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Assessment of Incomplete Vaccination and Associated Risk Factors among Children Under one Year at Guder Hospital, West Shoa Zone, Oromia Regional State, Ethiopia

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Abstract
Immunization is one of the most successful public health initiatives. Each year, vaccination averts an estimated 2-3 million deaths from diphtheria, tetanus, pertussis (whooping cough) and measles. In 2011, nearly 22.4 million children failed to receive at least 3 doses of diphtheria, tetanus, pertussis (DTP) vaccine, leaving large numbers of children susceptible to vaccine-preventable diseases and death. EPI cluster survey conducted in Ethiopia on 2012 revealed; only 50% of children less than 2 years of age fully complete their vaccination.**Objective:** To assess incomplete vaccination and associated risk factors among children aged less than twelve months at Guder Hospital.**Methodology:** Institution based cross-sectional study was conducted at Guder Hospital from January – May 2017. A total of 248 caregivers who have children of aged less than 12 months were included in this study. Modified 2005 WHO EPI cluster sampling method was implemented. Well structured pretested questionnaire was used. Data were entered and analyzed using SPSS version 20 for Windows. Bivariate and multivariate analysis was done to test the association between independent and dependent variables using binary logistic regression model. **Result:** From total of 248 children aged between 9-12months were 27.5% among them 14.7% didn't complete their vaccination according to schedule for routine immunization. DPT-HepB-Hib1- DPT-HepBHib3 dropout was 15%. More than half of respondents (58.9%) knew that the vaccination program should be finished at the age of nine months. This study revealed that children were less likely to incomplete vaccination if their primary caregivers knew the benefit of vaccinating child. Mothers ANC follow up and institutional deliveries during their last child were significantly associated with vaccination incompletion.**Conclusion:** There was low Vaccination coverage among children aged less than 12 months at Guder Hospital compared to national and global target. Caregiver's educational level, knowledge on benefit of vaccinating child and age to complete immunization, ANC follow up and institutional delivery were significantly associated with incomplete vaccination on this study. Guder Hospital and health office should work on it to increase community awareness through intensive public health education activities with regards to the benefits and needs of complete the entire schedule of vaccination.
Keywords: vaccine, incomplete, Guder Hospital and Ethiopia

Introduction

1. Background

Immunization is one of the most successful public health initiatives. Each year, Immunization averts an estimated 2-3 million deaths from diphtheria, tetanus, pertussis (whooping cough) and measles (1)

Globally under-five mortality rates have dropped by 49% between 1990 and 2013. The average annual reduction has accelerated but overall progress is still short of meeting the global target of a two-thirds decrease in under-five mortality by 2015. New estimates in "Levels and Trends in Child Mortality 2014" show that in 2013, 6.3 million children under five died from mostly preventable causes. Eight of the 60 countries identified as high mortality countries" have already reached or surpassed the MDG target (67% reduction). major improvements in child survival are in part due to affordable, evidence-based interventions against the leading infectious diseases, such as immunization, insecticide-treated mosquito nets, rehydration treatment for diarrhea, nutritional supplements and therapeutic foods(2).

In 1974, the World Health Organization (WHO) established the Expanded Program on Immunization (EPI) to ensure all children had access to routinely recommended vaccines. Initially, those vaccines were limited to bacille Calmette-Guérin vaccine (BCG), diphtheria-tetanus-pertussis vaccine (DTP) and oral poliovirus. In 2011, an estimated 83% of infants worldwide were vaccinated with three doses of vaccines required to immunize them against diphtheria, tetanus and pertussisi (3). The Expanded Program on Immunization started in Ethiopia in 1980 with the aim of reducing mortality and morbidity of children and mothers from vaccine preventable diseases (4). Immunization schedule for the ten EPI vaccines for children and tetanus vaccination for women of reproductive age in Ethiopia strictly follows the WHO recommendations for developing countries. Global goals and strategies related to specific disease control initiatives such as polio eradication, measles mortality reduction, and maternal and neonatal tetanus elimination have been adopted in the national vaccination policy(5). Immunization Service is given free of charge in the public sectors and NGOs operating in the field of health (4)

2. Methods and materials

2.1. Study area and period

The study was conducted from January – May 2017**.** The study area was Guder Hospital. Guder Hospital is found in Oromia regional state West Shoa Zone Tokke kutaye District, Guder town, which is at distance of 125 kilometers west of Addis Ababa. According to 2007 Central Statics Agency (CSA) the total human population of the town is 43,359. Of whom 10,103 female and 11383 males. Agriculture is the predominant means of livelihood for residents. The town has 2 kebeles, one district hospital, 1 health center and 6 private clinics in the town. Vaccination service is provided in health center and hospital free of charge.

2.2. Study design

Institution based cross-sectional study design was used

2.3. Source population

All Mothers/ caretakers with children aged less than one year at Guder town

2.4. Study population

Mothers /caretakers with children aged less than one year visited Guder Hospital.

2.5. Sample size determination

The Sample size was determined by the following formula

$$N= \frac{(z\alpha/2)^2 P (1-P)}{d^2} = \frac{(1.96)^2 x 0.05 (1-0.05)}{(0.05)^2} = 3.84$$

N f = no /1 +(no/N)=384/1+384/696
N f =384/1.55=248

Where

P= proportion of children who didn't complete vaccination
d=Margin of error, 0.05
z = Confidence level required and $Z\alpha/_2$ at 95% CI=1.96
n = minimum sample size
So, total sample size 248 individuals

2.6. Inclusion and Exclusion Criteria

2.6.1. Inclusion criteria

Families and caregivers who lived in Guder town for more than six months and that have a child whose age is less than one year and visited under 5 OPD and EPI.

2.6.2. Exclusion criteria

Any child whose age is above one year was excluded from the study.

2.7. Sampling Procedures

Simple- random sampling technique was used to collect the sample.

2.8. Data Collection Tools and Procedures

A structured pretested and self administered questionnaire was used for interviewing of the study subject. The Questionnaire was translated to local language (Afanoromo) form English language the questionnaire contains Vaccination histories of children, information on socio-demographic characteristics, monthly income, sex of the child, ANC follow up, place of delivery, accessibility and quality of vaccination service, knowledge of mothers or immediate caretakers on vaccination and Reasons for defaulting were captured into the questionnaire. The child's vaccination dates number of doses and dates of other visits to the health facility was extracted and collected from vaccination card and history. Information about mother's knowledge on vaccination and the program, and accessibility to the nearest health facility asked through verbal information. If vaccination card was unavailable for the child, the mothers/caretakers were asked for vaccination history.

2.9 Data Quality Control

Before data collection the group members discuss on how to approach and how to interview the study participants. After data collection the questionnaire was checked for completeness and consistency. At the end the data were entered to SPSS version 20 and analyzed. The finding of the result presented using tables and charts.

2.10. Data Processing and Analyzing

Data are coded and analyzed using SPSS version 20 for Windows. Summary statistics such as, percentages and graphical techniques are used. Then bivariate analysis will be done to test the association between the independent and the outcome variables. All explanatory variables that are associated with the outcome variable in bivariate analyses are included into multivariate logistic regression, to determine factors that are significantly associated with vaccination incompletion rate. P-value of 0.05 is considered as a cut-off point for statistical significance.

2.11. Ethical clearance

Letter of ethical clearance were obtained from Ambo University, College of Medicine and Health Sciences. Verbal and written informed consent was taken from all the study participants. All information was given to all participants about the objective, the contents of the study, as well as they are granted their freedom to withdraw from their participation at any time during the study period. They are also granted their freedom to withdraw from their participation at any time during the study period. Besides to this all the information collected from the study subjects was handled confidentially and data are used for the research purpose only.

3. RESULT

3.1 Socio-Demographic Characteristics of study population

A total of 248 mothers/ caregivers of children less than one year of age were interviewed for the study. The majority 201(81.4%) were between the age of 20 and 34, 43(17.3%) were 35years and above and the remaining 4(1.6%) were less than the age of 20 with the mean age of 27.8+_ 5.9.Concerning educational status 163(65.7%) marital status, 232 (93.5%) of the caregivers were currently married followed by 8 (3.2%) divorced, single 5(2%) and widowed 3(1.2%). With regard to religion 142 (57.3%) were orthodox while 86 (34.7%) were protestant, 9(3.6%) were Muslim and the rest 11(4.4%) were other religion followers (Table 1). The majorities of participants 224(90.3%) belong to the Oromo ethnic group. Among the interviewed caregivers 65.7% have primary education, 19.8% have secondary education, 8.5% were with higher education and the rest 6% were illiterate. By occupation 112 (45.2%) were housewives and 54 (21.8%) were merchant, 31(12.5%) and the rest 51(20.5%) were other occupational status. With regards to the income of respondents, 154 (62.2%) were with monthly income less than 500 birr and 94 (37.9%) were with monthly income greater than 500 birr (Table. 1)

Table 1: - Socio demographic characteristics of caregiver

Age	Frequency	Percent
<20 years	4	1.6
20-34	201	81.04
>35	43	17.3
Education level		
uneducated/illiterate	15	6
Primary	163	65.7
Secondary	49	19.8
Higher education	21	8.5
Marital status		
Married	232	93.5
Single	5	2
Widowed	3	1.2
Divorced	8	3.2
Occupation		
House wife	112	45.2
Farmer	18	7.3
government employee	31	12.5
Merchant	54	21.5
daily laborer	24	9.7
OTHERS	9	3.6
Religion		
Orthodox	142	57.3
Muslim	9	3.6
Protestant	86	34.7
Catholic	3	1.2
Other	8	3.2
Ethinicity		
Oromo	224	90.3
Gurage	4	1.6
Amhara	13	5.2
Tigirea	3	1.2
Others	4	1.6
MONTHLY INCOME	Frequency	Percent
<500 birr	154	62.2
>500 birr	94	37.9

3.2. Characteristics of the child

Among the Caregiver's children the age less than 9 month 180 (72.5%) and the rest age between 9-12 months are 68(27.5%) of children. sex of the child above half of the children are females 133(53.6%) and the rest 115(46.4%) are males.

Table 2: - Sex of children

Sex of child	Frequency	Percent
Male	115	46.4
Female	133	53.6
Age of child		
< 9 month	180	72
9- 12 month	68	28

3.3 Knowledge and Attitude on Immunization and Vaccine preventable diseases

Majority 245(98.8%)of caregivers had heard about the EPI as a specific program. caregivers major sources of information include health workers (n = 102, (41.1%), health extension workers (n = 118, 47.6%), community members (n = 14,5.6%) and Radio and TV (n = 12, (4.8%).Among these caregivers 221(89.1%) of them heard message related with vaccination completion. immunization was considered to be important to prevent disease by 164(66.1%) mothers while 71 mothers (28.6%) believe it help for child health. Mothers were asked if they think vaccine may cause harm to child health and 208(87.1%) of them replied it has no harm for child health. Most of the respondents 200(80.6%) knew at least 2 vaccine preventable diseases while 5(2.1%) stated that they didn't know any vaccine preventable diseases (Table 3).

Table 3: - Caregiver's knowledge and attitude on Vaccination and vaccine preventable diseases

Heard or seen about Vaccination	Frequency	Percent
Yes	245	98.8
no	3	1.2
Source of information		
Community members	14	5.6
health workers at health facility	102	41.1
health extension workers	118	47.6
Radio	4	1.6
Tv	8	3.2
kebele administrator	2	0.8
Messages content		
Message related with completion	221	89.1
Message not related with completion	27	10.9
Benefit of vaccinating a child		
To prevent the disease	164	66.1
For specific disease	11	4.4
For child health	71	28.6
I don't know	2	0.8
Mention Vaccine preventable diseases		
<2 and 2	200	80.6
3 and 4	40	16.1
5 and greater	3	1.2
I don't know	5	2.1
vaccination may cause health problem		
Yes	2	12.9
No	208	87.1
I don't know	38	15.3

Knowledge of respondents assessed about age child should begin vaccination 61% of them respond just after birth and 6 weeks after birth. Among respondents 58.9% of them know four sessions are needed to fully complete child vaccination (Table4).

Table 4: - Care giver's knowledge on Age to begin and complete vaccination and session needed

Age to begin vaccination	Frequency	Percent
Just after birth	109	43.7
Four weeks after a birth	43	17.3
Six weeks after a birth	75	30.2
I don't know	10	4.03
Other	11	4.4
Sessions needed for full vaccination		
Two	8	3.2
Three	22	8.9
Four	146	58.9
Five	62	25
I don't know	10	4.03

3.4 MATERNAL HEALTH CARE UTILIZATION

To assess maternal health care service utilization their follow up on ANC, Place of delivery and contraceptive utilization were taken as indicators. Among mothers 232 (93.5%) of them have attended antenatal care at least once and 156(62.90%) of them attended four and more times. Delivery Practice of mother during the last delivery prior to the survey showed 239(96.4)% of them had facility delivery of the total mothers, 188 (75.8%) used any type of modern contraceptive method. Most of the mothers and immediate caretakers (99.2%) took their children to health institution to seek help for illnesses (Table 5).

Table 5: - Maternal health care utilization

Attended Antenatal care	Frequency	Percent
Yes	232	93.5
No	16	6.5
Frequency of ANC		
One	10	4.3
two	19	8.2
three	47	20.2
four and above	156	67
Place of delivery		
Health facility delivery	239	96.4
Home delivery	9	3.6
Place to seek help for child illnesses		
Health institution	246	99.2
Other places	2	0.8
Utilization of contraceptive ever		
Yes	188	75.8
No	60	24.2

3.5 Access and quality of immunization service

The survey showed that 245(98.8) lived nearby health facility that provide vaccination service. The walking time to the nearest health facility was less than 15 minutes for 197(79.4%) care takers and the same number of respondents replied they get vaccination service from hospital Majority of the care takers by any transport to nearby health facility to get vaccination service while 42.3 percent of them use walk means (Table 6).

Table 6: - Immunization Service Access

Nearby health facility with vaccination	Frequency	Percent
Yes	245	98.8
No	3	1.2
Type of health Facility		
health center	46	18.5
Hospital	197	79.4
Health post	2	0.8
Transportation to Health Facility		
Walk	105	42.3
By any transport	143	57.7
How long does it take to Health Facility		
Less than 15 minutes	197	79.4
15-30 minutes	48	19.4
30-1hour minute	3	1.2

To assess quality of immunization service provided in health facilities in town few questions where included in the questionnaire mainly related with clients of immunization service. Among clients 228(91.9%) of them get advice from health worker who provide them vaccination service and 53.5% of them were advised related with about the completion of child vaccination. respondents were asked about waiting line during service and 49(19.8%) of them answered there was long waiting line during their last visit for vaccination service and only 226(91.1%) of them rated the satisfaction they get from vaccination service good. among the mothers who take their children for vaccination 5(2.1%) of them claim they were refused of the service due to not vaccination day (40%) and the child was sick(60%)(Table 7).

Table 7: - Vaccination service quality in Health facilities visited by caregivers

Health worker advice	Frequency	Percent
Yes	228	91.9
No	20	8.1
Area of advice		
Advice related with completion	122	53.5
Advice not related with completion	108	46.5
Long waiting line		
Yes	49	19.8
No	199	80.2
Satisfaction of Vaccination service		
Good	226	91.1
Medium	22	8.9
Bad	0	0
Refused Vaccination service		
Yes	5	2.1
No	243	97.9
Reasons for refusal		
Child was sick	3	60
Not vaccination day	2	40

3.6 Vaccination coverage

Vaccination coverage was defined as reported vaccination, evidenced by card, by history from mother/caregiver. Information on child vaccination was obtained from 248 children aged less than12 months, of which 76.6% had vaccination cards and the rest 23.3% have no vaccination card. Among them 72%of children are less than 9 month and the rest 28% are 9 month up to 12 months. From 68 (28%) of children 58(85.2%) completed the recommended vaccination by history and vaccination card. Whereas 10(14.7%), of the children were not fully immunized.

The vaccination coverage varied among series of vaccines. The BCG vaccination coverage was 87% and measles vaccination rate was 79% by history and vaccination card. Similarly PCV DPT-HepB-Hib3 and polio three vaccination coverage was 81% and 82% respectively by history and vaccination card. The DPT¬HepB-Hib1-measles measles dropout rate for children was 18 and DPT-HepB-Hib1- DPT¬HepB-Hib3 dropout was 15. Coverage by card only was also calculated for those children who had vaccination.. From these children, 88% took BCG vaccines which is followed by measles (76%). DPT-HepB¬Hib1 was also taken by 95% children,

82% took pentavalent3 vaccine.OPV3 vaccine was taken by 79% of children and DPT-HepB-Hib1- DPT-HepB-Hib3 dropout by card only was 13 %

3.7 Reasons for Defaulting from Vaccination service

To determine reasons why care givers failed to complete their child vaccination, the survey asked the specific reason. The findings of the survey showed that 50 % of caregivers reported that the reason for not completing child vaccination was vaccination time is in convient, 20% lack of awareness on the importance of vaccination and the rest 30% of them give different other reasons (table 8).

Table 8:- Reasons given by caregivers for not completing children Vaccination

Reasons for incompletion of vaccination	Frequency	Percent
Vaccination time is inconvenient	5	50
Lack of awareness on the importance of Vaccination	2	20
Fear of side effects	3	30
Total	10	100

3.8 Factors associated with incompletion of vaccination

The study assessed factors affecting completion of child vaccination including socio demographic characteristics of mothers, child characteristics, maternal health care utilization, vaccination service availability and quality, and knowledge and attitude of caregivers on vaccination and vaccine preventable. Vaccination status of children is measured according to national guideline for routine EPI schedule.

3.8.1 Socio-demographic characteristics of care takers

For further analysis, the dependent variable vaccination status was dichotomized into “incomplete” and “Complete” vaccination. Caretaker’s educational status showed a significant association on bivariate analysis. From children of whom their caregivers attend higher education only 1.4% of them didn’t complete vaccination which is 5.8% less likely to incomplete vaccination than those children who have caregivers with no education. From 51.4 % children of caregivers who attended primary school, 47.1% were fully vaccinated, whereas 4.3% were not fully vaccinated. This is 5.8% less likely to incomplete vaccination than caregiver children with no education.

Regarding Caregivers occupation, from children of government employee 1.5 % of their children were not fully vaccinated which is 5.8% less likely to incomplete vaccination than those children of housewife caregivers. But being children from daily laborer, farmer and merchant caregiver have no significant difference with those of housewife caregiver during biviriate analysis. the study also showed child from orthodox caregiver is 5.8% less likely to incomplete vaccination than protestant caregivers .But, marital status and age of primary caregiver did not show any significant association with the whether the child is vaccinated or not on bivariate analyses.

When we compare vaccination status children from family which has less than 500 birr monthly income and more than 500 birr monthly income those from former caregiver are 1.8% times more likely to incomplete vaccination than the later one(Table 9).

Table 9: - Vaccination status of children age between 9 -12 months by socio demographic characteristics of caregivers

Age	Vaccination status		Odd Ratio
	Incomplete	Complete	Crude
<20 years	1(1.5%)	3(4.4%)	0.73(0.08,6.3)
20-34	6(8.8%)	41(60.2%)	1
~35	3(4.4%)	14(20.5%)	1.26(0.7, 2)
Educational level			
Less than primary	4(5.8%)	6(8.8%)	1
Primary	3(4.4%)	32(47.1%)	0.49*(0.29,0. 83)
Secondary	2(2.9%)	8(11.7%)	0.24*(0.1 1,0.5)
Higher	1(1.4%)	12(17.6%)	0.1 9*(0.08,0.4)
Marital status			
Married	7(10.2%)	51(75%)	1
Single	1(1.5%)	2(2.9%)	0.45(0.13,1.5)
Widowed	1(1.5%)	3(4.4%)	1.09(0.3,3)
Divorced	1(1.5 %)	2(2.9)%	0.66(0.2,1.7)
Occupation			
House wife	4(5.8%)	38(55.5%)	1
Farmer	2(2.9%)	4(5.8%)	1.2(0.5,2.6)
Government employee	1(1.5%)	6(8.8%)	0.35*(0. 17,0.7)
Merchant	1(1.5%)	5(7.3%)	1.58(0.7,3.4)
Daily laborer	2(2.9%)	5(7.3%)	0.9(0.37,2.2)
Religion			
Orthodox	4(5.8%)	43(63.2%)	0.34*(0. 1,0.6)
Muslim	1(1.5%)	1(1.5%)	0.46(0.18, 1. 1)
Protestant	3(4.4%)	11(16.2%)	1
Catholic	1(1.5%)	1(1.5%)	1.62(0.6,4.2)
Other Christians	1(1.5%)	2(2.9%)	1.39(0.5,3.5)
Monthly income			
Income less than 500 birr	7(10.2%)	25(36.7%)	1.94*(1. 1,3. 1)
Income more than 500 birr	3(4.4%)	33(48.5%)	1

* Significant at 95% CI,NI-not include

3.8.2 Knowledge and Attitude on Vaccination and Vaccine preventable diseases

Knowledge and attitude of mothers about vaccination and vaccine preventable disease its association with completion of vaccination was also assessed in this study. Bivariate analysis showed hearing information about vaccination relate with child incompletion of vaccination. children of mothers who did heard about vaccination were 3.6% times more likely to incomplete child vaccination than those didn't heard. Mothers that think the benefit of vaccination is for child health were 2.3% time more likely to incomplete their children vaccination than those mentioned the benefit is to prevent disease.

Regarding the number of vaccine preventable disease, from 11.8% children of those mothers who know 3 and 4 vaccine preventable diseases 2.9% of their children were not fully vaccinated which is 47% less likely to incomplete vaccination than those who know 2 and less vaccine preventable diseases(Table 10).

Table 10: - Vaccination status of children aged between 9-12 months by the knowledge and attitude of caregivers, at Guder Hospital

	Vaccinationstats		Odd Ratio
Heard or seen about Vaccination	**Incomplete**	**Complete**	**Crude**
Yes	8(11.7%)	57(83.8%)	1.56
No	2(2.9%)	1(1.5%)	1(0.8,2.9)
Messages content			
Message related with completion	7(10.3%)	53(77.9%)	1
Message not related with completion	3(4.4%)	5(7.3%)	1.430(0.8,2.3)
Benefit of vaccinating child			
To prevent the disease	5(7.3%)	31(48.7%)	1
For specific disease	1(1.5%)	6(8.8%)	0.4*(0. 17,0.95)
For child health	3(4.4%)	20(29.4%)	2.3* (1.4,3.8)
I don't know	1(1.5%)	1(1.5%)	1.76(0.79,3.96)
Vaccine preventable diseases			
<=2	6(8.8%)	47(69.1%)	1
3 and 4	2(2.9%)	8(11.8%)	0.38* (0.17,0.83)
~ 5	1(1.5%)	1(1.5%)	0.26(0.06,1.1)
I don't know	1(1.5%)	2(2.9%)	1.76(0.6,3)
Vaccination may cause health problem			
Yes	2(2.9%)	1(1.5%)	1.5(0.8,2.8)
No	8(11.8%)	57(83.8%)	1

* Significant at95%CI ,NI not - included

3.8.3 Access and quality of vaccination service

The presence and accessibility of vaccination service was assessed by presence of nearby health

To reach vaccination facility on average walking time taken was association with child vaccination incompletion was checked but, none of these factors show any significant association by bivariate analyses (Table 12).

Table 11: - Vaccination status of children aged between 9-12 months by access to vaccination service

	Vaccination status		Odd Ratio
Health worker advice	**Incomplete**	**Complete**	**Crude**
Yes	4(5.8%)	54(79.4%)	1
No	6(8.8%)	4(5.8%)	2.82*(1.8, 4.4)
Area of advice			
advice not related with completion	7(10.3%)	6(8.8%)	1
advice related with completion	3(4.4%)	52(76.5%)	0.36*(0.16,0.81)
Long waiting line			
Yes	6(8.8%)	3(4.4%)	2.7*(1 .7,4.3)
No	4(5.8%)	55(80.9%)	1
satisfaction from vaccination service			
Good	3(4.4%)	53(77.9%)	1
Medium	7(10.3%)	6(8.8%)	1.2(0.7, 1.9)

* Significant at95%CI ,NI not - included

3.8.4 Maternal health care utilization

The associations of health care utilization by the mother with child vaccination completion were also seen using bivariate. Mothers who didn't attend ANC are 2.3 times more likely to incomplete vaccination than those who attend ANC and those who delivered their last child in home were 2.1 times more likely than those who delivered their babies in health facility. Other maternal health care utilization factors did not have significant association with incompletion of vaccination on bivariate analysis (Table 14).

Table 12: Vaccination status of children aged between 9-12 months by ANC follow, delivery and contraceptive utilization

Attended antenatal care	**Vaccination status**		**Odd ratio**
Yes	**Incomplete**	**Complete**	**Crude**
	3(4.4%)	56(82.3%)	1
No	7(10.3%)	2(2.9%)	5.10*(3,8.52)
Frequency of ANC	8(11.7%)		
<=3		14(20.6%)	1.47(0.28,2.6)
>=4	2(2.9%)	44(64.7%)	1
Delivery place			
Health facility delivery	3(4.4%)	57(83.8%)	1
Home delivery	7(10.3%)	1(1.5%)	2.1*(3.78,9.68)
Place to seek help for child illnesses	9(13.2%)	57(83.8%)	0.25 5
Health institution			
Other place	1(1.5%)	1(1.5%)	1.5(0.9,2.5)
Utilization of any modern method of contraceptive ever	4(5.8%)	41(60.2%)	1
Yes			
No	6(8.8%)	17(25%)	1.32(0.74,2.35)

4. Discussion

This study was conducted at Guder Hospital to assess the incomplete vaccination and associated factors among children aged less than 12 months. Guder Hospital which is at distance of 125 kilometers West of Addis Ababa..

The total of children included in this study aged between 9-12 months were 27.5%, among them 14.7% didn't complete their vaccination according to schedule for routine vaccination.

From the total interviewed care givers, 190(76.6%) them able to show the vaccination card. vaccination incompletion rate in this study was lower as compared to Ethiopia EPI cluster survey result of 2012 which was 50.1% and this can be explained by high incompletion rate of vaccination in different parts of the country that are included in the cluster survey that lowered the nation figure.

The PCV, DPT-HepB-Hib1 coverage, seen as an indicator of access to vaccination services while the DPT-HepB-Hib3 coverage, seen as an indicator of utilization. The DPT-HepB-Hib1 and DPT-HepB-Hib3 coverage were 81% and 82% consecutively by maternal history and vaccination card. Coverage of other vaccines such as PCV and OPV given at the same time with DPT-HepB-Hib was the same with slight difference. The measles coverage was 79% which was lower than other vaccines.

Dropout rate for DPT-HepB-Hib1- DPT-HepB-Hib3 on this study was 13% only by card. Measles vaccine was the most frequently defaulted routine vaccine in this study. Other studies including EPI cluster survey of 2012 have reported a similar finding. Knowledge of respondents assessed about age child should begin vaccination and 61% of them respond correct answer. Above the half of respondents 146 (58.9%) knew that the vaccination program should be finished at the age of nine months.

In this study the dependent variable vaccination status was dichotomized into "incomplete" and "Complete" vaccination. An odd of having incomplete vaccination was compared among potential factors. bivariate and multivariate analysis was computed to identify associated factors with vaccination incompletion.

Regarding socio demographic characteristics of the respondents, the study showed religions of caregivers have significant association with child vaccination incompletion which is consistence with others studies finding on the area (6, 7). Cross-sectional study done Mozambique revealed factors such as mothers' age and marital status showed no significant differences with respect to children with complete and incomplete vaccination status which was the same finding on this study. In contrary to this study finding study done by analyzing Ethiopia DHS data of 2005 revealed no association between care takers educational level and vaccination incompletion. Another study from Malaysia showed maternal age is predictor of vaccination incompletion which is not consistence with this study finding.

This study showed no significant difference between both sexes on completion of Vaccination similar to Nigeria study. In some societies with cultural discrimination against female children, boys have a greater chance to be vaccinated (8).

Among maternal health care utilization factors ANC and maternal delivery place showed statistically significant association on multivariate analysis. Mothers who didn't attend ANC are more likely to incomplete vaccination than those who attend ANC. home delivered children have a 2 times higher risk of not completing their vaccination. This may be related with increased awareness and health seeking behavior of those mothers

with these profiles that also contribute for their vaccination service utilization. This is consistence with study done in Mozambique. The study done in three east African countries including Ethiopia also showed similar finding on association of these factors with children vaccination incompletion(9). In contrary to our finding Study done in Malaysia found no association between child vaccination incompletion and place of delivery which was different from this study finding. As many studies had shown, our study identified that maternal knowledge regarding vaccination was important to vaccination status of the children (1,). Knowledge regarding the benefit of vaccinating a child and the age to complete vaccination were significantly associated with child vaccination completion which is consistence with South Ethiopia study. The Health Belief Model is a theory that attempts to explain health-seeking behavior by examining how people perceive disease severity, their likelihood of contracting that disease, the benefits of taking preventive action, and the costs of taking preventive. This theoretical framework is useful in helping to explain these findings. In contrary to this study in Mozambique revealed understanding the important of vaccination has no significant association with child vaccination completion.

Regarding access and quality of vaccination service, Accessibility as a function of distance and need for using transport were not significantly associated with vaccination incompletion similar to study done in Nigeria (10). Ethiopia 2006 nation EPI survey had uncovered those with longer than one hour walk from an vaccination site had lower vaccination rates (11).

Various reasons were adduced by the mothers for incomplete vaccination of their children. These include Vaccination time is inconvenient (50%)

Lack of awareness on the importance of vaccination (20%), and other miscellaneous reasons (30%).Most of reasons given by the care givers has similarity with the reasons provided by other caregivers on other similar studies (2,12)

5. Conclusion and Recommendation

- There was low Vaccination coverage among children aged less than 12 months at Guder Hospital Compared to national and global target.
- The study showed factors that are significantly associated with vaccination incompletion among children age between 9-12 months were knowledge about benefit of vaccinating child and age to complete vaccination, Area of advice, ANC follow up and institutional delivery.
- Factors related with Vaccination Service access and quality such as time it take to reach nearby health facility, maternal perception of health institution service and waiting line during vaccination sessions showed no significant association
- Reasons for incompletion are mostly because of lack of information about importance of vaccination, fear of side effect and vaccination time is inconvenient.

6. Recommendation

Based on the research findings, the following recommendations can be made.

- Guder town health office and health facilities in town should work to Increase community awareness through Intensive health education activities about the benefit and need to complete the entire schedule of vaccination.
- The health office and health facilities in town should work to increase knowledge and attitude to the caregivers for about importance of vaccination and its completion.
- Ensure all health facilities providing vaccination in town educate mothers about the importance of childhood vaccination completion.
- Further analysis on the health seeking behavior of the parents and caregivers in this area can illuminate best methods of vaccination promotion.

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8. Competing Interest

I have declared that there is no any relevant competing interest to disclose in this research.

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