

# Factors Affecting Immunization Status of Children Aged 12-23 Months in Goba Town, Bale Zone, Southeast Ethiopia

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**Abstract Background:** Immunization is a proven vaccination tools in preventing and eradicating communicable disease. Even though increase in global immunization coverage many children around the world especially in developing countries still left unvaccinated. About one million children in Ethiopia were unvaccinated in 2007 and only 20% of the countries children are fully vaccinated in 2005. **Objectives:** To assess immunization status and factors affecting it among children aged 12-23 months in Goba town. **Method:** A cross sectional community based study was conducted from April 28 to May 04, 2016 in Goba town, Bale zone, southeast of Ethiopia using pretest, structured questioner and a systematic random sampling was used and data collected through face to face interview. A total of 280 children of aged between 12-23 months from 280 household were selected. Data was by using SPSS 20 software. **Result:** In this study 94.6% of children were vaccine. About 99.6% Of mothers heard about vaccination and vaccine preventable disease and 94.6% awarded correctly the benefit of immunization. About 52.1% of children were fully vaccinated by card plus recall, and 5.4% children were unvaccinated. **Conclusion:** There is low immunization coverage among children aged 12-23 months in the town. Antenatal care follow up, institutional delivery and awareness of mothers about the age at which child begins and finishes the vaccination are significant predictor of child immunization status.

**Keywords:** immunization status, under one child, fully immunized, months in Goba town, Ethiopia

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## 1. Introduction

Immunization is one of the most cost effective public health interventions worldwide through which a number of serious child hood diseases has been successfully prevented and eradicated. It is available for protecting individual against infection and promoting good health. It is estimated that immunization against vaccine preventable disease saves over two million lives each year. Vaccination is essential for children to achieve their highest attainable standards of health [1]. World health organization (WHO) recommends vaccination against a number of serious infectious diseases, including diphtheria, pertusis, tetanus, Hep-b, invasive Hib disease and measles for all children and against pneumococcal disease, yellow fever and Rota virus for children in some areas as a part of their expanded program on immunization (EPI). However, many infants and children still die every year from these diseases, and most of them are not fully vaccinated.

Globally, 130 million children are born annually and 91 million of these are in developing country. However, 10

million of these children under 5 years of age die every year. However, many infants and children still die every year from vaccine preventable diseases. Despite increase in global immunization coverage, many children around the world especially in developing countries still left unvaccinated. It has been shown that in 2007 Over 27 million infants do not get full routine immunization. About 41% of these were in sub-Saharan African countries [2,3].

Every year more than 10 million children in low and middle income countries die before they reach their fifth birth day. Most Of them die because they do not have access to effective intervention that combat common and preventable child hood illness. Nearly 23.2 million of children missed the vaccine of which 15.3 million resides in eight countries of Africa and south Asia. From this, one million children in Ethiopia were unvaccinated in 2007 and only 20% of the countries children are fully vaccinated [4]. Infant and under- five mortality rate in Ethiopia are some of the highest in the world. One of the major causes of this mortality is vaccine preventable disease [2]. Epidemiological investigation on recent outbreak of vaccine preventable disease indicates that

incomplete immunization was a major reason for this outbreak [5]. According to the 2006 national EPI survey in Ethiopia only 50% of children were fully immunized, with wider variation from one region to another. This shows half of the children were not fully protected [6]. It has been also recognized that vaccine preventable diseases are responsible for 16% of under-five mortality in Ethiopia [7]. 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 [12]. Therefore, this study was conducted to assess immunization status and associated factors among children aged 12-23 months in Goba town, southeast Ethiopia.

## 2. Methodology

### 2.1. Study Design, Area and Period

Community based cross-sectional study was conducted in Goba town from April 28 to May 04/ 2016. Quantitative data was collected from mother who had children age 12-23 months to assess the immunization status and factors affecting it. The Study was conducted at Goba town, Bale zone southeast of Ethiopia. Goba is found in bale zone 445 km from Addis Ababa. It has a total population of 50,650 from which 24,256 are males and 26,394 are females. This town is located about 2743 m above sea level and its climatic condition is Dega. There is one regional hospital, one health center and seven private clinics in this town. The study was conducted

### 2.2. Sample Size and Sampling Technique

The sample size was determined by using the standard parameter of 95% of confidence interval, 5% of significance level and 24% of population prevalence [28]. The sample size was calculated to be 280.

Households with mothers having infants from 12-23 months were selected systematically ( $K^{\text{th}}$ ) interval from health extension registration book. The next respondents were identified systematically forwards by adding cumulatively ( $K^{\text{th}}$ ) intervals to the first randomly selected participant.

### 2.3. Data Collection Data Quality Assurance

The data was collected by using pretested and structured questionnaire through face to face interview. The questionnaire was first prepared by English language and was translated to afaan Oromo and Amharic by local person who knows and perfectly understands the language. Ten trained students were a data collectors and the questionnaire covers factors affecting immunization status of children age 12-23 months old.

To ensure the quality of data, training was given for data collectors. The questionnaire was presented on 5% of population and close supervision was carried out by principal investigators. Necessary modification was made after pretested.

## 2.4. Data Processing and Analysis

The data was analyzed manually by tallying and organizing. The result was presented by using tables and graphs. Chi-square was done to assess the association between the dependent and other variables.

## 2.5. Ethical Consideration

First of all, official letter was obtained from student research program office of Madaa Walabu University, college of medicine and health science and then it was submitted to the administration of Goba town. Oral consent was obtained from study participants.

## 3. Results

### 3.1. Socio-demographic Characteristics of the Study Population

A total of 280 mothers of children aged 12-23 months old were interviewed with the response rate of 100%. The age of the mother participated in this study were ranged from 18-47 with mean and SD of age 29.17 and  $\pm 6.21$  years respectively. From total respondent the majority of mothers were married (77.86%), and the least were widowed (4.28%). The majority of the respondent in this study were literate (83.60%) and the least were read and write (6.0%). From the respondents of literate, majority of them was secondary school (9-12), (40%). Also, 51.42% mothers were Oromo, which is the major and the least were Gurage (0.71%). Regarding the respondent occupation, 52.14% were house wife and the least were others occupation, (1.79%). Majority of them were orthodox Christian, (58.93%) and the least were other religion, (0.36%). Majority of the house hold, 40% had the average monthly income of 501-1500 Ethiopian birr, followed by 1501-2500 birr (26.4%), and the least were below 500 birr (10.40%) (Table 1).

### 3.2. ANC Follow up and TT Immunization Status of Mothers and Children

The majority of the respondents, 258(92.14%) had ANC follow up during their last pregnancy of the child. From the respondents, (67.83%) had four (full) visit of ANC. In addition, 258(92.14%) of them took TT vaccine. The major TT vaccinated mothers, 175(67.83%) were fully vaccinated followed by 58(22.48%) were three dose of TT vaccinated, 20(7.75%) were two dose of TT vaccinated and 5(1.94%) were one dose of TT vaccinated (Table 2).

### 3.3. Awareness of Respondents about Vaccine and Vaccine Preventable Disease

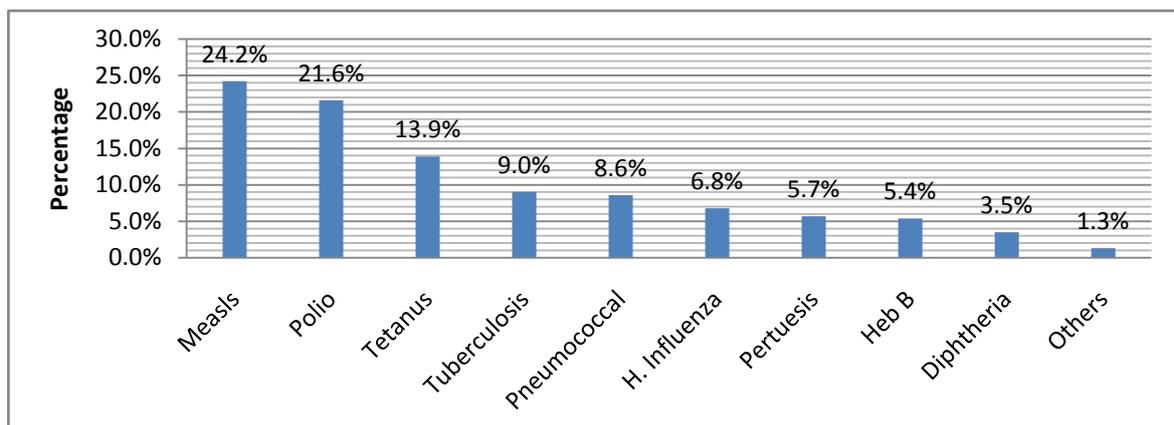
Majority of the respondents, 68(24.2%) knew measles, 60(21.6%) polio and 40(13.9 %) of the participants knew tetanus (Figure 1).

**Table 1. Distribution of socio-demographic characteristics of respondent mother of 12-23 months old children in Goba town, southeast Ethiopia**

Variable		Frequency	Percentage	
Age of mother	15-19	8	2.86%	
	20-24	59	21.07%	
	25-29	95	33.92%	
	30-34	55	19.64%	
	35-39	49	17.50%	
	40-44	12	4.29%	
	≥45	2	0.71%	
	Total	280	100%	
Age of child in months	12-13 month	54	19.30%	
	14-15 month	43	15.35%	
	16-17 month	39	13.92%	
	18-19 month	40	14.28%	
	20-21 month	47	16.78%	
	22-23 month	57	20.35%	
Sex of child	M	135	48.22%	
	F	145	51.78%	
Marital status of mother	Married	218	77.86%	
	Single	17	6.07%	
	Divorced	33	11.79%	
	Widowed	12	4.28%	
	Total	280	100%	
Educational status of mother	Illiterate	29	10.40%	
	Read and write	17	6.00%	
	Literate	1-8	80	28.60%
		9-12	112	40%
		College	42	15%
Total	234	83.60%		
	Total	280	100%	
Ethnicity of mother	Oromo	144	51.42%	
	Amhara	111	39.64%	
	Tigre	33	11.79%	
	Gurage	2	0.71%	
	Other	0	0%	
	Total	280	100%	
Occupation of mother	House wife	146	52.14%	
	Government employee	57	20.35%	
	Merchant	47	16.80%	
	Daily labor	25	8.92%	
	Other	5	1.79%	
	Total	280	100%	
Religion of mother	Muslim	82	29.29%	
	Orthodox	165	58.93%	
	Catholic	8	2.86%	
	Protestant	24	8.56%	
	Other	1	0.36%	
	Total	280	100%	
Monthly income	≤500 birr	29	10.40%	
	501-1500 birr	112	40%	
	1501-2500 birr	74	26.4%	
	>2500 birr	65	23.2%	
	Total	280	100%	

**Table 2. Distribution of ANC follows up and TT vaccination respondent mothers of 12-23 months old children in Goba town, southeast Ethiopia**

Variable	Frequency	Percentage
Antenatal care		
Yes	258	92.14%
No	22	7.86%
Number of ANC taken		
One	5	1.94%
Two	20	7.75%
Three	58	22.48%
Four	175	67.83%
TT immunization		
Yes	258	92.14%
No	22	7.86%
Number of TT immunization		
Fully	86	33.33%
Partial	172	66.67%
Place of delivery		
Home	52	18.57%
Health institution	228	81.43%
Birth order		
First	86	30.71%
Second	65	23.21%
Third and above	129	46.10%
Vaccination		
Yes	265	94.6%
No	14	5.0%
Vaccination card		
Yes	185	69.81%
No	80	30.19%
Immunization status by card (n=185)		
Fully vaccinated	100	54.1%
Partially vaccinated	85	45.9%
Immunization status card plus recall (n=280)		
Fully vaccinated	146	52.1%
Partially vaccinated	119	42.5%
Unvaccinated	15	5.4%

**Figure 1. Distribution of awareness on vaccine preventable disease**

### 3.4. Awareness about Age the Children Begin and Complete Immunization

Respondents' were asked for their awareness on age at which the child begin and complete immunization. About 156(55.71%) were respondents that the age at which child begins immunization is 45 days after birth, 90(32.14%) said just after birth and the least were, 15(5.35%) said they do not know the age at the child begin immunization. On the other hand, 215(76.79%) of them replied that the age at which child complete immunization is 9-12 months and the least 7(2.50%) said >12 months age at the child complete immunization (Table 3).

Table 3. Distribution to age the child begins and completes immunization of respondent mothers of 12-23 months old children, Goba town, southeast Ethiopia

Variable		Frequency	Percentage
Age at which child begin immunization	Just after birth	90	32.14%
	one month after birth	19	6.78%
	At 45 day	156	55.71%
	I don't know	15	5.35%
	Total	280	100%
Age at which child complete immunization	6-9 month	33	11.78%
	9-12 month	215	76.79%
	>12 month	7	2.5%
	I don't know	25	8.93%
	Total	280	100%

### 3.5. Vaccination Make Child Sick and Bring a Sick Child for Vaccine

The respondents were asked if vaccination make child sick and majority of them were, 258(92.15%) did not know and few of them, 9(3.21%) were vaccination is make child sick. From the total respondents, asked if they bring a sick child for vaccination, above half of them, (54.29%) were did not bring a sick child for vaccine (Table 4).

Table 4. Distribution vaccination make child sick and bring a sick child for vaccine of respondent mothers of 12-23 months old children in Goba town, southeast Ethiopia

Variable		Frequency	Percentage
Vaccination make child sick	Yes	9	3.21%
	No	13	4.64%
	I don't know	258	92.15%
	Total	280	100%
Bring a sick child for vaccine	Yes	128	45.71%
	No	152	54.29%
	Total	280	100%

### 3.6. Immunization Coverage among Children Age between 12-23 Months

#### 3.6.1. Vaccination Card

According to vaccination card, All of them who showed vaccination card, 185(100%) had vaccinated the dose of OPV1 and pentavalent1, 180(97.30%) had OPV2 and pentavalent2 and the least, 106(57.29%) had PCV1. Out of the vaccinated children most of them, 200(75.50%) had BCG scar (Figure 2).

#### 3.6.2. Factor Affecting Immunization Status of Children

Educational status of mothers was the first factor affecting that shows a significant association with immunization status of the children( $X^2(52.52)$  and  $P<0.001$ ). From, 29(10.40%) children of illiterate mothers and 14(6.0%) children of read and write mothers, two third of their children were vaccinated and one third were unvaccinated. Also from, 80(28.60%) children of mothers who attended primary school, 77(27.5%) were vaccinated, whereas 3(1.1%) were unvaccinated. From the total children of mothers, 115(41.0%) of those who educated secondary school (9-12) and 42(15.0%) of educated college and university, all of them were vaccinated.

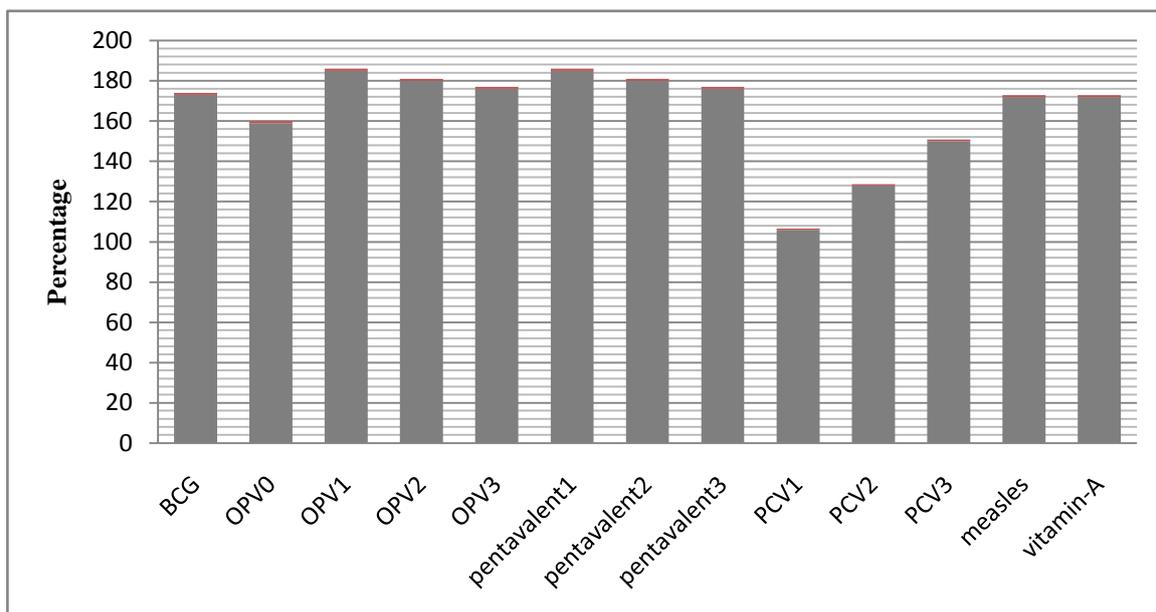


Figure 2. Distribution of child vaccination from card of respondents

**Table 5. Immunization status of children aged between 12-23 months by socio- demographic characteristics of mothers in Goba town, southeast Ethiopia**

Variable	Vaccinated		X2	P. value	OR		
	Yes	No					
Age of mothers	15-19	7(2.5%)	1(0.36%)	0.363	>0.2	2.7	
	20-24	56(20%)	3(1.1%)			1	
	25-29	90(32.14%)	5(2.0%)			1.03	
	30-34	52(18.6%)	3(1.1%)			0.62	
	35-39	46(16.42%)	2(0.71%)			0.81	
	40-44	11(4.0%)	1(0.36%)			1.7	
	≥45	2(0.71%)	0(0%)				
Marital status of mothers	Married	207(73.9%)	11(4.0%)	0.653	>0.2	1	
	Single	16(5.7%)	1(0.36%)			1.17	
	Divorced	31(11.07%)	2(0.70%)			1.21	
	Widowed	11(4.0%)	1(0.36%)			1.7	
Educational status of mothers	Illiterate	21(7.5%)	8(2.86%)	52.523	<0.001	9.8	
	Read & write	10(3.6%)	4(1.43%)			10.26	
	Literate	1-8	77(27.5%)			3(1.1%)	1
		9-12	115(41.0%)			0(0%)	
	>12	42(15.0%)	0(0%)				
Occupational status of mothers	House wife	137(48.90%)	9(3.21%)	18.258	<0.01	3	
	Governmental employee	57(20.35%)	0(0%)				
	Merchant	46(16.43%)	1(0.36%)			1	
	Daily labor	22(7.85%)	3(1.1%)			6.27	
	Others	3(1.1%)	2(0.70%)			30.7	
Religion of mothers	Muslim	78(27.85%)	4(1.43%)	1.211	>0.2	1	
	Orthodox	156(55.71%)	9(3.21%)			1.12	
	Catholic	7(2.5%)	1(0.36%)			2.8	
	Protestant	23(8.22%)	1(0.36%)			0.85	
	Others	1(0.36%)	0(0%)				
Monthly income	≤500 birr	22(7.86%)	7(2.5%)	26.6	<0.001	23.22	
	501-1500 birr	105(37.5%)	7(2.5%)			4.87	
	1500-2500 birr	73(26.07%)	1(0.36%)			1	
	>2500 birr	65(23.21%)	0				

Mothers occupation was also shows a significant association with immunization status of children (X2(18.25) and P<0.01). From, 47(16.79%) children of merchant mothers, 46(16.43%) were vaccinated and 1(0.36%) were unvaccinated. From, 146(52.11%) children of house wife mothers, 137(48.90%) were vaccinated and 9(3.21%) were unvaccinated, in which 3 times more likely vaccinated than merchant mothers of children. All governmental employee mothers' children were vaccinated. From 25(8.95%) children of daily labor mothers, 22(7.85%) were vaccinated and 3(1.1%) were unvaccinated, in which 6.27 times more likely vaccinated than merchant mothers. From, 5(1.80%) children of other occupation mothers, 3(1.1%) were vaccinated and 2(0.70%) were unvaccinated.

On the other hand, monthly income of the mothers have a significant association with immunization status of children (X2(26.6) and P<0.001). From, 74(26.43%) children of 1501-2500 birr monthly income mothers, 73(23.07%) were vaccinated and 1(0.36%) were unvaccinated. From 112(40%) of 501-1500 birr monthly income mothers, 105(37.5%) were vaccinated and 7(2.5%) were unvaccinated, in which 4.87 more likely vaccinated

than 1501-2500 birr monthly income mothers of children. From, 29(10.36%) ≤500 birr monthly income, 22(7.86%) were vaccinated and 7(2.5%) were unvaccinated. From, 65(23.21%) >2500 birr monthly income mothers, all of them were vaccinated their children (Table 5).

### 3.7. ANC Follow up and TT Status of Mothers

Maternal health care utilization like ANC follow up and TT status were another factors assessed in this study(X2(90.28) and P<0.001).

Mothers who had ANC follow up during their last pregnancy ,63.5 times more likely to immunize their children than those who do not, and the number of ANC follow up have a significantly association with immunization status of children(X2(51.78) and P<0.001). From, 175(67.83%) children of mothers fully ANC follow up, all of their children were vaccinated. TT immunization has significant association with immunization status of children irrespective of their dose (Table 6).

**Table 6. Immunization status of children aged between 12-23 months by ANC follow up and TT vaccine of mothers in Goba town, southeast Ethiopia**

Variable	Vaccinated		X2	P. value	OR
	Yes	No			
ANC follow up			93.73	<0.001	63.5
Yes	254(90.71%)	4(1.43%)			
No	11(3.93%)	11(3.93%)			
Number of ANC(n=258)					
One	3(1.16%)	2(0.78%)	51.784	<0.001	38
Two	19(7.36%)	1(0.39%)			3
Three	57(22.09%)	1(0.39%)			1
Fully	175(67.83%)	0(0%)			
TT immunized					
Yes	254(90.71%)	4(1.43%)	90.288	<0.001	63.5
No	11(3.93%)	11(3.93%)			
TT status (n=258)					
Partially	85(32.95%)	2(0.77%)	0.503	>0.2	0.5
Fully	169(65.5%)	2(0.77%)			

### 3.8. Awareness of Mothers on Vaccination and Vaccine Preventable Disease

Mothers of the selected child, heard about vaccination and vaccine preventable disease, knew the correct age at child begin and finish immunization shows a significant association with immunization status of children (X2(17.58) and P<0.001), (X2(7.5) and P<0.05) and (X2(35.82) and P<0.001) respectively. From, 279(99.61%) mothers who had heard about vaccination and vaccine preventable disease, 265(94.6%) were vaccinated and 14(5.0%) were unvaccinated their children. Mothers who did not heard about vaccination and vaccine preventable disease, all of them were unvaccinated their children. Children of mothers who knew the correct age at begin immunization, 90(32.14%) were vaccinated. From 190(67.86%) children of mothers who did not knew the correct age at begin immunization, 175(62.5%) were vaccinated and 15(5.36%) were unvaccinated. Children of mothers who knew the correct age at finishing immunization were 26.6 times more likely to be vaccinated than who did not knew (Table 7).

**Table 7. Immunization status of children aged between 12-23 months by knowledge of mothers on vaccination and vaccine preventable disease, in Goba town, southeast Ethiopia**

Variable	Vaccinated		X2	P. value	OR
	Yes	No			
Heard about vaccine and VPD			17.583	<0.001	
Yes	265(94.61%)	14(5.0%)			
No	0(0%)	1(0.39%)			
Know correct age begin immunization					
Yes	90(32.14%)	0(0%)	7.504	<0.05	
No	175(62.5%)	15(5.36%)			
Know correct age finish immunization					
Yes	213(76.07%)	2(0.70%)	35.829	<0.001	26.6
No	52(18.6%)	13(4.63%)			

### 3.9. Characteristics of Child

The characteristics of children like sex, place of delivery and birth order did not have a significant

association with immunization status of children age between 12-23 months of this study (Table 8).

**Table 8. Immunization status of children aged between 12-23 months by characteristics of children in in Goba town, southeast Ethiopia**

Variable	Vaccinated		X2	P. value	OR
	Yes	No			
Sex			0.00076	>0.2	1.07
Male	128(45.71%)	7(2.5%)			
Female	137(48.93%)	8(2.86%)			
Place of delivery					
Health institution	51(18.21%)	0(0%)	5.345	<0.1	
Home	214(76.43%)	15(5.36%)			
Birth order					
First	80(28.57%)	6(2.14%)	2.439	>0.2	2.3
Second	60(21.43%)	5(1.79%)			2.6
Third and above	125(44.64%)	4(1.43%)			1

## 4. Discussion

Immunization status was assessed using the availability of vaccination card and maternal recall. Based on the immunization card and recall, 152(52.14%) of the children were fully vaccinated, and 15(5.39%) were unvaccinated. Since, PCV starts recently in Ethiopia, children who were 21 months old took PCV2 and PCV3, those 22 months old took PCV3, but not other dose of PCV and the children who were 23 months old didn't take any dose of PCV vaccine. As result of this, about 185(69.81%) were received PCV1 which was slightly lower than PCV2 and PCV2 was also slightly lower than PCV3, but not PCV1. From the total respondents, 52.14% were fully vaccinated their children. While this represents 28% increase from the report in the 2011 EDHS. And also, 5.36% were unvaccinated their children, which decrease about 9.14% from the 2011 EDHS report [26,27,28].

This study was also tried to assess factor affecting the immunization status of the children in to two categories, vaccinated or unvaccinated. In this study age of mothers, marital status of mothers and religion of mothers did not show the significant association with the immunization status of children aged between 12-23 months old, but Educational status, occupational status and monthly income of mothers have a significant association with immunization status of children. This is consistent with the study done in Dhaka Bangladesh in which educational status, monthly income and living condition of the mothers [17].

Inadequate awareness about immunization contributes to low immunization coverage in Ethiopia [12]. The finding of this study also indicate that lack of awareness on vaccination and vaccine preventable disease is associated with the immunization status of children aged 12-23 months. Mothers those do not heard about vaccination and vaccine preventable disease were not beginning the immunization for their children.

ANC follow up and TT status of mothers was showed a significant association with immunization status of children. Children of mothers who follow ANC 63.5 times

more likely to be vaccinated than who did not, which is consistent with the study done in India shows, children of mothers who visit ANC was 2-3 times higher than those who did not visit ANC [21].

Awareness of mothers about vaccination and vaccine preventable disease was also assessed in this study. Most of mothers were heard about vaccination and vaccine preventable disease, regarding to correct awareness of mothers age at which child begin and finishes the immunization one third of the respondent mothers knew the correct age at the child begin immunization and three fourth of them knew the correct age at the child should complete vaccination. This finding inconsistent with the study done in Nigeria, in which most of the mothers knew the objective and schedule of the immunization [20].

Different reasons were given by the respondent for their unimmunized children. These are, the health worker did not come and give at kebele and perceiving vaccine hurts children. This is similar with base line study done by polio core group in Ethiopia [26].

The characteristics of childlike sex, place of delivery and birth order did not show significant association with immunization status of children aged between 12-23 months of this study; however place of delivery showed significant association with completion of vaccination. Mothers who deliver their last child at health institution were 3.3 times more likely to be vaccinated than children born at home, which is consistent with study done in Uganda (22).

## 5. Conclusion

There is low immunization coverage among children aged 12-23 months in the kebele. In which only 52.14% were fully vaccinated. About, 99.64% mothers heard about vaccination and vaccine preventable disease, from these 32.14% knew the age at the child should begin immunization and 76.07% knew the age at child should complete immunization. ANC follow up, institutional delivery services and awareness of mothers about the age at which child begins and finishes the vaccination were significant predictors for fully immunization status of children age 12-23 months. A few Children are unvaccinated because the respondent mothers perceived health worker do not come and give at our kebele and vaccine hurts children.

## Competing Interests

The authors declare that they have no any competing interests.

## Authors' Contributions

Both authors have equal contribution to the manuscript.

## Authors' Information

Ahmed Yasin Mohammed is an assistant professor at Madda Walabu University and Abate Lette Wodera is a lecturer at Madda Walabu University.

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