

Factors for Low Routine Immunization Performance; A Community Based Cross Sectional Study in Dessie Town, South Wollo Zone, Ethiopia, 2014

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Abstract: Immunization is one of the most cost effective public health interventions in preventing and eradicating communicable diseases. In spite of increase in global immunization coverage, many children around the world especially in developing countries still missing unvaccinated. In 2013, 21.8 million children of under one year of age did not receive DPT3 vaccine worldwide and 75% of them live just in 15 countries, of which Ethiopian rank 4th. The aim of this study was to identify factors influencing on low immunization among 12-23 month old children in Dessie Town, Amhara, Ethiopia. A cross-sectional community based survey was conducted. We have used Epi info Version 7 for entry and analyzed by SPSS 20 version statistical software. A total of 724 mothers of children aged between 12-23 months old were interviewed from 10 kebeles, with the response rate of 100%. The mean age of the mother and children were 29.24+ 5.2 SD (range 18 to 51) and 1.4 with SD 0.69 respectively. According to Sex wise distribution of children 241(54.7%) and 193(58.1%) of them were males children in rural and urban setting respectively. Overall 472(65.2%) children finished all recommended doses while 130(17.9%) never get vaccine. On logistic regression analysis, Attained ANC follow-up, knowledge of mother about vaccine, Education status of mother, place of delivery and family size were found predictor of full immunization. The study revealed that there is low immunization coverage among children aged 12-23 months in the study area of Dessie Town. Good access to health facilities or health services does not indicate uptake of immunization services. The reasons are complex and multifaceted but in general relate to the health services' insufficient understanding of and attention to their clients' needs. It is recommended that strength the local specific health service to be adequate and quality service with comprehensive strategy to optimize children immunization coverage.

Keywords: Immunization Coverage, Dessie Town, Children 12-23 Months, Ethiopia

1. Introduction

Vaccination is one of the most cost effective public health interventions in mitigating the impact of vaccine preventable disease. By reducing mortality and morbidity, vaccination can contribute substantially to achieving the millennium development goal (MDG) of reducing the mortality rate among

children under five by two-thirds between 1990 and 2015 [1].

The expanded Program on Immunization (EPI) was launched in 1974 by the World Health Organization (WHO); low immunization coverage persists in sub-Saharan Africa. In 2011, the World Health Organization estimates that, only about 71% of children in sub-Saharan Africa completed the full course of three DPT vaccinations in their first year of life [2].

The Expanded Programme on Immunization remains committed to its goal of universal access to all relevant vaccines for all at risk. The Programme aims to expand the targeted groups to include older children, adolescents and adults and work in synergy with other public health programmes in order to control disease and achieve better health for all populations, particularly the underserved populations [3].

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 (Hep. B), and homophiles influenza (Hib). These vaccines are preventing more than 2.5 million child deaths each year [4].

In the EPI program, which started in Ethiopia in 1980, routine immunization services have been provided to children under one year of age for the six vaccine preventable childhood diseases (tuberculosis, poliomyelitis, tetanus, diphtheria, pertussis and measles), and tetanus toxoid is given to women of child bearing age. The schedule for child and TT immunizations is in accordance with the WHO recommended schedule for developing countries [2-4].

A goal of the Expanded Program on Immunization (EPI) in Ethiopia is reducing mortality and morbidity of children from vaccine preventable diseases. During its inception, the Ethiopian EPI had as its objective to increase immunization coverage by 10% annually and reach 100% in 1990. Unfortunately, the program has not managed to achieve its original coverage objective; however, recent coverage increases are significant [5].

Immunization is one of the national child survival strategies in the country to reach Diphtheria-Pertussis and Tetanus (DPT3)/measles vaccination coverage 90% in 2010 [6]. It is also presented as the key strategy to achieving the Millennium Development Goals (MDGs) especially to reduce the child mortality [7]. And proportion of children immunized against measles is one of the MDG indicators of health [8].

The Ethiopia Demographic and Health Survey (EDHS) in 2005 reported that by card plus history 29% of children aged

12-23 months had been vaccinated for DPT3 before the age of one year [9]. However, documented kebele factors in the national EPI coverage survey were important for assessing immunization operations including availability and accessibility of immunization sites, utilization of immunization services, and involvement of kebele administration in the EPI program.

The Ethiopian Demographic and Health Survey (DHS) 2005 revealed that children were more likely to be vaccinated the first doses of vaccination than the third and the fourth doses in which 60% of children received BCG and from these only 35% of them received measles vaccine [10].

Dessie Town has good access to health services which are operated by both government and private sector organizations. Potential health service coverage is around 100%. Both rural and urban communities are fully covered with health extension workers and accessible transport.

Despite these benefits, the measles immunization coverage as compiled from published monthly immunization reports was 62% and fully vaccinated children is 62% [11]. Also, there had been measles outbreak in the district in 2012 and 2013. Thus the object of this study was to assess routine immunization coverage and identify factors influencing child immunization in Dessie Town, Amhara Region, 2014.

2. Methods and Materials

2.1. Study Area

Dessie town was one of the districts in South Wollo Zone, Amhara regional state. It was located at a distance of 480 KM from the regional town (Bahir Dar) and 401 Km from Addis Ababa. According to the 2007 census, the estimated total population of the town in 2012 was 181,658 (33,500 Rural and 148,108 Urban) and the total number of households was 40,368 [11]. About four percent of the total population was children at the age of 12-23 months. The town had 10 urban and 6 rural kebeles. The town also had two hospitals, three non-governmental hospital, 7 health centre, 6 health posts, and 24 private clinics. Potential health coverage for year 2012 was 100%.



Figure 1. Map of Amhara region showing a location of South Wollo zone with study area of Dessie Town, 2014.

2.2. Study Design

A descriptive community based cross-sectional survey was conducted.

2.3. 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 selected kebeles in the district. Mothers'/caretakers were studied about their knowledge on the child immunization, socio demographic status and tetanus toxoid immunization status.

2.4. Study Subjects

Children 12-23 months and their mothers or care takers of the child in the selected eligible households.

2.5. Sample Size

Sample size was calculated based on the proportion of fully immunized children aged less than two years in the Dessie Town which is 62% with 95% confidence interval and precision level of 5%. We were taken our sample size after multiplying by design effect 2.

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

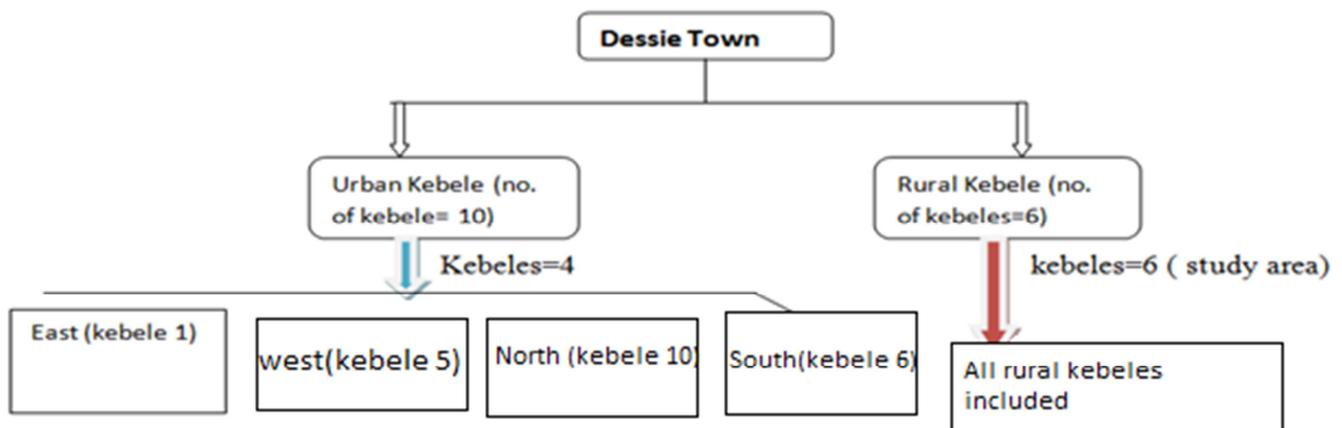


Figure 2. Sampling procedure of the study area, Amhara, 2014.

2.7. Data Collection and Analysis

Data collection was conducted using a semi structured questionnaire to collect information on vaccination, knowledge and Altitude of mothers/care takers. Questionnaire was Pre-tested prior to conduct real field work in defined communities. Two field supervisors based on their qualification: BSc in health for supervisors and ten data collectors who had good experience were participated. Respondents were mothers or caretakers of eligible children. Supervisors/coordinators were reviewed completed questionnaires for completeness and accuracy on a daily basis.

And also we were adding 10% contingency to overcome non response rate, the total of 796 children aged between 12-23 months was targeted for the study (13).

2.6. Sampling Methods

The kebeles were stratified in to urban and rural kebeles. Each Kebele considered as one cluster. Then 6 urban kebeles and 4 rural were selected by lottery method. The lists and number of households which had children of 12-23 months age in the study village found from the district health extension worker. In each kebele the first household were 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 are 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 the remaining household selected from four urban kebeles (See Figure 1).

2.8. Study Variables

A).Dependent variable

Immunization status of children aged between 12-23 months

B).Independent variable

Socio demographic characteristics of mothers/caretakers, Sex of child, place of residence, place of delivery, educational status of mother/ care taker, maternal tetanus toxoid immunization status. Knowledge of mothers/caretakers about vaccinations and its importance, family size, Number of child ever born, Time of travel to reach the nearest health facility, monthly family income, ANC follow up of a mother and etc

were our independent variables.

2.9. Inclusion and Exclusion Criteria

a. 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.

b. Exclusion criteria

Households without children aged between 12-23 months were not including.

2.10. Ethical Clearance

Ethical approval was obtained from the Amhara Regional Health Bureau Research institute. Informed consent which was prepared in English and translated into local language (Amharic) was administered prior to individual interview; therefore, the respondents were participated based on his/her willingness. Data collectors were assured that privacy and the confidentiality of the information maintained in every stages of the study.

3. 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 nine vaccine

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

Vaccinated- a child who take at least one dose of the nine 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 had 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. Result

4.1. Descriptive Study

4.1.1. Socio Demographic Characteristics of the Study Population

Out of the 724 families interviewed from 10 kebeles, with

the response rate of 100%. About 54% (391) of the respondents were from rural kebele areas. The mean age of the mothers were 29 with standard deviation (SD) =5.2. From the total of mothers participated were 221(30.5%) those can read and write followed by educated secondary and above 186(25.7%). Concerning of marital status, 332(84.9%) and 289(87.3%) for rural and urban settings were married, followed by 43(11%) and 31(9.4%) divorced for respective settings.

The majority of them, 276(70.6%) were Muslim by religious in rural area while 179(53.9%) Orthodox Christians in urban area.

Also, 279(71.4%) were farmers in occupation of rural area and 198(59.4%) were House wife in occupation of urban area.

Majority of the respondents were, 202(51.7%) in rural and 116(35.1) in urban had the average monthly income of between 501 – 1000 Ethiopian birr. The average family size of the study population was 5.0 ranging from 2 to 10, in which most families had between 5 and 6 members 87(47.8%) in rural area and 109(32.7) in Urban area.

4.1.2. Antenatal Care (ANC) Follow up and TT Status of Mothers

Concerning of attained at least one ANC follow up during their pregnancy of the child selected for this study were 65.5% and 72.1% in Rural and Urban area respectively. In adding up 221(56.5%) in rural and 210(63.1%) in urban area of them ever took one or more doses of TT vaccine.

4.1.3. Accessibility of Vaccination Service

The accessibility of vaccination service was evaluated by presence of the service and average walking time to reach the health facility. 100% of the respondents have access of health facility that provides immunization services in both setting. Majority of the reported 245(62.8%) that they were more access to health post in rural area and 244(74.4%) were access to health center in urban area. For majority respondent 245(33.8%) the average walking time to the nearest health facilities was 15 minutes.

4.1.4. Knowledge on Vaccination and Vaccine Preventable Diseases

Concerning on Knowledge of mothers/caretakers on the vaccination and vaccine preventable disease, from the total respondents about 73.6% and 90.4% of the heard about vaccination and vaccine preventable disease in rural and urban setting respectively. Most of respondent was 115(40.4) heard from health professionals in rural area and 81(26.9) heard from Television and health professional in urban area.

Majority of the respondent mentioned the objective immunization is to prevent disease were 135(47.8%) and 156(51.8%), responded it is for healthy child were 78(27.4%) and 124(41.2%) and 72(25.3%) and 21(6.9%) said they do not know in rural and urban kebele of Dessie Town respectively.

The majority respondents were also asked the number of vaccine preventable disease they know, 173(60.7%), one and

two vaccine preventable disease in rural setting and 158(52.4) of them knew three or four vaccine preventable disease in urban area.

The respondents' were respond for their knowledge on age at the child begins immunization, session needed for completion of immunization and age of completion of immunization. About of them said age at the child begins immunization is just after birth (45 days after birth), 271(69.3), 163(49.2) in rural and urban setting respectively. Also on the session needed to complete immunization 196(50.1) in rural area and, 219(66.2) in urban area answered four. On age complete immunization 181(46.2) and 201(60.4) responded nine months in rural and urban setting respectively.

4.1.5. Characteristics of the Child

An entirety of 724 children of aged, 391(54%) in rural area and 46% (333) between 12- 23 month of age were included and most of them were 12 months of age. The mean children age was 1.4 with SD 0.69. About sex children 241(54.7%)

and 193(58.1%) of them were males in rural and urban kebele. Place of delivery 250(63.9%) and 60(18.0%) were born at home, while 141(36.1) and 273(82.1%) of them at health facility in rural and urban setting respectively. In addition, majority the children were ever took one or more doses of vaccine, from these about 67.9% of them had vaccination card during the study.

4.1.6. Immunization Coverage among Children Aged Between 12-23 Months

From a total 724 children aged 12-23 months selected and included in this study, 241(61.6%) in rural and 231(69.3%) in urban kebele of them were ever took one or more of the nine recommended vaccine and 73(18.6%) and 57(17.1%) are unvaccinated in rural and urban setting respectively. From total vaccinated children, 492(67.9%) mothers showed a vaccination Card. 472(65.2%) children finished all recommended vaccination and 130(17.9%) of them took one or more vaccine but did not finish the recommended doses (see; Figure 3).

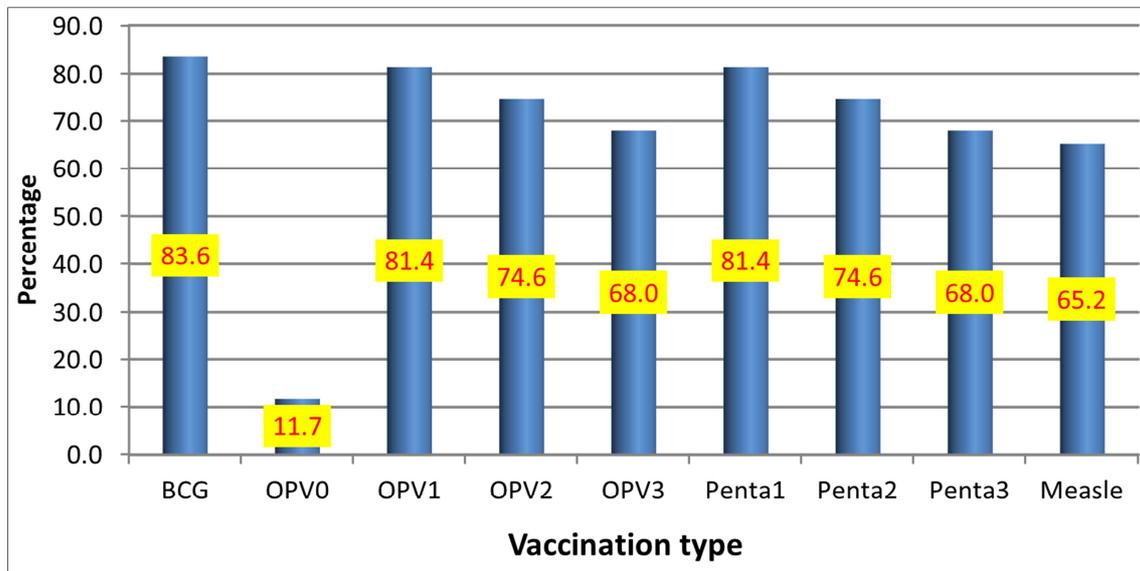


Figure 3. Immunization coverage among children aged between 12-23 months by card and history in Dessie Town, Amhara, 2014.

4.1.7. Factors Affecting Immunization Status of Children

Variables are implicit to be associated to immunization status of the children were included. These include socio demographic characteristics of mothers and child, child characteristics and knowledge of mother/ care takers about vaccination were included. Factors associated with child immunization and completion of immunization was seen using bi-variate analysis.

4.2. Analytical Study

4.2.1. Socio-demographic Characteristics of Mothers

The association of mothers' socio demographic characteristics with immunization status of the children was assessed using bivariate analysis. Mothers' educational status with secondary and above were 3.0 times (95% CI 1.2-7.8) more likely to let their children vaccinated in rural area and

2.8 times (95% CI 1.1-7.0) more likely to let their children vaccinated in urban area. Regarding the mother's occupation, farmers are 2.2 times (95% CI: 1.3-3.7)) more likely to vaccinate their children than housewife in rural kebele of Dessie town where as in urban kebeles there is no any association.

Almost all age of the mother and average monthly income of the household in rural and urban kebeles did not show any significant association with the whether the child is vaccinated or not by bivariate analyses. After further analysis was done most of the mothers' socio demographic characteristics show no significant association with the immunization status of the children. (See Table 1 and 2)

The associations of family size was seen using Bivariate analysis have no statistically significant association with the child immunization in rural and urban kebeles of Dessie Town (See Table 1 and 2).

Table 1. Immunization status of children aged between 12-23 months by socio demographic characteristics of mothers and children in rural kebele of Dessie Town, Amhara, 2014.

Variables	Vaccinated, n (%) n=391		Odd ratio (95% CI)
	Yes	No	Crude
Education status of mother/caretaker			
Illiterate	55(14.1)	7(1.8)	1
can read and write	147(37.6)	25(6.4)	1.3(0.5-3.3)
Primary	69(17.6)	16(3.8)	1.7(0.6, 4.4.56)
Secondary and above	52(13.3)	20(5.1)	3.0(1.2, 7.8)*
Marital status of mother/caretaker			
single	8(2.0)	2(0.7)	1
Married	273(69.8)	59(15.1)	0.43(0.07, 2.41)
Divorced	39(9.9)	4(1.0)	0.20(0.02, 1.49)
Widowed	4(1.0)	2(0.5)	1.0(0.09, 11.02)
Religious of mother/caretaker			
Orthodox	35(8.9)	9(2.3)	1
Muslim	229(58.6)	47(12.0)	0.79(0.35, 1.7)
Others	60(15.3)	11(2.8)	0.7(0.2, 1.8)
Occupation of mother/caretaker			
House wife	151(38.6)	28(7.2)	1
Gov. employee	20(5.1)	6(1.5)	1.6(0.6, 4.3)
Farmer	159(40.6)	67(17.1)	2.2(1.3, 3.7)*
Daily labourer	9(2.3)	12(3.1)	7.1(2.7, 18.6)*
other	11(2.8)	13(3.3)	6.3(2.6, 15.7)*
Mother age			
18-24	36(9.2)	6(1.5)	1
25-30	173(44.2)	35(8.9)	1.2(0.4, 3.1)
31-40	100(25.6)	23(5.8)	1.3(0.5, 3.6)
41 and above	14(3.6)	3(0.8)	1.3(0.3, 5.8)
Monthly Income of mother/caretaker			
<500	10(2.6%)	5(1.2)	1
501-1000	82(20.9%)	27(6.9)	0.6(0.3, 2.1)
>1001	232(59.3%)	35(8.9)	0.3(0.09, 0.93) *
Family size			
1-3	40(10.2)	33(8.4)	1
4	69(17.6)	28(7.2)	0.4(0.3-0.9)*
5-6	119(30.4)	73(18.7)	0.6(0.4-1.2)
≥7	16(4.1)	13(3.3)	0.6(0.4-2.3)

*Significant at 95% CI

Table 2. Immunization status of children aged between 12-23 months by socio demographic characteristics of mothers and children in urban kebele of Dessie Town, Amhara, 2014.

Variables	Vaccinated, n (%) n=333		Odd ratio (95% CI)
	Yes	No	Crude
Education status of mother/caretaker			
Illiterate	54(16.2)	6(1.8)	1
can read and write	44(11.2)	6(1.8)	1.02(0.3-3.6)
Primary	54(13.8)	3(0.9)	0.5(0.1, 2.1)
Secondary and above	125(37.5)	39(11.7)	2.8(1.1, 7.0)*
Marital status of mother/caretaker			
single	7(2.1)	1(0.3)	1
Married	244(73.2)	46(13.8)	0.2(0.05, 0.5)*
Divorced	26(7.8)	5(1.5)	0.20(0.04, 0.67)*
Widowed	2(0.6)	2(0.6)	0.4(0.03, 5.9)
Religious of mother/caretaker			
Orthodox	145(43.3)	34(10.2)	1
Muslim	121(36.3)	14(4.2)	0.4(0.2, 0.9)*
Others	12(3.6)	7(2.1)	1.7(0.6, 5.4)

Variables	Vaccinated, n (%) n=333		Odd ratio (95% CI)
	Yes	No	Crude
Occupation of mother/caretaker			
House wife	173(51.9)	26(7.8)	1
Gov. employee	46(13.8)	14(4.2)	2.2(1.0, 4.6)
Merchant	14(4.2)	4(1.2)	1.5(0.4, 5.7)
Daily labourer	31(9.3)	4(1.2)	0.9(0.3, 2.9)
other	14(4.2)	7(2.1)	3.3(1.2, 9.0)*
Age of Mother/Care taker			
18-24	62(18.6)	8(2.4)	1
25-30	137(41.1)	24(7.2)	1.3(0.5, 3.2)
31-40	77(23.1)	19(5.7)	1.9(0.7, 4.6)
41 and above	4(1.2)	2(0.6)	3.8(0.6, 24.6)
Monthly Income of mother/caretaker			
<500	27(8.1)	10(3.0)	1
501-1000	116(34.8)	15(4.5)	0.4(0.2, 0.9)
>1001	133(39.9)	32(9.6)	0.6(0.2, 1.4)
Family size			
1-3	77(23.1)	27(8.1)	1
4	63(18.9)	22(5.6)	0.9(0.5-1.9)
5-6	78(23.4)	30(9.0)	1.1(0.6-2.0)
≥7	25(7.5)	11(3.3)	0.7(0.5, 2.9)

*Significant at 95% CI

4.2.2. Antenatal Care (ANC) Follow up and TT Status of Mothers

ANC follow up of maternal health care utilization and maternal tetanus toxoid status were an additional factors assessed in this study if they have an association with child immunization coverage. The frequency 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 5.4(95% CI: 3.8-7.6) 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 (See; Table 3).

Table 1. Immunization status among children aged 12-23 months by knowledge of age begins finish and session needed for immunization in Dessie Town, Amhara, 2014.

Variable	Fully vaccinated		Odds ratio (95% CI)
	Yes	No	Crude
Know correct age of begin immunization			
Yes	295(40.7)	87(12.0)	1
No	77(10.6)	265(36.6)	11.6(8.2, 16.5)*
Know correct sessions needed to complete immunization			
Yes	262(36.2)	86(11.8)	1
No	130(17.9)	246(33.9)	5.7(4.1, 7.9)*
Know the correct age at complete immunization			
Yes	289(39.9)	77(10.6)	1
No	125(17.3)	233(32.2)	6.9(5.0, 9.7)*

Children of mother who immunized TT dose was 10.3 times (95% CI: 7.2-14.2) more likely to be vaccinated than not immunized mothers. Beside this, children of mothers who had received 1-2 doses and more than 3 dose of tetanus toxoid vaccine were 1.9 times (95% CI: 1.3, 2.6), 1.5 times (95%CI: 1.1-2.2) more likely to be vaccinated than whose mother did not received respectively.

4.2.3. Availability and Accessibility of Vaccination Service

Another factor was the availability and accessibility of vaccination service by average walking time to reach to the health facility and the availability of vaccination service in this study for the association with child immunization status. From 330(45.6%) households average walking time less than 15 minutes to health service were more vaccinated than those

takes long time but 70(9.7%) children of household who reported nears the Health facility were not vaccinated.

Regarding to the average walking time to reach the nearest health facility, there is no statistically significant difference in child immunization among those who reported walking of less than 15 minutes and those take above. All children of households have available vaccination services.

4.2.4. 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 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 mothers who heard about vaccination 4.5 times (95% CI: 3.2-6.4) more likely to vaccinate their children than those who did not heard. Also mothers' knowledge of objective of immunization to preventable disease and for healthy child known by the mother 265(36.6%), 135(18.6%) reported child immunization (See; Table 3).

4.2.5. Knowledge of Age Begins, Finish and Session Needed for Immunization

Mothers' correct knowledge on immunization timetable 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 11.6(95% CI: 8.2-16.5) time likely to be vaccinated than who did know and those of who know the correct age of finishing immunization were also 5.7(95% CI: 4.1-7.9) time more likely to be vaccinated. Also the correct knowledge of session needed to complete immunization 6.9(95% CI: 5.0-9.7) time more likely to be vaccinated.

4.2.6. Child Characteristics

The associations factor related to child characteristics like sex and place of delivery with the immunization status of child were assessed by bivariate analyses. About 39.4% of male and 29.4% female children were vaccinated. Bivariate analysis shows that children born at health institution were 3.2(95% CI: 2.3, 4.4) time likely to be vaccinated than children's born at home.

4.2.7. Reasons for Vaccination Failure among Partially or Unvaccinated Children

The respondent who were defaulting and not vaccinated their children asked for reasons of failure. From the reasons given for not completing immunization majority of the respondents said the 27(20.8%) Lack of awareness about vaccination, 24(18.5%) child sick, 16(12.3%) vaccination time is inconvenient, 13(10.0%) of them said they do not know time and place of vaccination and 9(6.9%) Vaccination card lost was final given reason about vaccination among of the respondents (See; Table 4).

Table 4. Reasons given by mothers for defaulting from completing children immunization, Dessie Town, Amhara, 2014.

Reasons	Frequency, n (%) n= 130		
	Rural	Urban	Total
Vaccination card lost	5	4	9(6.9)
Vaccination time inconvenient	11	5	16(12.3)
Absence of vaccinators	10	2	12(9.2)
Lack of awareness about vaccination	21	6	27(20.8)
Don't know time and place of vaccination	8	5	13(10.0)
Unaware of need to return for subsequent doses	7	3	10(7.7)
Child sick	16	8	24(18.5)

In addition to this, reasons for unvaccinated 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 not outreach service at our kebele 31(25.4%), 20(16.4%) of the respondents religion and cultural refute, 18(14.8%) said fear of side effect, 17(14.8%) of them perceived vaccination hurts children (See; Table 5).

Table 5. Reasons were given by mothers for not vaccinating their children in Dessie Town, Amhara, 2014.

Reasons	Frequency, n (%) n= 122		
	Rural	Urban	Total
vaccination no use	7	3	10(8.2)
vaccination hurts children	12	5	17(14.0)
religion and cultural refute	14	6	20(16.4)
fear of side effect	15	3	18(14.8)
Vaccination time inconvenience	12	3	15(12.3)
Health professionals don't give outreach service at our kebele	23	8	31(25.4)

5. Discussion

From selected 10 kebeles of 6 rural and 4 urban area study showed the coverage of immunization and factors associated with it among children aged between 12-23 months old residing in of Dessie Town found in South Wollo Zone, Amhara region.

Immunization coverage was assessed using the availability of vaccination card and maternal recall (history). Based on immunization card and history, 241(61.6%), 231(69.3%) children were fully vaccinated, and 73(18.6%), 57(17.1%) were unvaccinated in rural and urban setting respectively. The pentavalent 3 coverage was 68% and 65.2% took measles. The OPV0 vaccine coverage was higher low than the coverage of other vaccine which is given each other according to the EPI schedule might be the documentation recording problem and recall biased. Also the measles coverage is slightly lower than the pentavalent 3 coverage this might be follow up system loose for respect the schedule and the presences of time gap b/n the two vaccines.

When we compare the immunization coverage of Dessie Town with of 2013, the percent of fully vaccinated is higher by 3.2% [11].

From a total interviewed households, 494(68.2%) them able to show the vaccination card. From these most the children vaccinated BCG and OPV1 vaccines but only 65.2% of finished the immunization. The coverage by card and recall is also less than WHO standard.

About knowledge on vaccination and vaccine preventable disease of mother/ care takers was also assessed in this study. About 285(73.6%) in rural and 301(90.4%) in urban kebeles of mothers/ care takers were heard about immunization and vaccine preventable disease. But only 135(47.8%) in rural and 156(51.8%) in urban kebele of them mentioned that vaccination is to prevent disease which is the correct objective of vaccination. Also, less than half percent of respondents knew more than three vaccine preventable

disease. Regards to correct knowledge of mothers age at the child begins and finishes the immunization, 33.9% of the respondents knew the correct age at the child begin immunization, 57.5% knew session needed to complete immunization and only 52.9% of them knew the correctly the age at the child should finish vaccination. This finding is similar with the study done in urban Dili, Timor-Leste [13].

This study also assessed associated factors affecting the immunization status of the children concerning on children vaccinated or not and whether the child is fully vaccinated. Factors affecting these two variables were analyzed separately and associated factors related to them were identified by bivariate analysis using binary logistic regression.

In both setting of bivariate analysis on educational status, 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 can read and write/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. These findings are similar with the study done in Ethiopia [14]. But average household's monthly income, age of mother/caretakers and marital status had no association with child immunization status.

Beside this Studies on 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. Also Studies showed that, middle aged mother are also more likely to vaccinate their children than the older mothers and Younger (25-40). This also did not have a significant association by bivariate analysis in this study.

Regarding of the characteristics of the child; sex and place delivery showed an association child immunization status. Health institution born children were 3.2 times more likely to be vaccinated and 3.2 times more likely to complete vaccination than home born children, which is consistent with studies from other places (29-31). Regarding sex of child showed no significant between male and female for vaccination.

Concerning on antenatal care (ANC) follow up and TT status of the mother also showed a significant association with the child immunization status by bivariate analysis. The findings showed children of mothers who had followed antenatal care during their pregnancy the child selected for these study were 5.4(95% CI: 3.8, 7.6) 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. Also, children of mothers who had received 1-2 doses and more than 3 dose of tetanus toxoid vaccine were 1.9 times (95% CI: 1.3, 2.6), 1.5 times (95% CI: 1.1, 2.2) more likely to be vaccinated than whose mother did not received respectively. This is consistence with the study done in Bangladesh [15].

All Children of household's access to the vaccination

services but not it contribute for complete immunization. On average walking time for arrived Health facilities not had significant difference for household nearest and far away for child to be vaccinated. But, for completion of immunization households near to vaccination service were more likely to be vaccinated than those far away. This is similar findings with the study in central Ethiopia [14].

Awareness about mothers' correct knowledge on immunization timetable 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 11.6(95% CI: 8.2, 16.5) time likely to be vaccinated than who did know and those of who know the correct age of finishing immunization were also 5.7(95% CI: 4.1, 7.9) time more likely to be vaccinated. Also the correct knowledge of session needed to complete immunization 6.9(95% CI: 5.0, 9.7) time more likely to be vaccinated.

From a total interviewed household who were defaulting and not vaccinated their children asked for reasons of failure. From the reasons given for not completing immunization majority of the respondents said the 27(24.3%) Lack of awareness about vaccination and 24(21.6%) child sick where as reasons for unvaccinated 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 not outreach service at our kebele 31(27.9%), 20(18.0%) of the respondents religion and cultural refute, and 18(16.2%) said fear of side effect. This is consistence with the study done in central Ethiopia.

6. Limitations

Mothers may not remember doses that child took due to recall bias. So, Immunization coverage by report of mother may under/over report the immunization coverage. Attitude of the mothers/caretakers was not studied, which may have a collision 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).

7. Conclusions

There was low immunization coverage among children age 12-23 months in the woreda. In which only 65.2% were fully vaccinated and nearly one fifth (16.8%) of the children are unvaccinated. About 80.9% mothers heard about vaccination and vaccine preventable disease; from these 68.0% they can correctly mention the objective of immunization. Half of the mother knows the age at the child begins immunization, 52.7% knows correctly the age at the child finishes vaccination, and only 57.5% 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 association for full immunization status of children age 12-23 months. Children are defaulted mostly because of absence of health professional, Fear of side effect 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.

Recommendations

The Town health office should work sensitization on the awareness by scheming proper health education targeting the mothers/caretakers on benefit about the program. The health office and health workers should work to raise 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 laborer, 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/Town health office should strength outreach service at rural kebeles.

What is known about this topic?

- The identification of low routine immunization coverage among children aged 12-23 months in the study area of Dessie Town. Because immunization is one of the most cost effective public health interventions in preventing and eradicating communicable diseases. But in good access to health facilities or health services does not indicate uptake of immunization services.

What this study adds

- This study has gone a low immunization coverage among children age 12-23 months in the woreda and nearly one fifth (16.8%) of the children are unvaccinated.
- The study has also looked at other factors Children are defaulted mostly because of absence of health professional, Fear of side effect inappropriate time of vaccination and lack of information when to come back again for the sequent doses and also children are unvaccinated mostly because of absence of health professionals who give vaccination from their locality and mothers not believe the use of vaccination.

Competing Interests

There was no any conflict of interest among the authors and with the others too.

Authors' Contributions

The correspondent authors conceived the study, proposal development, involved in data collection, analysis, interpretation and write up of the manuscript. All authors read and approved the final manuscript.

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