

# Knowledge, Attitude and Practice of Mothers Towards Immunization of Infants in Health Centres at Addis Ababa, Ethiopia

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**Abstract:** Background: In Ethiopia, a considerable proportion of childhood morbidity and mortality is due to vaccine preventable diseases. According to EDHS 2011, only 24% of children were fully vaccinated nationally. Mothers' knowledge, attitude and practice are key tools to decrease dropout rates and to prevent or control infectious diseases. Thus, this study was aimed to assess Knowledge, Attitude and Practice of mothers regarding infant immunization and their associated factors in immunization clinic in health centers at Addis Ababa, Ethiopia. Methods: Institutional based cross-sectional study was conducted from March 1<sup>st</sup> to April 1<sup>st</sup>, 2013. Multi stage sampling technique was used for participant selection. Participants were interviewed with structured questionnaire for different variables. Descriptive statistics and binary logistic regression analyses were performed during data analysis. Results: Only 55.0%, 53.8%, and 84% of respondents had good knowledge, positive attitude, and good practice towards immunization of infants, respectively. Maternal education (Adjusted Odds Ratio [AOR]= 1.781, 95% CI: 1.035, 3.065), respondents who had infants aged from 3-9 months (AOR=1.947, 95% CI:1.051, 3.607), 9-12 months (AOR =2.305, 95% CI: 1.216, 4.371) and mothers who gave births greater or equal to two times (AOR = 1.560, 95% CI: 1.087, 2.238) were significantly associated with knowledge of mothers regarding immunization of infants. Mothers' education (AOR = 2.160, 95% CI: 1.208, 3.864) and mothers who had infants' aged from 2-3 months (AOR = 2.014, 95% CI: 1.044, 3.883) were significantly association with favorable attitude towards immunization of infants. Good infant immunization practice was significantly associated with mothers who heard information about vaccination (AOR=1.784, 95% CI: 1.002, 3.176), mothers who know correctly the time when infants should begin immunization (AOR=2.240, 95% CI: 1.198, 4.192), know the number of sessions needed (AOR=1.772, 95% CI: 1.076, 2.918), know the time when infants should complete immunization (AOR=1.800, 95% CI: 1.123, 2.885) and place of delivery (AOR=23.829, 95% CI: 10.025, 56.639). Conclusions: Knowledge and attitude of mothers' about infant vaccination was not adequate. Despite inadequate knowledge and attitude of mothers towards infant immunization, 84.0% of mothers found in Addis Ababa had good practice of infants' immunization. Health education to promote knowledge and attitude based immunization practice is recommended.

**Keywords:** Immunization, Infant, Knowledge, Attitude, Practice, Immunization Clinic, Health Centre

## 1. Background

World Health Organization (WHO) initiated the Expanded Program on Immunization (EPI) in May1974 with the objective to vaccinate children throughout the world [1]. A major goal for the World Health Organization is the global

control of certain infectious diseases [2]. The main strategies for the prevention of infection are to eliminate or diminish the amount of infecting microorganism from circulation, to enhance the host immune response and to treat the infected host. These strategies are achieved by two of immunization types (active and passive) [2].

The millennium development project 2009 emphasizes

that, reducing child morbidity in a nation ensures a healthy and robust generation contributing to society. According to this report, Sub-Saharan Africa is the lowest performing region in terms of MDG4-reducing child mortality and Ethiopia is one of the lowest performers in all MDGs [3]. According to the Ethiopia Ministry of health 2011 annual health and health related indicator report, national infant and under five mortality rates were 59 and 88/1000 live births, respectively [4]. In this report, Addis Ababa City administration infant and under five mortality rates were 39 and 50/1000 live births respectively. Moreover, reports indicated that the major responsible causes for childhood deaths in Ethiopia are diarrheal diseases, VPDs and malnutrition [5]. Measles attributed to 4% of child and infant deaths in 2004 which was highest of the world [6].

In Ethiopia, Expanded Program on Immunization was started in 1980 with the intention of increasing the immunization coverage by 10% annually and to reach 100%

coverage in 1990. But the objective set in 1980 was not met because of factors such as poor health infrastructure, low number of trained man power, high turnover of staff, low awareness in parents regarding infant immunization, and lack of donor funding [5].

According to the global immunization division CDC report, the global parental Attitude and Knowledge regarding immunization services was low and parents have negative beliefs about measles and beliefs about vaccination programs [7]. Thus, Parental attitudes and beliefs about vaccines are an important factor in predicting child's immunization status [8]. Keeping the point of view, this study was conducted to assess mothers' knowledge, attitude and practice regarding infants' immunization and their associated factors in Addis Ababa.

## 2. Methods

### 2.1. Study Area

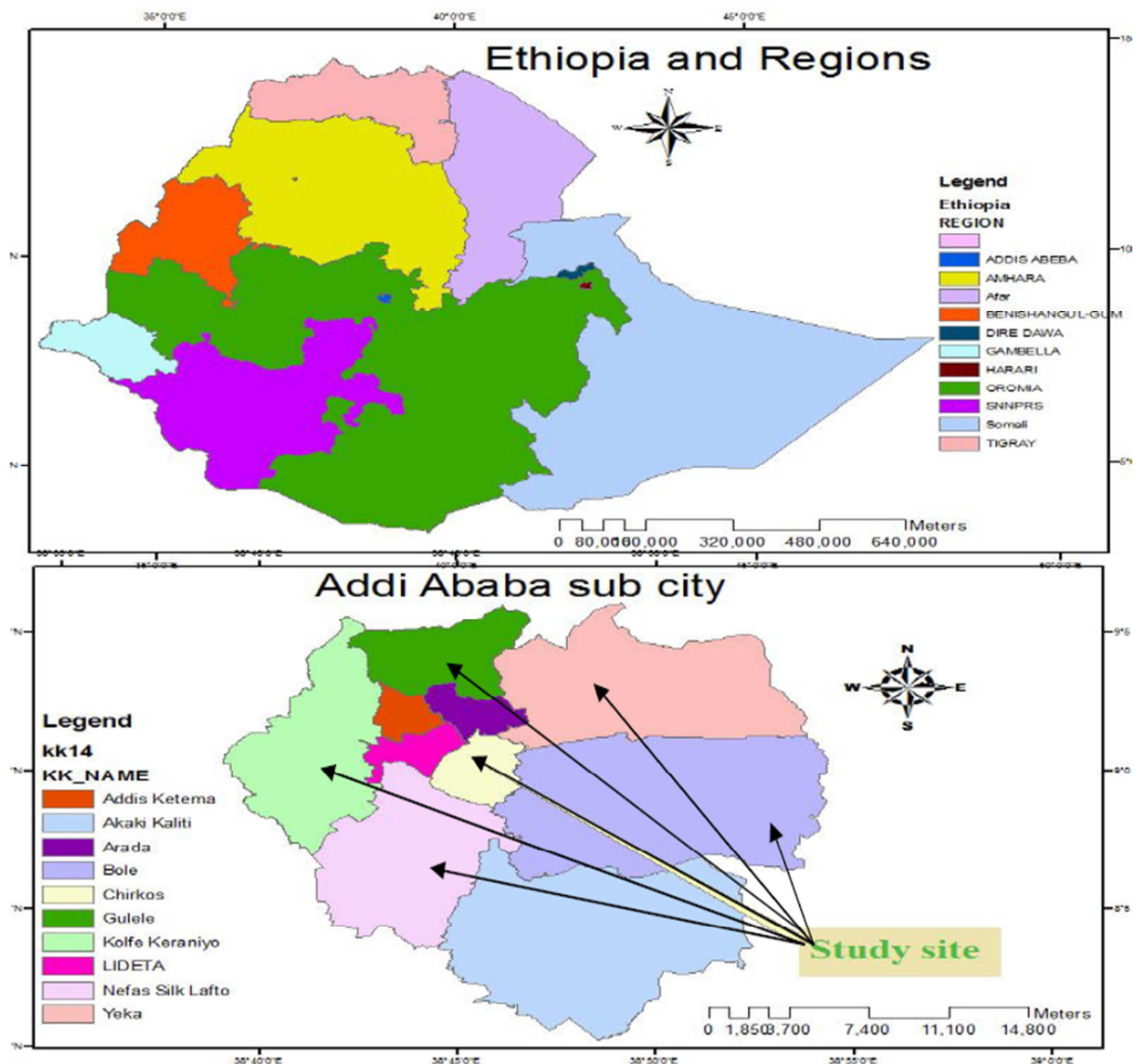


Figure 1. Geographical location of the study site, Addis Ababa.

The study was conducted in Addis Ababa, the capital city of Ethiopia. It lies at an altitude of 7,546 feet (2,300 meters) above sea level. According to the 2011 federal democratic republic of Ethiopia ministry of health annual health and health related report, during 2013 total population and number of infants was projected to be 3,101,896 and 68,242, respectively. This number (68,242) is approximately represents the total population of mothers with infants in 2013 in the city. In this report, the infant mortality rate of Addis Ababa city administration was 39 per 1000 live births [10]. According to EDHS 2011 report, in Addis Ababa 79% of infants were fully vaccinated. Taking this 79% in to account, still 14,331(21%) infants found in the capital city of Ethiopia were not fully vaccinated [4]. Addis Ababa has 10 sub cities (Fig. 1). In these sub cities, there are 43 hospitals (11 governmental and 32 privates) and 53 health centers which give vaccination services.

## 2.2. Study Design and Sample Size Determination

Cross-sectional study was conducted from March 1<sup>st</sup> to April 1<sup>st</sup>, 2013 among mothers with infants attending Addis Ababa city administration health centers. Sample size was

determined using single population proportion formula  $n = \frac{Z^2 p (1-p)}{d^2}$ , with the following assumptions: prevalence (p) of 50% in order to get large sample size [11], 95% confidence level, 5% margin of error, 10% for anticipated non-response rate, and 1.5 design effect. Accordingly, the minimum sample size (n) was found to be 634. The total sample size was allocated proportionally to the selected health centers. Multistage sampling technique was used for participant selection (Fig. 2).

## 2.3. Data Collection

The data was collected by 18 well trained nurses through face-to-face interview using interviewer-administered questionnaire. Close-ended with some open-ended questions were used to collect information on socio- demographic variables and KAP of mothers regarding infant immunization. The questionnaire was prepared in English version and then translated in to Amharic version for ease of understanding by the data collectors and respondents. Finally, it was translated back again in English version to make ease of data analysis.

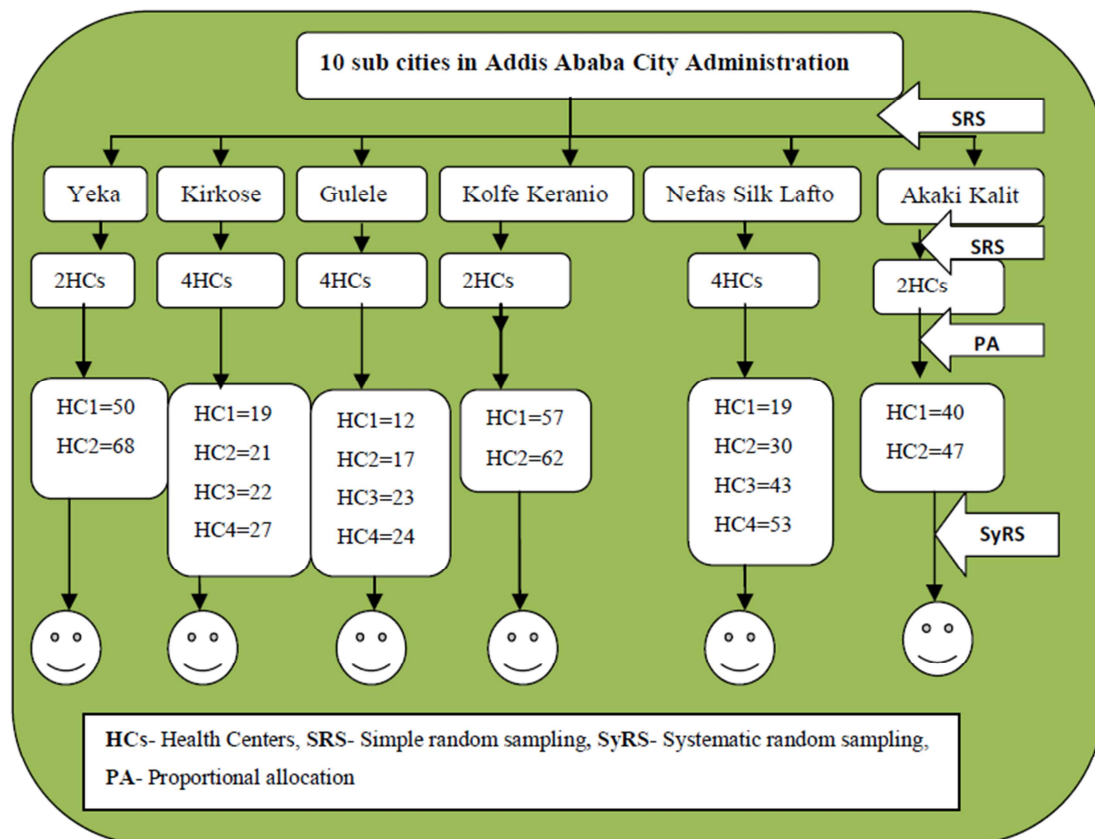


Figure 2. Schematic presentation of the sampling procedure.

## 2.4. Operational Definitions

### Good Knowledge:-

Those mothers who answer correctly the knowledge questions and if they score the median value and above

### Poor Knowledge:-

Those mothers who answer correctly the knowledge questions and if they score below the median value

### Positive Attitude:-

Those mothers who answer correctly the attitude questions

and if they score the median value and above

#### *Negative Attitude:-*

Those mothers who answer correctly the attitude questions and if they score below the median value

#### *Good Practice:-*

Those mothers who answer correctly the practice questions and if they score the median value and above

#### *Poor practice:-*

Those mothers who answer correctly the practice questions and if they score below the median value

#### *Fully vaccinated:-*

An infant who received all doses of the nine vaccines before he/she celebrates the first birth day (one BCG, three doses of Pentavalent, three doses of OPV, three doses of PCV and one dose measles vaccine)

#### *Partially vaccinated:-*

An infant who misses at least one doses of the nine vaccines.

### 2.5. Data Analysis

Data were coded, checked for completeness and cleaned for any inconsistencies. The data were then entered and analyzed using SPSS version 16.0. Descriptive statistics and Binary logistic regression were used and 5% level of precision was used for checking the association between dependent and independent variables. For ease of analysis, to measure knowledge and practice of mothers, eight questions were selected and scored one for each correctly answered and zero for the incorrectly one. The minimum, median and maximum values were calculated. On the other hand, the attitude statements constructed with five alternatives previously (agree, strongly agree, don't know, disagree and strongly disagree) were modified in to three responses i.e. "strongly agree and agree" responses of mothers were taken as having "agree", "don't know" for those neither agree nor disagree responses taken as it is, and "disagree and strongly disagree" responses were coded as "disagree" about vaccination of infants and vaccine preventable diseases [9, 10]. Results of the total attitude questions were summed; the minimum, maximum and median values were calculated. Finally, results are presented using tables and graphs.

### 2.6. Ethical Clearance

Approval was secured from the Ethical Clearance Committee of Addis Ababa University. Then, official support letter from the university had been written to Addis Ababa city administration health bureau. Data collection was under taken after permission was obtained from Addis Ababa city administration health Bureau and from the selected health centers. Verbal informed consent was asked and taken from every study participant before asking any information or interview.

## 3. Results

### 3.1. Socio-demographic Characteristics

A total of 626 mothers with infants were participated in

this study. The mean age of respondents was  $26.6 \pm 4.8$  years. Five hundred seventy six (92%) of the study participants were married and only 5.6% were single. Regarding mothers occupation 60.1% were house wives. Socio-demographic characteristics of study participants are summarized on Table 1.

**Table 1.** Socio demographic characteristics of respondent mothers towards infant immunization in Addis Ababa, Ethiopia, 2013.

Characteristics	Frequency	Percent (%)
Age category of mothers (Years)		
15-19	25	4
20-34	557	89
35-49	44	7
Marital status		
Married	576	92
Single	35	5.6
Divorced	11	1.8
Widowed	4	0.6
Mothers' occupation		
House wife	376	60.1
Employee	73	11.7
Private	127	20.3
Other	50	8
Mothers' education		
illiterate	113	18
Grade 1-8 <sup>th</sup>	219	35
Grade 9-12 <sup>th</sup>	169	27
>12 <sup>th</sup>	125	20
Households monthly income ETB		
≤500 ETB	47	7.5
501-1000 ETB	132	21.1
>1000 ETB	246	39.3
Don't Know	201	32.1
Means of transportation		
On foot	275	43.9
Vehicle	351	56.1
Time taken to health centres (foot)		
<15 minutes	72	26.2
15-30 minutes	178	64.7
31-60 minutes	24	8.7
>60 minutes	1	0.4
Time taken to health centres (vehicle)		
<10 minutes	26	7.4
10-20 minutes	182	51.9
21-30 minutes	99	28.2
>30 minutes	44	12.5

Regarding their infants' 328 (52.4%) were females. Age of infants ranged from 1 day to 11 months. The mean age of infants was  $4.3 \pm 3.3$  months. About one third, 189 (30.2%) infants found in the age group of 3-9 (Fig. 3)

### 3.2. Knowledge of Respondents on Infant Vaccination and Vaccine Preventable Diseases

Of 626 respondents, 542(86.6%) have ever heard information about vaccination (Table 2). Only 23.8% of the respondents knew the objective of infant immunization (Fig. 4).

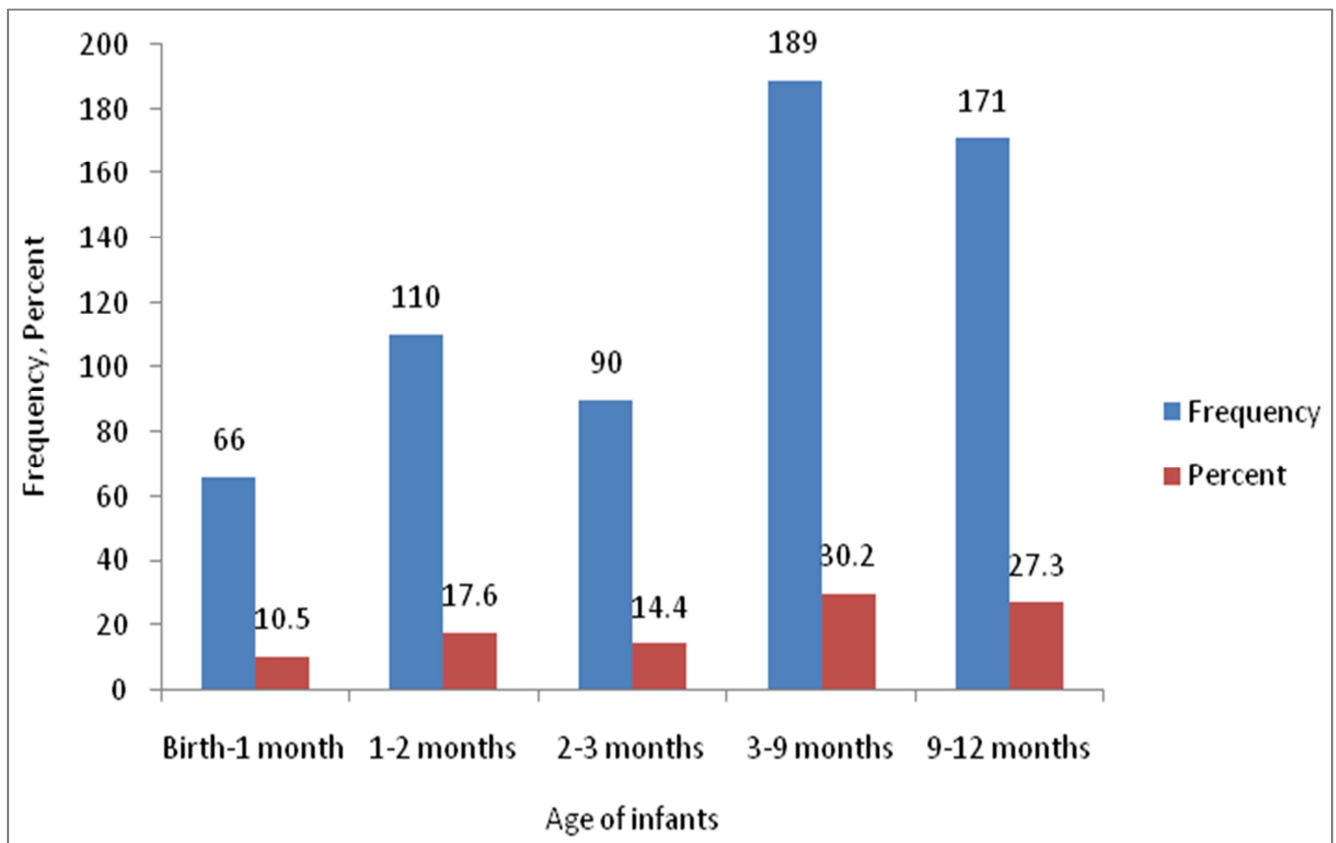


Figure 3. Age category of infants of respondent mothers in Addis Ababa, Ethiopia, 2013.

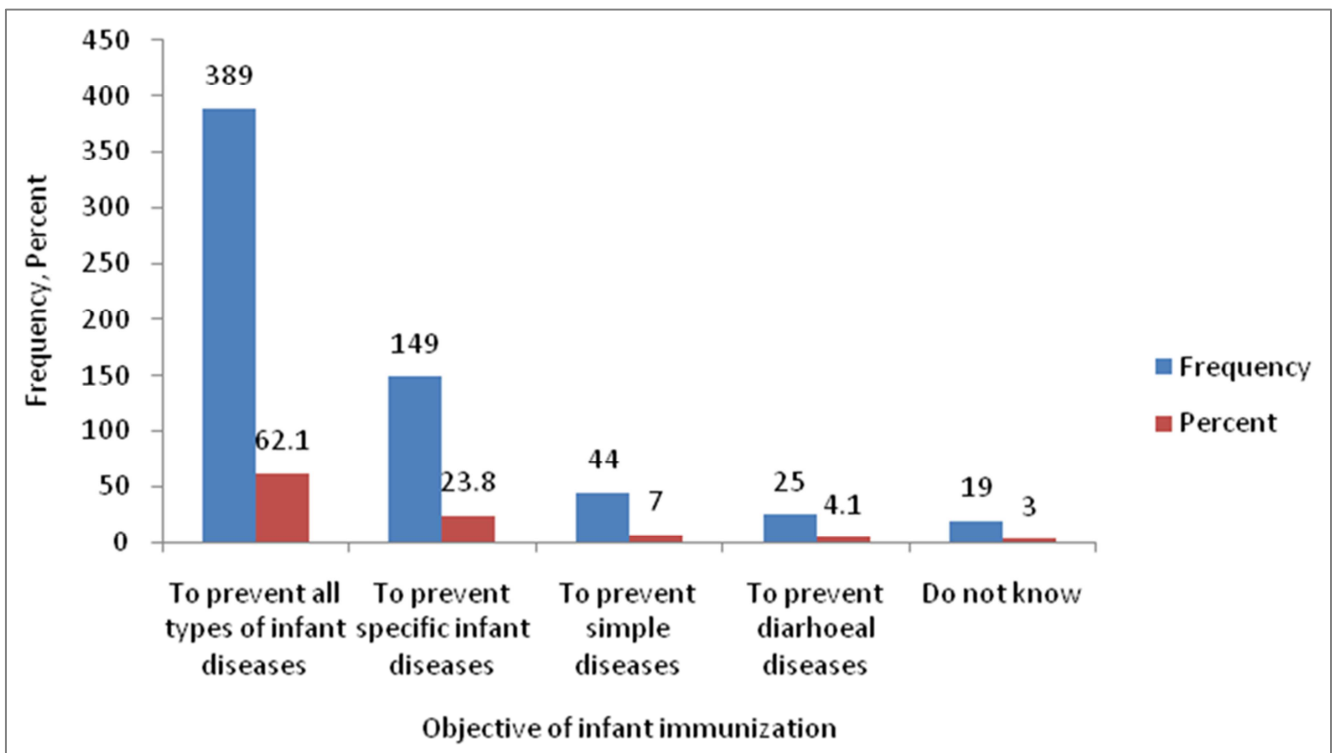


Figure 4. Objectives of infant vaccination mentioned among respondent mothers in Addis Ababa, Ethiopia, 2013.

**Table 2.** Knowledge of respondent mothers regarding infants' vaccination in Addis Ababa, Ethiopia, 2013.

Variables	Frequency	Percent (%)
Information heard about vaccination		
Yes	542	86.6
No	84	13.4
Health professionals	261	48.2
Television	14	2.6
Radio	17	3
Friends	8	1.5
School	11	2
Infants should start vaccination program		
Just after birth	562	89.8
After one month	44	7
Don't know	20	3.2
Sessions needed to complete vaccination		
≤3	36	5.8
4or5	276	44.1
≥6	77	12.3
Don't know	237	37.8
Age of infant to complete its vaccination program		
Before one year	328	52.4
Greater or equal to one year	207	33.1
Don't know	92	14.5
Number of VPD* mentioned by respondents		
Single diseases	147	23.5
More than one disease	351	56
Don't know	128	20.5
Name of VPD* mentioned by respondents		
Measles	82	13.1
Poliomellitus	27	4.3
ClostridiumTetani	25	4
Tuberculosis	7	1.1
Pneumonia	6	1
Multiple VPD* mentioned by respondents		
Two	117	18.7
Three	151	24.1
Four	48	7.7
Five	31	5
Six	4	0.6
Alternative mechanism to prevent infants from VPD		
Yes	20	3.2
No	606	96.8

VPD\*-Vaccine Preventable Disease

### 3.3. Attitude of Respondents Towards Immunization

The attitude of mothers towards infants' immunization is

summarized on table 3.

**Table 3.** Attitude of respondent mothers towards infants' immunization in Addis Ababa, Ethiopia, 2013.

Variables	Frequency	Percent (%)
Favourable opinion on immunization		
Agree	618	98.7
Disagree	5	0.8
Don't know	3	0.5
Infants took usually too many vaccines		
Agree	298	98.7
Disagree	260	41.5
Don't know	68	10.9
EPI program being free		
Agree	157	25.1
Disagree	462	73.8
Don't know	7	1.1
Immunization prevent diseases		
Agree	601	96
Disagree	21	3.4
Don't know	4	0.6
Immunization is important for infants		
Agree	617	98.6
Disagree	4	0.6
Don't know	5	0.8
Important only for non serious diseases		
Agree	458	73.2
Disagree	128	20.4
Don't know	40	6.4
Vaccination side effects are dangerous		
Agree	240	38.3
Disagree	329	52.6
Don't know	57	9.1
Vaccination will not work/have no use		
Agree	94	15
Disagree	525	83.9
Don't know	7(1.1)	1.1
Vaccination makes infants sick		
Agree	309	49.4
Disagree	304	48.5
Don't know	13	2.1
Vaccination makes infants for death		
Agree	47	7.5
Disagree	544	86.9
Don't know	35	5.6
Positive attitude towards professionals		
Agree	604	96.5
Disagree	19	3
Don't know	3	0.5
Vaccinators do experiment on infants		
Agree	181	28.9
Disagree	433	69.2
Don't know	12	1.9



### 3.4. Practice of Study Participants Regarding Immunization of Infants

Regarding infant immunization practice of mothers, 594 (94.9%) was always bringing their infants for immunization according to the schedule given by health professionals (Table 4).

**Table 4.** Practice of respondent mothers regarding immunization of infants in Addis Ababa Ethiopia, 2013

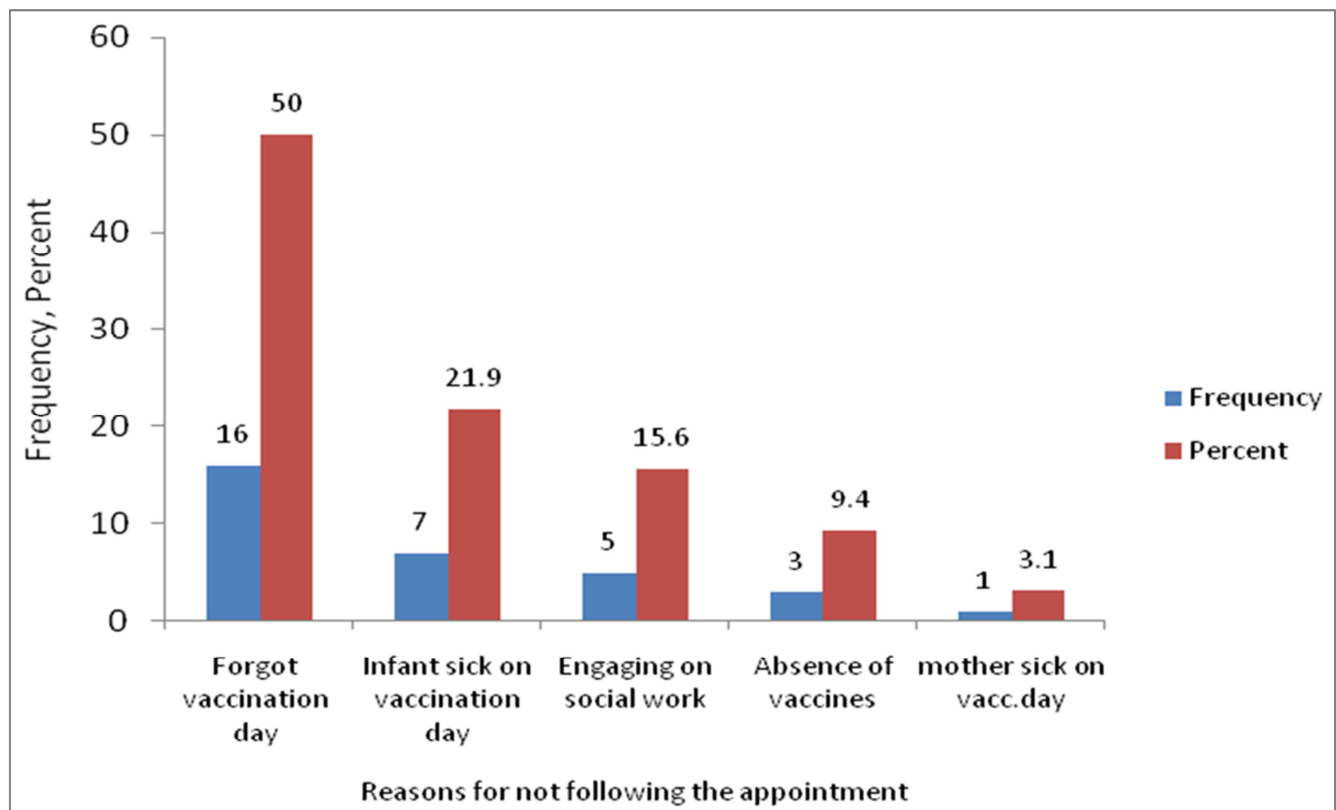
Variables	Frequency	Percent (%)
Adhering to immunization schedule		
Yes	594	94.9
No	32	5.1
Confirming BCG vaccination		
By looking the presence of BCG scar	371	59.3
Don't know	255	40.7
Availability of EPI card during immunization		
Yes	618	98.7
No	8	1.3
Infant immunization practice always by EPI card (n=597)		
Yes	582	97.5
No	15	2.5
Tetanus Toxoid vaccination during pregnancy		
Yes	591	94.4
No	35	5.6

Variables	Frequency	Percent (%)
BCG scar confirmed by data collectors on infants taking vaccines $\geq 2$ times (n=542)		
Yes	480	88.6
No	62	11.4
Immunization status of infants (age <9 months) (n=455)		
Took all vaccines appropriate for the age	407	89.5
Not took all vaccines appropriate for the age	48	10.5
Immunization status of infants (age $\geq 9$ months) (n=171)		
Fully immunized	160	93.6

From the total 626 respondents, only 32 (5.1%) missed their appointments for EPI for different reasons (Fig. 5)

### 3.5. Factors Affecting Knowledge of Mothers About Their Infants Immunization

Literate mothers who attend primary school, secondary school, and higher education were about two times (AOR=1.781, 95% CI: 1.035, 3.0651), three times (AOR=2.565, 95% CI: 1.735, 5.537), three times (AOR=2.606, 95% CI: 1.738, 6.517), respectively more likely to be knowledgeable than illiterate respondents. Factors affecting knowledge of mothers about their infants' immunization are summarized on Table 5.



**Figure 5.** Reasons of mothers for not adhering to the EPI schedule in Addis Ababa, Ethiopia, 2013.

### 3.6. Factors Affecting Attitude of Mothers About Infants' Immunization

Literate respondents who attend elementary school were about two times [AOR= 1.688, 95%CI: (1.053, 2.707)] where as mothers who achieved higher education were two times [AOR=2.160, 95%CI: (1.208, 3.864)] had positive attitude towards infant immunization than illiterate respondents. Mothers who had infants aged from 2-3 months were two times [AOR=2.014, 95%CI: (1.044, 3.883)] significantly associated with positive attitude about infant immunization program than mothers having infants in the age group less than one month. Factors affecting Attitude of mothers about

their infants' immunization are summarized on Table 6.

### 3.7. Factors Affecting Practices of Mothers Towards Their Infants Immunization

Mothers who had infants aged from 1-2 months were about four times [AOR=3.921, 95%CI: (1.543, 10.026)] and respondents who had infants aged from 2-3 and 9-12 months were four times [AOR=4.135, 95%CI: (1.726, 9.911)] and [AOR=4.159, 95%CI: (1.515, 11.418)], respectively more likely to practice infant immunization than mothers with their infants aged from 0-1 month old (Table 7).

**Table 5.** Factors associated with respondent mothers' Knowledge regarding immunization of infants in Addis Ababa, Ethiopia, 2013.

Variables	Knowledge No (%)		COR (95%CI)	AOR (95%CI)
	Poor	Good		
Mothers age				
15-19 yrs	15(60.0)	10(40.0)	1	1
20-34 yrs	254(45.6)	303(54.4)	1.789(.790,4.052)	0.922(.356,2.386)
35-49 yrs	13(20.5)	31(70.5)	3.577(1.278,10.013)*	1.580(.491,5.090)
Mothers education				
Illiterate	66(59.5)	45(40.5)	1	1
Grade1-8 <sup>th</sup>	100(45.5)	120(54.5)	1.760(1.108,2.795)*	1.781(1.035,3.065)*
Grade9-12 <sup>th</sup>	73(43.7)	94(56.3)	1.889(1.161,3.073)*	2.565(1.735,5.537)*
Higher education	43(33.6)	85(66.4)	2.899(1.711,4.913)*	2.606(1.738,6.517)*
Mothers' occupation				
House wife	183(48.7)	193(51.3)	1	1
Governmental Employee	20(27.4)	53(72.6)	2.513(1.446,4.367)*	4.861(1.390,3.688)*
Private	52(40.9)	75(57.1)	1.368(.910,2.055)	1.170(.728,1.880)
Other	27(54.0)	23(46.0)	.808(.447,1.460)	.913(.452,1.843)
Monthly family Income				
≤500 ETB	26(55.3)	21(44.7)	1	1
501-1000 ETB	59(44.7)	73(55.3)	1.532(.784,2.993)	1.397(.640,3.053)
>1000 ETB	90(36.6)	156(63.4)	2.146(1.142,4.033)*	1.324(.615,2.852)
Don't Know	107(53.2)	94(46.8)	1.088(.574,2.059)	.930(.445,1.945)
Husbands' education				
Illiterate	24(54.5)	20(45.5)	1	1
Grade1-8 <sup>th</sup>	82(49.4)	84(50.6)	1.229(.631,2.395)	.987(.482,2.023)
Grade9-12 <sup>th</sup>	86(44.6)	107(55.4)	1.493(.773,2.882)	1.085(.511,2.307)
Higher education	57(35.2)	105(64.8)	3.211(1.825,4.343)*	2.316(1.551,3.145)*
Don't know	8(72.7)	3(27.3)	.450(.05,1.925)	.385(.084,1.768)
Age of infants				
0-1 month	39(59.1)	27(40.9)	1	1
1-2 months	56(50.9)	54(49.1)	1.393(.752,2.581)	1.401(.710,2.762)
2-3 months	43(47.8)	47(52.2)	1.579(.831,2.999)	1.410(.695,2.862)
3-9 months	80(42.3)	109(57.7)	1.968(1.114,3.477)*	1.947(1.051,3.607)*
9-12 months	64(37.4)	107(62.6)	2.415(1.352,4.314)*	2.305(1.216,4.371)*
Birth Order				
First	153(49.4)	157(50.6)	1	1
Second and above	129(40.8)	187(49.7)	1.413(1.030,1.938)*	1.560(1.087,2.238)*



**Table 6.** Factors associated with respondent mothers' Attitude regarding immunization of infants in Addis Ababa, Ethiopia, 2013.

Variables	Attitude No (%)		COR (95%CI)	AOR (95%CI)
	Negative	Positive		
Mothers education				
Illiterate	63(56.8)	48(43.8)	1	1
Grade1-8 <sup>th</sup>	98(44.5)	122(55.5)	1.634(1.031,2.589)*	1.688(1.053,2.707)*
Grade 9-12 <sup>th</sup>	77(46.1)	90(53.9)	1.534(.946,2.487)	1.624(.975,2.704)
Higher education	51(39.8)	77(60.2)	1.982(1.183,3.320)*	2.160(1.208,3.864)*
Household income				
≤500 ETB	27(57.4)	20(42.6)	1	1
501-1000 ETB	53(40.2)	79(59.8)	2.012(1.025,3.952)*	1.743(.876,3.466)
>1000 ETB	113(45.9)	133(54.1)	1.589(.846,2.984)	1.177(.601,2.308)
Don't Know	96(44.8)	105(52.2)	1.477(.778,2.803)	1.354(.707,2.594)
Age of infants				
0-1 month	36(54.5)	30(45.5)	1	1
1-2 months	49(44.5)	61(55.5)	1.494(.809,2.758)	1.507(.808,2.811)
2-3 months	33(36.7)	57(63.3)	2.073(1.085,3.958)*	2.014(1.044,3.883)*
3-9 months	89(47.1)	100(52.9)	1.348(.768,2.366)	1.348(.762,2.383)
9-12 months	82(48.0)	89(52.0)	1.302(.737,2.303)	1.249(.700,2.228)
Place of delivery				
Home	33(75.0)	11(25.0)	1	1
Health institutions	67(11.5)	515(88.5)	23.060(11.132,47.770)*	23.829(10.025,56.639)*

**Table 7.** Factors associated with respondent mothers' Practice regarding immunization of infants in Addis Ababa, Ethiopia, 2013.

Variables	Practice No (%)		COR (95%CI)	AOR (95%CI)
	Negative	Positive		
Mothers education				
Illiterate	25(22.5)	86(77.5)	1	1
Grade1-8 <sup>th</sup>	40(18.2)	180(81.8)	1.308(.746,2.294)	.795(.365,1.731)
Grade 9-12 <sup>th</sup>	27(16.2)	140(83.8)	1.507(.822,2.765)	.559(.225,1.393)
Higher education	8(6.2)	120(93.8)	4.360(1.877,10.130)*	.517(.149,1.798)
Higher education	10(6.2)	152(93.8)	5.067(1.988,12.912)*	3.267(.859,12.426)
Don't know	4(36.4)	7(63.6)	.583(.143,2.378)	.625(.105,3.709)
Age of infants				
0-1 month	25(37.9)	41(62.1)	1	1
1-2 months	15(13.6)	95(86.4)	3.862(1.847,8.074)*	3.921(1.543,10.026)*
2-3 months	11(12.2)	79(87.8)	4.379(1.961,9.778)*	4.159(1.515,11.418)*
3-9 months	31(16.4)	158(83.6)	3.108(1.657,5.829)*	2.870(1.295,6.361)*
9-12 months	18(10.5)	153(89.5)	5.183(2.581,10.406)*	4.135(1.726,9.911)*
Place of delivery				
Home	33(75.0)	11(25.0)	1	1
Health institutions	67(11.5)	515(88.5)	23.060(11.132,47.770)*	23.829(10.025,56.639)*
Know correct sessions to complete vaccination				
Yes	28(10.1)	248(89.9)	2.294(1.435,3.666)*	1.772(1.076,2.918)*
No	72(20.6)	278(79.4)	1	1
Know correct age to complete immunization				
Yes	36(11.0)	292(89.0)	2.218(1.424,3.455)*	1.800(1.123,2.885)*
No	64(21.5)	234(78.5)	1	1
Know correct age of beginning immunization				
Yes	80(14.2)	482(85.8)	2.739(1.535,4.887)*	2.240(1.198,4.192)*
No	20(31.2)	44(68.8)	1	1
Heard about vaccines				
Yes	77(14.2)	465(85.8)	2.277(1.331,3.895)*	1.784(1.002,3.176)*
No	23(27.4)	61(72.6)	1	1

## 4. Discussion

The present study has tried to identify the Knowledge, Attitude and Practice of mothers about immunization of infants in Addis Ababa city administration, Ethiopia. In this study, 542(86.6%) of mothers have heard information about infant immunization, and 261(48.2%) of them have accesses of information from health professionals. Similarly, study

participants included in other study areas have got information primarily from health professionals [11, 12]. This is due to the fact that vaccination information are usually given for mothers by health professional just before infants/ children taking vaccines with each immunization sessions or at the time of antenatal checkups.

About 90% of respondents correctly mentioned the time when infants should begin vaccination programs (just after birth) and should follow immunization sessions as per of

the scheduled time (97.6%). This is similar to a study done in India; all mothers had the knowledge that immunization is important for the child and all of them knew that immunization is to be started at birth and should follow vaccination sessions [13]. In contrast, mothers studied in Ambo, Ethiopia, only 6.7% of respondents know the exact time when infants should begin immunization [11]. The discrepancy between the present study and Ambo district may be due to the difference in information, education and communication (IEC) or in terms of health service accessibility in comparison to this study since 73% of the respondents in Ambo were from rural areas. Similarly, 52.4% of mothers mentioned the time when infants should finish vaccination correctly (at nine months or before the first birth day). This is different from other study done in rural Nigeria, only (14.1%) of respondents mentioned vaccination against childhood killer diseases should be completed at the age of nine months [14]. The inconsistency might be due to the difference in study participants' educational status since about 70% of mothers included for study in rural Nigeria were illiterates, which is quite higher than the illiteracy status of the present study (18%). Despite the fact that greater than half of respondents in this study have mentioned correctly the time when infants should begin and finish vaccination, only 23.8% of mothers correctly knew the objective of immunization (i.e. 'to prevent specific and killer diseases'). This is consistent with the response of mothers in rural Nigeria which indicated that only 20.1% [14] and contradicts with another finding in Enugu, Nigeria, 81.2% of respondents mentioned correctly the objective of immunization [15]. The inconsistency between the present participants and the later Nigerian participants may be due to educational status differences in respondents since only 47% of mothers in the present study and 90% of mothers in Nigeria attended secondary school up to higher education.

Over all, in this study 344(55.0%) of mothers had good knowledge and this is lower than the study finding from Nnamdi Azikiwe University hospital, Nigeria which revealed that, 215(70.0%) of mothers had good knowledge [16]. The inconsistency may be due to sample size difference or educational back grounds of the participants. On the other hand, a study conducted in Connecticut (north eastern United States) showed that both fresh and experienced mothers scored poor knowledge about vaccination [10]. The possible explanation about poor knowledge of mothers in developing and developed countries is different. For example, the major health problem in developed countries is not communicable disease and mothers may not focus on vaccine preventable diseases and may not develop good knowledge on communicable diseases, while poor knowledge in developing countries may be due to social, economical or educational reason.

As it is presented on table, 98.7% and 96.5% of respondents in this study had favorable attitude towards immunization of infants, and health personnel, respectively. This is similar to the study done in Kinshasa, Congo; showed

that 93.8% of respondents had positive attitude about children immunization and 93.5% of them had friendly seen the health personnel [12]. Despite the fact that respondents had positive attitude towards the EPI program and vaccine providers in general, a large proportion 47.6% of mothers believed that infants took too many vaccines and 73.2% of mothers believed that vaccines are given for infants to prevent non serious (simple) diseases. This type of perception is similarly described by other scholars from Texas health science center at Fort Worth (America) with three consistent belief/attitudes of mothers such as vaccines could harm child, children receive too many vaccinations and vaccinations are given to prevent diseases that are not serious [17]. Basically this similarity should not be seen from the same angle of reference. For example, mothers found in developed countries may develop this type of belief due to they pay attention more about vaccines safety while mothers found in developing countries like Ethiopia may be due to lack of knowledge or social influences. Surprisingly, 49.4% of respondents worried that vaccination may make infants sick and 7.5% perceived that vaccination can cause death in infants. Similarly, 15.0% and 16.1% of respondents believed that vaccination had no any use (not work) and decreases infants' natural immunity respectively. This finding is in line with other cross-sectional study done in Connecticut (north eastern United States) [10].

As far as their practice is concerned on infant immunization, about 98.7% of mothers had and showed EPI card on the spot of immunization. Contradictory, only 29% of mothers in Ethiopian demography and health survey (EDHS) report of 2011 [18] and 41.8% of respondents in Ambo district [11] had showed EPI cards for their children, respectively. Moreover, immunization practice in the present study (94.9%) is also a beat greater than EDHS 2011 and Ethiopia ministry of health 2011 annual health and health related indicator reports which represents 79% and 84.4% of infants were fully vaccinated, respectively [18, 4]. The variation is due to a study design difference (institution in this study and national based survey in comparison studies). Nearly 95% of respondents in this study always bring their infants for immunization according to the scheduled time. From the total 455 infants aged less than nine months, 89.5% of them were received vaccines appropriate to their age where as from 171 infants aged nine months and above, 93.2% of infants were fully vaccinated. This is consistent with a cross sectional study done in India, that 98% and 93% of children completely immunized and had been immunized on the schedule, time, respectively [13]. In the contrary, inconsistencies had been seen with other findings. For example, in Congo, mothers' immunization practice based on immunization card showed about 37% [12] and in Ambo, Ethiopia only 35.6% of infants completed all the recommended vaccines [11]. The discrepancy may be due to social or cultural reasons, and study setting differences.

The present study also tried to identify predictors of maternal knowledge, attitude and practice towards infant immunizations using multivariate analysis. Accordingly,

literate mothers attending grade 1-8<sup>th</sup> were about two times (AOR= 1.781, 95% CI: 1.035, 3.065) more likely to have good knowledge of immunization than illiterate mothers. Similarly, other study findings conducted in United Arab Emirates and Enugu (Nigeria) mothers attending secondary or higher educational status was significantly associated with good knowledge and acceptance of immunization [15, 9]. In addition to literacy status, mothers who had infants aged from 3-9 months and 9-12 months old were about two times more likely to have good knowledge of immunization than mothers who had infants below one month. This might be due to the fact that mothers could get information from health professionals and add knowledge of immunization with repeated vaccination visits than mothers who couldn't visit immunization clinics repeatedly. Mothers who gave births two times and above were also about two times more likely to have good knowledge of infant immunization than respondents who delivered only once. Similarly, a study conducted in Kinshasa (Democratic Republic of Congo), showed that mother's experience of an EPI-targeted disease emerged as significant predictors of knowledge of immunization [12]. Inconsistencies regarding birth order of infants were also seen between this study and other study findings which were conducted in Arab Emirates and Ambo district, Ethiopia, [19, 11]. The inconsistency might be due to differences in study design, sample size or study participants' educational status.

In respect to respondents' attitude on immunization, literate respondents who attend elementary school or higher education were about two times more likely to have positive attitude towards infant immunization than illiterate mothers. This is consistent with results of different articles reviewed by global immunization division centers for disease control and prevention from 1999-2009 [7]. The possible explanation might be, literate mothers may have more opportunities to understand about vaccination and its importance than illiterate mothers and this may create favorable attitude towards infant immunization than illiterates. On the other hand, study conducted from Oromia zone of Amhara region of Ethiopia which showed no association between maternal education and favorable attitude towards immunization [20]. The discrepancy may be due to educational background difference between the two study respondents since only 18% of mothers in the present study and the majority 80% of the study participants in Oromia zone Amhara region were illiterates, respectively. It may be also due to study period difference and could be associated with the efforts of health extension workers since the comparison study was conducted six years ago. Similar to knowledge association with infants' age, mothers who had infants aged from 2-3 months were two times more likely to develop positive attitude about infant immunization program than mothers who had infants aged 0-1 month. This may be due to frequent contact of immunization sessions.

Regarding immunization practice, those mothers who had infants with the age range of 1-2 months, 2-3 months and 9-12 months were four times significantly associated with

mothers' immunization practices than those mothers who had infants aged 0-1 month old. On the other hand, mothers' who had infants aged 3-9 months old were about three times, had infants' immunization practice than their counter parts, respectively. This may be due to BCG vaccines opened only one day per a week. So that mothers who delivered on non BCG vaccination days went to their home without vaccinating their neonates. Moreover, place of delivery was also significantly associated with infant immunization practices. In the present study, respondents who delivered in health institutions were twenty three times significantly associated to infant immunization practice than those mothers who delivered at home. Similarly, respondents who heard information about vaccination and vaccine preventable diseases were about two times significantly associated with infant immunization practice than who didn't heard information yet. This finding is similar with research findings conducted in Ambo, Ethiopia. Besides, Mothers who responded correctly for the time 'when infants should begin vaccination', who mentioned correctly 'the number of vaccination sessions needed' and 'when infants' should finish vaccination' were two times significantly associated with their practices than those mothers who responded wrongly. This is also consistent to other research findings [11].

This paper has its own strength because it is based on primary data and can be used as base-line information for intervention programs and further investigations. Moreover, the sample size was large enough and representative and the questionnaire was pre tested. On the other hand, as a limitation the study was a cross-sectional design and the associations observed may not be causal. Besides, it was institution based study and previously disappointed or dissatisfied mothers may not come to the same health institution again and the number of mothers having unfavorable attitude could be decreased.

## 5. Conclusions

In this study, only 55.0%, and 53.8 of respondents had good knowledge and attitude towards immunization of infants, respectively. Despite inadequate knowledge and attitude of mothers towards infant immunization, the majority 84.0% of mothers had good practice of infant immunization. From this point of view, it is possible to conclude that mothers' immunization practice was not really based on their knowledge and attitude regarding immunization of infants. Maternal education and birth order were significantly associated with good knowledge. Similarly, Mothers' education, infants' aged from 2-3 months was significantly associated with favorable attitude towards immunization of infants. Good infant immunization practice was significantly associated with mothers who have ever heard information about vaccination, who know correctly the time when infants should begin immunization, who know correctly the number of sessions needed, who know the time when infants should complete immunization and place of delivery.

## Authors' Contributions

SB conceived the study, involved in the study design, data analysis. AA and YK involved in the design, supervised data collection and analysis. AJ involved in the design, analysis, drafted and critically reviewed the manuscript. All authors read and approved the final manuscript.

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