A Community Based Assessment of the Immunization Coverage and the Associated Factors of Children Aged 12-23 Months at Gondar Town, Northwest Ethiopia

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Abstract

Background: More than 10 million of the child deaths each year are caused by lack of application of evidence based, and cost effective prevention methods. Immunization coverage is one of the indicators used to monitor progress towards the achievement of MDG4 and the reduction of child morbidity and mortality, as it is one of the most cost-effective public health interventions for reaching these goals. According to the 2011 EDHS, 24% of Ethiopian children aged 12–23 months have received all recommended vaccines.

Objective: To assess the immunization coverage and the associated factors of children aged from 12-23 months old.

Method: A community based cross-sectional study was conducted in Gondar town, Amhara national regional state, Northwest Ethiopia from July 15 to September 01, 2013. It is 737 km far from Addis Ababa. The 30 cluster sampling technique was employed to select 630 study participants from 12 city administrative kebeles. Data quality was maintained by checking every day filled questionnaires about its completeness. Data analysis was done by using Pearson chi-square test with SPSS version 20 statistical software package. P-value less than 0.05 were considered statistically significant.

Results: Majority of the mother (55.1%) aged from 21-30 years old with a range from 17 to 49 years old. Of mothers interviewed, 79.8% were married, 31.3% able to write and read, 44.9% housewife, 35.0% had monthly income of greater than 2000 ETB, 87.1% mothers were Amhara, and 72.7% were Orthodox. Of all participants, 98.3% were reported as they had access to the health institution. Majority respondents (53.8%) had average walking time to the nearest health institutions 15 to 30 minutes. Overall immunization coverage by card and history accounted 85.9%, but only 54.0% were confirmed by card, and 14.1% were unimmunized. Of the total, 54.0% took OPV1 to OPV3 and penta 1 and penta 2 followed by penta 3 and measles (53%). Mothers' marital status, educational status, their occupation and some other variables showed statistically significant association with our dependent variable by Pearson chi-square test analysis (p = 0.00). Among mothers,92.9% had at least one ANC follow up during their pregnancy and most of them received three or more ANC service, and 87.6% of them ever took > 1 doses of TT vaccine.

Conclusion: There is low immunization coverage among children aged 12-23 months in the study compared to WHO target though it is higher than the national immunization coverage (24.0%). Community mobilization and efforts to raise the awareness of mothers are important strategies to increase immunization coverage in the area.

Keywords: Children; Immunization; Coverage; Ethiopia

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Background

Immunization is a proven tool for controlling and even eradicating communicable diseases. Since the 1960s, prevention methods such as childhood vaccination are the main reason for improvements in child survival in developed world [1]. Reduce child mortality is the 4th of the Eight Millennium Development Goals (MDGs) [2]. These MDGs are health and social outcome objectives that were agreed upon by all UN member nations in 2000 and are to be achieved by 2015. Looking at the fourth MDG, the aim is to reduce the global child mortality rate by two-thirds. It is meant that immunization 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 World Health Organization (WHO) from 1967 to 1977 [3]. 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 [4].

All countries have national immunization programs, 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 influenzae type b (Hib). These vaccines are preventing more than 2.5 million child deaths each year [5]. 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 with an intention of reaching 100% coverage by 1990, this program goal has largely remained unrealized even using different efforts. Despite the high prevalence of vaccine preventable diseases in the country, immunization coverage rates stagnated and remained very low for many years. As a result many children in Ethiopia do not get the benefits of immunization [6,7]. The objective of the National Immunization Policy was to reduce morbidity and mortality 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 [8].

According to the 2011 EDHS, 24% of Ethiopian children aged 12-23 months have received all recommended vaccines, one dose each of BCG and measles, and three doses each of DPT and polio (excluding polio vaccine given at birth). Fifteen percent of children did not receive any of the recommended vaccines [9-11]. Immunization during childhood has been proven to be the most effective strategy for the prevention of many infectious diseases [10-14]. The percentage of children ages 12-23 months who are fully vaccinated (24%) in Ethiopia remains far below the goal of 66% coverage set in the HSDP IV [15] though it shows a 19% increase from the level reported in the 2005 EDHS. More than 10 million of the child deaths each year are caused by lack of application of evidence based and cost effective prevention methods [16]. Although reducing child morbidity ensures that there is a healthy and robust generation contributing to society, Sub-Saharan Africa is the lowest performing region in terms of MDG 4-reducing child mortality [17] and Ethiopia is one of the Sub-Saharan countries with immunization coverage of 24% [9].

This study was therefore aimed to assess immunization coverage and identifying the associated factors that affect full immunization of children of the age between 12 and 23 months in Gondar town, Northwest Ethiopia. Results of this study should guide the health sector authorities and personnel in what to do to increase the coverage.

Subjects and Methods

Study area

The study was conducted in Gondar town, Capital of the North Gondar administrative zone in Amhara national regional state, Northwest Ethiopia, just north of Lake Tana 737 km northwest of the country's capital, Addis Ababa. Gondar is recognized as the cradle of Ethiopian art and culture, it is a town with origins that date to the 1630s and it is founded by Emperor Fasilledes. Many of its early churches

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and castles built during these founding years are still in existence and accessible to visitors today. Gondar was the first permanent capital of Ethiopia, serving that purpose from 1635 until 1867. Today, Gondar is home to approximately 207,000 people and is the fifth-most populated town in Ethiopia. It serves as a regional trade center and supports both a university and a medical school. The economy of Gondar is driven by retail and wholesale trade, agriculture, manufacturing, tourism and textiles production. Sitting roughly 7,200 feet above sea level, and it is located in the foothills of the Simien Mountains and is surrounded by both arid lands and lush green hills. Gondar town has two hospitals: one governmental and one private; six governmental health centers and more than seven private clinics [18].

Study design and period

A community based cross-sectional study was conducted from July 15 to September 01, 2013 to determine the immunization coverage of children aged from 12-23 months and investigate the associated factors for non-immunization of children in Gondar town, Northwest Ethiopia.

Population

Source population

All children of 12-23 months old residing in the Gondar town was constitute as the source population of the study.

Study population and study participants

All children in the age group of 12-23 months of age living within eligible household in randomly selected 'kebeles' in the town were constituted the study population, and all eligible children of 12-23 months of age living within randomly selected households in the town were our study participants.

Inclusion and exclusion criteria

Inclusion criteria

Households with at least one live child of aged between 12-23 months, and residence of Gondar town.

Exclusion criteria

Children who are admitted due to illness, if the randomly selected house is office or institution, and children who are not found during data collection via house to house visit.

Sample size determination

The sample size is determined using a single population proportion formula using the proportion of fully immunized children aged between 12-23 months which is 24% with 95% confidence interval and precision level of 5% (Ethiopia Central Statistical Agency and ICF International. 2012).

$$n = \frac{(Z^2_{\alpha/2}) \times P(1-P)}{d^2}$$

Where: n = sample size
Z = Z score for 95 % confidence interval = 1.96,
p = proportion of fully immunized children aged
between 12-23 months = 24%,
d = tolerable error = 5 %.

$$n = \frac{(1.96 \times 1.96) \times 0.24(1-0.24)}{0.05 \times 0.05}$$

n = 281

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After addition of 10% non-response rate to the calculated sample size, it became = 310. To avoid the design effect, we multiply it by 2, and the total sample size was 630.

Sampling procedure

The 30 cluster sampling technique [19] was employed to select the study participants. Twenty one mothers who had child with age of 12-23 months will be included per cluster (ketena) which comes to 630. Gondar town will be divided into 12 city kebeles (small administrative units), we will randomly select three clusters (ketenas) each from six city kebeles, and two clusters (ketenas) each from the other six least populated city kebeles. Random numbers' list will be utilized to select ketenas and in each ketenas, 21 households (with at least one child aged 11-23 months) will be chosen by systematic random sampling.
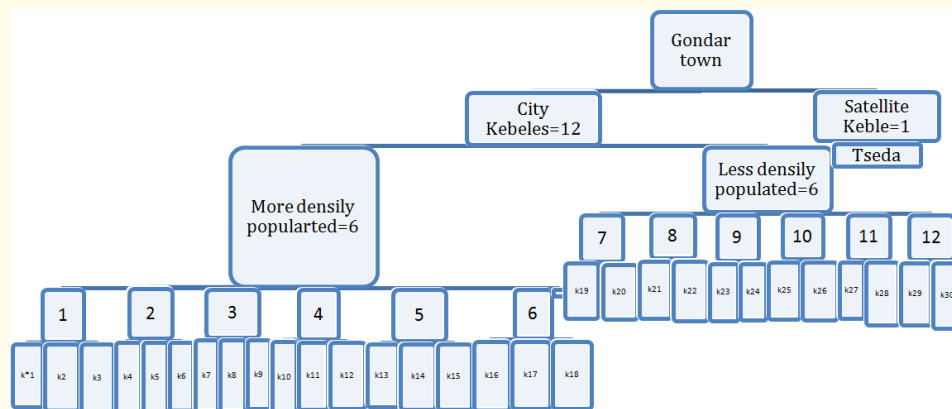
Figure 1: Sampling frame work.
1: Azezo air marefia; 2:Azezo dimaza; 3: Maraki; 4: Lideta; 5: Gebriel; 6: Aribegnoch adebabay; 7: Medihanialem; 8: Abajalie; 9: Adebabay eyesus; 10: Kerikos; 11: Mehal arada; 12: Abiye egiziyer; *Ketenas (clusters).

Study variables

Dependent variable

Immunization coverage of children aged between 12 to 23 months.

Independent variable

1. Socio demographic characteristics of mothers/guardians
2. Sex of the child
3. Educational status of mothers/guardians
4. Family size
5. Average time of travel to reach the nearest health facilities
6. Place of delivery
7. Maternal tetanus toxoid immunization
8. ANC follow up
9. Knowledge of mothers/guardians

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Data collection technique

An interview guided structured questionnaire was utilized to collect data. Data on immunization history were 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 was asked for the presence of child's immunization card. For the child with immunization card, the information on the doses and types of immunization received by the child was copied from the card. If immunization card was not 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 from the child's mother/guardian.

Data quality control

Questionnaires were pretested for completeness and appropriateness to the local context on 16 households in one of the kebeles not selected for the study. Every day filled questionnaires was checked in the field for completeness by all data collectors and supervisor before they return from field. Data collectors were asked to return and complete for the incomplete questionnaires. Every questionnaire was checked by principal investigators every day after data collection but before data entry.

The questionnaire which was used for study was adapted from demographic health survey (EDHS) and from the prior researches done in other places, and then was developed according to the local context. The questionnaires were developed in English and then translated into Amharic and retranslated back to English for accuracy and consistency.

Data management and analysis

Data were checked for its completeness, coded and entered into computer by using SPSS version 20 for analysis. Descriptive statistics was used to analysis and described using percentage and Pearson chi-square values. The results of the study were presented by tables and charts. P-value < 0.05 was considered as statistical significance.

Operational definitions

Confirmed by card only: data are collected from EPI cards.

Confirmed by history: dose of vaccine the child received as reported by the mother.

Fully vaccinated children: children 12-23 months old who received one dose of BCG, one dose of measles and three doses of Pentavalent, four doses of Polio vaccines and three doses of PCV (pneumonia) vaccines.

Negligence: a person who have awareness about immunization; however, s/he did not vaccinate his/her child

Ethical approval

The project was started after ethical clearance is obtained from the Ethical Clearance Committee of Nursing Department, College of Medicine and Health Sciences, University of Gondar. All the stake holders were informed about the study. Informed consent was sought from the study participants before administration of the questionnaire. That is, the mothers were consented for an interview regarding the immunization status of their infant and their own tetanus toxoid vaccination status. In case of refusal, we approached the next closest household.

Results

Socio demographic characteristics of the study population

A total of 630 mothers of children aged between 12-23 months old were interviewed from 12 city administrative kebeles. All respondents were mother of the children aged 12-23 months.

Majority of the mother (55.1%) aged from 21-30 years old with a range from 17 to 49 years old. From mothers interviewed, 79.8% were married, 31.3% able to write and read, 44.9% housewife, 35.0% had monthly income of greater than 2000 ETB, 87.1% mothers were Amhara, and 72.7% were Orthodox (Table 1).

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Variables	Frequency	Percent
Mother/caregiver age		
< 20	141	22.4
21-30	347	55.1
31-40	141	22.4
41-50	1	0.2
Mother/care taker marital status		
Unmarried	45	7.1
Married	503	79.8
Separated	33	5.2
Divorced	26	4.1
Widowed	23	3.7
Mother/caregiver Educational status		
Unable to write and read	62	9.8
Able to write and read	197	31.3
Grade1-8	87	13.8
Grade9-12	168	26.7
College/University	116	18.4
Mother/caregiver Occupation		
Housewife	283	44.9
Governmental employee	147	23.3
Merchant	100	15.9
Daily laborer	78	12.4
Other	22	3.5
Income/month (ETB)		
< 750	196	31.1
750-2000	214	33.9
> 2000	220	35.0
Ethnicity		
Amhara	549	87.1
Tigre	69	11.0
Oromo	12	1.9
Religion		
Orthodox	458	72.7
Muslim	122	19.4
Protestant	37	5.9
Catholic	13	2.1

Table 1: Socio demographic characteristics of the respondents in Gondar town, 2013.

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Family size and child ever born by the mothers

Most families (54.3%) had less than or equal to 4 members, and a majority (40.8%) of study participant mothers had one alive child. Majority of study participants (81.4%) gave their last child birth in the health institution (Table 2).

Variables	Frequency	Percent
Family size		
< 4	342	54.3
> 4	288	45.7
Alive child		
1	257	40.8
2-4	233	37.0
> 4	140	22.2
Place of delivery		
Hospital	355	56.3
Health Center	158	25.1
Home	177	18.6

Table 2: Distribution of family size, child ever born and alive to mother, Gondar town, 2013.

Antenatal care (ANC) follow up and TT status of mothers participated in this study

About 92.9% of mothers participated in this study had followed at least one ANC follow up during their pregnancy and most of them received three or more ANC service. In addition, 87.6% of them ever took one or more doses of TT vaccine, from these 69.7% took more than two doses. Fifty three (8.4%) of those study participants gave lack of knowledge as their reasons not had TT vaccine followed by negligence (3.3%) (Table 3).

Variables	Frequency	Percent
Antenatal care		
Yes	585	92.9
No	45	7.1
No of ANC taken (n = 585)		
< 2	47	7.5
> 3	538	85.4
TetanusToxoid immunization		
Yes	552	87.6
No	78	12.4
No. of TT received (n = 552)		
< 2	113	17.9
> 3	439	69.7
Reasons not had TT vaccination(n = 78)		
Negligence	21	3.3
Lack of services	1	0.2
Doubt on its use	3	0.4
Lack of knowledge	53	8.4

Table 3: Maternal health care utilization, Gondar town, 2013.

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Availability and accessibility of vaccination service

It was assessed by presence of the service and average walking time to the health institution. Six hundred and nineteen (98.3%) of the respondents were reported that they had access to the health institution that provides immunization services and majority of the reported (74.0%) that they were more access to health center. For majority respondent (53.8%) the average walking time to the nearest health institutions was 15 to 30 minutes (Table 4).

Variables	Frequency	Percent
Availability of health service		
Yes	619	98.3
No	11	1.7
Type of health institutions available (n = 619)		
Health center	458	74.0
Hospital	120	19.4
Health post	7	1.1
Private clinics	34	5.5
Average walking time to reach nearest vaccination service (n = 619)		
< 15 minutes	107	17.3
15-30 minutes	333	53.8
30-60 minutes	98	15.8
> 60 minutes	81	13.1

Table 4: Vaccination service availability and accessibility, Gondar town, 2013.

Characteristics of the child

A total of 630 children of aged between 12-23 months old were included and most of them were 17 and 18 months of age. The mean and median ages of children were17.0 and 17.3 respectively. About 51.6% of them were males and 48.4% were female children. Five hundred and thirteen (81.4%) were born at health institution, while 18.6% of them at home. Majority of the children were ever took one or more doses of vaccine, from these about 62.8% of them had vaccination card during the study (Table 5).

Variables	Frequency	Percent
Sex		
Male	325	51.6
female	305	48.4
Place of birth		
Home	117	18.6
Health institution	513	81.4
Child ever vaccinated		
Yes	541	85.9
No	89	14.1
Had vaccination card (n = 541)		
yes	340	62.8
no	201	37.2

Table 5: Characteristics of the study children aged between 12-23 months, Gondar town, 2013.

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Immunization coverage in children aged between 12-23 months

Five hundred and forty one (85.9%) of the children participated in this study were ever took one or more of the nine vaccines and 14.1% were unvaccinated. Of those vaccinated children, 54.0% had a vaccination card. Two hundred and seventy (42.9%) children completed all nine recommended vaccination, and the remaining 43.0% of children took one or more vaccine but did not complete the recommended doses (Table 6).

Variable	Frequency	Percent
Vaccinated (card + history)		
yes	541	85.9
no	89	14.1
Vaccination card (n = 541)		
yes	340	54.0
no	201	31.9
Immunization coverage (card + history)		
Fully vaccinated	270	42.9
Partially vaccinated	271	43.0
Unvaccinated	89	14.1

Table 6: Frequency of immunization status of children aged 12-23 months by immunization history and vaccination card, Gondar town, 2013.

The card handling rate was 54.0% and vaccine coverage by card only was calculated by taking children who had vaccine card as a numerator. From the total, 54.0% took OPV1 to OPV3 and pental1and penta2 followed by penta3 and measles (53%) (Figure 2).
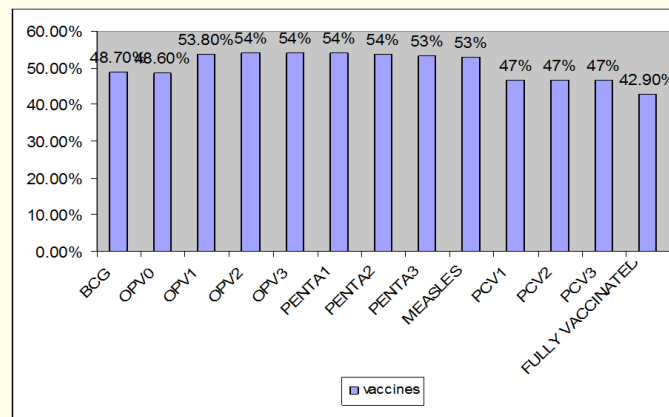
Figure 2: Immunization coverage among children aged between 12-23 months by card only, Gondar town, 2013.

Socio-demographic feature of mothers that may affects immunization coverage of children

The association of mothers' socio-demographic characteristics with immunization status of the children was assessed using Pearson chi-square test analysis. Mothers' marital status, educational status, and their occupation showed statistically significant association by Pearson chi-square test analysis (p = 0.00). But being the children of aged or young, Amhara, Tigre or Oromo, and Orthodox, Muslim, Protestant or Catholic mothers had no statistical significant association (p > 0.05) (Table 7).

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Variables	Immunization status			
	Yes, n (%)	No, n (%)	X²	p-value
Mother age			3.321	0.341
< 20	115 (21.3)	26 (29.2)		
21-30	300 (55.5)	47 (52.8)		
31-40	125 (23.1)	16 (18.0)		
41-50	1 (0.2)	0 (0)		
Marital status			37.526	0.00
unmarried	29 (5.4)	16 (18.0)		
Married	452 (83.5)	51 (57.3)		
separated	24 (4.4)	9 (10.1)		
divorced	17 (3.1)	9 (10.1)		
widowed	19 (3.5)	4 (4.5)		
Maternal educational status			24.187	0.00
Unable to write and write	43 (7.9)	19 (21.3)		
Able to write and write	162 (29.9)	35 (39.3)		
Grade1-8 (primary)	76 (14.0)	11 (12.4)		
Grade9-12 (secondary)	152 (28.1)	16 (18.0)		
College/university	108 (20.0)	8 (9.0)		
Maternal occupation			39.257	0.00
Housewife	254 (47.0)	29 (32.6)		
Governmental employee	137 (25.3)	10 (11.2)		
merchant	81 (15.0)	19(21.3)		
Daily laborer	51 (9.4)	27 (30.3)		
other	18 (3.3)	4 (4.5)		
Ethnicity			5.466	0.065
amhara	477 (88.2)	72 (80.9)		
Tigre	53 (9.8)	16 (18.0)		
Oromo	11 (2.0)	1 (1.1)		
Religion			3.387	0.336
Orthodox	397 (73.4)	61 (68.5)		
Muslim	104 (19.2)	18 (20.2)		
Protestant	31 (5.7)	6 (6.7)		
Catholic	9 (1.7)	4 (4.5)		

***Table 7:** Immunization status of children aged from 12-23 months by socio-demographic features of mothers that possibly affect children`s immunization coverage, Gondar town, 2013.*

Factors such as maternal TT vaccination, ANC follow up, and place of birth for the last child showed statistically significant association with the dependent variable by Pearson chi-square test analysis (p = 0.00); however, variables such as child sex, and average walking time to reach the nearest health institution did not reveal statistical association to the dependent variable (p > 0.05) (Table 8).

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Variables	Immunization status			
	Yes	**No**	**X²**	***p*-value**
Child sex			0.062	0.803
Male	278 (51.4)	47 (52.8)		
female	263 (48.6)	42 (47.2)		
Maternal TT vaccine			69.364	0.00
Yes	498 (92.1)	54 (60.7)		
no	43 (7.9)	35 (39.3)		
ANC follow up			68.563	0.00
yes	521 (96.3)	64 (71.9)		
no	20 (3.7)	25 (28.1)		
Place of birth for the last child			31.698	0.00
home	82 (15.2)	35 (39.3)		
Health center	136 (25.1)	22 (24.7)		
hospital	323 (59.7)	32 (36.0)		
Average walking time to reach the nearest health institution			1.013	0.798
< 15 minute	93 (17.2)	14 (16.3)		
15-30 minutes	287 (53.1)	46 (51.7)		
30-60 minutes	82 (15.2)	16 (18.6)		
< 60 minutes	78 (14.4)	10 (11.6)		

Table 8: Completion of immunization among children aged between 12-23 months by sex, TT vaccination, ANC follow up, place of birth, and average walking time, Gondar town, 2013.

Association of mothers' knowledge about vaccination and vaccine preventable disease with the completion of immunization was the other factor assessed in this study. The results from Pearson chi-square test analysis shows that the variables hearing of VPDs, when does the child begin and complete his/her vaccination are statistically associated to our dependent variable (p = 0.00) (Table 9).

Discussion

Ethiopia has been engaged in expanding immunization services against the six childhood diseases since 1980 [6,20], but currently it rises to against the nine selected childhood diseases. It implies that vaccination in Ethiopia is an obligatory program to combat infections which cause high morbidity and mortality.

This study tried to assess the coverage of immunization and factors associated with it in children aged between 12-23 months old residing in selected 12 city administrative kebeles, Gondar town. In spite of all effort taken by the country and international aid agencies, still there remain many unimmunized and partially immunized children observed in our study (Table 6). Immunization coverage was assessed using the availability of vaccination card and maternal recall or history. The fully immunization coverage for children aged of 12 to 23 months in our study (Table 6) was lower than a report from Al-Beida City, Libya (81%) [21]; however, it is higher than the 2011 EDHS (24%) report of the Ethiopian children aged 12-23 months old.

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Variables	Immunization status			
	Yes	No	X²	*p*-value
Hearing of VPDs			42.383	0.00
Yes	525 (97.0)	72 (80.9)		
No	16 (3.0)	17 (19.1)		
When does the child start vaccination			72.203	0.00
Immediately after birth	380 (70.2)	37 (41.6)		
One month after birth	109 (20.1)	15 (16.9)		
At any time	19 (3.5)	7 (7.9)		
After one year of birth	7 (1.3)	8 (9.0)		
I do not know	26 (4.8)	22 (24.7)		
When does the child complete vaccination			63.292	0.00
< 1year	404 (74.7)	41 (46.1)		
1-2years	63 (11.6)	14 (15.7)		
3-4years	11 (2.0)	9 (10.1)		
> 5years	57 (10.5)	14 (15.7)		
I do not know	6 (1.1)	11 (12.4)		

Table 9: Knowledge of mothers on vaccination & vaccine preventable diseases,Gondar town, 2013.

Result of a community-based cross-sectional survey conducted in 220 households with children 12-13 months of age in 7 villages and 4 urban centers of Ethiopia selected by stratified multistage cluster sampling showed that 51.0% [6] validly fully immunized for age which is nearly consistence with our report. 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. These shows, half of the children were not fully protected [22] and it is almost equivalent to our result. However, results of this study is higher than the study done in Ambo Woreda which showed that immunization coverage by routine vaccination was less than 20% with card and less than 50% with card and history [23]. This is possibly because of temporal and special differences between the two studies.

Unimmunized children in our study (Table 6) is slightly lower than the various reports done elsewhere in the world such as in semi urban area in Rajasthan (18.5%) [24], City of North India (23.9%) [25], Mawatch Goth, Kemari town, Karachi, Pakistan (30.0%) [26] and Kep District, Kingdom of Comodia (80.0%) [27] though is comparable to the finding of EDHS 2011(15%) [9].

Antenatal care follow-up and TT status of the mother also showed a significant association with the child immunization status by Pearson chi-square analysis. Mother who had followed ANC was more likely to vaccinate their children and to complete vaccination and this is consistence with the study done in Bangladesh [28].

Conclusion

Our finding here indicates that in spite of all effort taken by the country and the international aid agencies, more than half (Figure 2) of the children aged from 12 to23 months did not get the full vaccinations which are appropriate for their age. Therefore, health sector personnel and other responsible authorities should work hard to address the coverage of immunization appropriate for all children.

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