and institution that gave support for this have been duly acknowledge.

Name: Belachew Etana

Signature_____

Place: Addis Ababa

Date of submission:

This Thesis work has been submitted with my approval as University Advisor.

Advisor's Name_____

Signature

Dr. Wakgari Deressa
