

Research Article

Vaccination Coverage and Associated Factors among Children Aged 12–23 Months in Debre Markos Town, Amhara Regional State, Ethiopia

Tenaw Gualu and Abebe Dilie

Department of Nursing, College of Health Sciences, Debre Markos University, Debre Markos, Ethiopia

Correspondence should be addressed to Tenaw Gualu; tenawgualu@yahoo.com

Received 4 February 2017; Accepted 15 June 2017; Published 18 July 2017

Academic Editor: Ronald J. Prineas

Copyright © 2017 Tenaw Gualu and Abebe Dilie. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction. Vaccination is the administration of a vaccine or a biological substance intended to stimulate a recipient's immune system to produce antibodies or undergo other changes that provide future protection against specific infectious diseases. *Objective.* To determine vaccination coverage and associated factors among children aged 12–23 months in Debre Markos town 2016. *Methods.* Community-based cross-sectional study was employed among 288 mothers/caretakers to child (12–23 months) pair. Study populations were selected using systematic random sampling technique. Structured interviewer administered questionnaires were used to collect data. Variables with *P* value of less than 0.05 in multivariate analysis were considered as statistically significant at 95% CI. *Result.* About 264 (91.7%) of children were completely vaccinated. Male birth 3.24 (1.16–9.04), wanted pregnancy 2.89 (1.17–7.17), having at least two ANC follow-ups 4.04 (1.35–12.06), and short distance from vaccination site 3.38 (1.29–8.86) were found positively associated with complete immunization. *Conclusion and Recommendation.* There was relatively high immunization coverage in the study. Child's sex, ANC follow-up, type of pregnancy, and distance from health institution were factors associated with complete vaccination. Preventing unwanted pregnancy and promoting ANC and postnatal follow-up should be strengthened. Vaccination sites should also be further expanded.

1. Introduction

Vaccination is the administration of a vaccine, that is, a biological substance intended to stimulate a recipient's immune system to produce antibodies or undergo other changes that provide future protection against specific infectious diseases. Immunization is the stimulation of changes in the immune system through which that protection occurs [1].

The Expanded Program on Immunization (EPI) was established by the World Health Organization in 1974 to control vaccine preventable diseases. In Ethiopia, EPI program was launched in 1980 [2]. It was launched with the aim of reducing mortality and morbidity of children and mothers from vaccine preventable diseases. The target group when the program started were children under two years of age until it changed to under one year in 1986 to be in line with the global immunization target [3].

In a study conducted in Ethiopia, it was found that 73.2% of the children were fully immunized, 20.3% were partially immunized, and 6.5% received no vaccine [4]. In another study conducted, 76% of the children were fully immunized. Dropout rate was 6.5% for BCG to measles, 2.7% for Penta 1 to Penta 3, and 4.5% for Pneumonia 1 to Pneumonia 3 [5].

Vaccination is a highly effective method of preventing certain infectious diseases. Routine immunization programs protect most of the world's children from a number of infectious diseases that previously claimed millions of lives each year [6].

In Ethiopia, vaccine preventable diseases contribute substantially to under-five mortality as well as morbidity. Diarrhea (18%), pneumonia (18%), measles (1%), and meningitis are the leading causes of child mortality in the country [3].

Ten currently available EPI vaccines in Ethiopia include (BCG, measles, DPT-HepB-Hib or pentavalent, rotavirus,

pneumococcus vaccine (PCV), and OPV. Moreover, it is directed in the implementation guideline to introduce Inactivated Polio Virus (IPV), measles-rubella, meningitis, and yellow fever vaccines for less than one-year-old children [2].

However, many factors are linked to un/undervaccinated children. In Ethiopia, living in rural area and distance to health clinic, mothers with limited education, and socioeconomic capital are linked to low vaccine uptake and placing children at risk for vaccine preventable diseases [7]. Mother education, mothers' perception to accessibility of vaccines, mothers' knowledge to vaccine schedule of their site, place of delivery, and living altitude were independent predictors of children immunization status [4].

As a result of the ten vaccines introduced, complementary with other interventions, many deaths due to vaccine preventable disease are being averted than ever before [3]. However, still related system-wide barriers are linked to incomplete vaccination or unvaccination of children.

As a result, childhood immunization and associated factors should be targeted through educational research. This study was conducted to identify the current gaps and supplement the past studies. Thus, this study can be used as a reference for health care providers, health care educators, policy makers, and future researchers in this and/or related fields.

2. Objectives

The main objective is to determine vaccination coverage and associated factors among children aged 12–23 months in Debre Markos town, Amhara Regional State, Ethiopia, 2016.

3. Methods

3.1. Study Area. The study was conducted in Debre Markos town. Debre Markos is found in East Gojjam Zone of Amhara Regional State of Ethiopia.

3.2. Study Period. The study was conducted from August to September, 2016.

3.3. Study Design. Community-based cross-sectional study design was used.

3.4. Source Population. The source population was all mothers/caretakers to children aged 12–23 months pair in Debre Markos town.

3.5. Study Population. The study population included all mothers/caretakers to children aged 12–23 months pair in Debre Markos town who fulfill the inclusion criteria.

3.6. Inclusion Criteria. The inclusion criteria were all mothers/caretakers to children aged 12–23 months pair who are permanent residents (for at least six months) in Debre Markos town.

3.7. Exclusion Criteria

- (i) Mothers/caretakers with missed immunization card
- (ii) Mentally/critically ill mothers/caretakers
- (iii) Not volunteering to participate/being unable to give required information

3.8. Sample Size. The sample size was determined by using single proportion formula, by using prevalence of complete immunization coverage in children as 22.9% from previous study conducted in Ethiopia [8], 95% CI, and 10% nonresponse rate. Hence, the sample size calculated was 298.

3.9. Sampling Procedure. There were seven kebeles in the town. All the seven kebeles were included in the study. At each kebele, households are selected by using systematic random sampling. The sample in each kebele is allocated proportional to the number of households. When two or more eligible mothers/caretakers to child pair were found, only one was included by lottery method.

3.10. Instrument and Personnel. Structured interviewer administered questionnaire was used to collect the data. It was adapted from previous researches done on similar title [4, 7, 9]. The questionnaire was first prepared in English and translated to Amharic and back to English to maintain the consistency of the content of the instrument. Seven nursing students participated as data collectors.

3.11. Data Quality Control. Orientation and training were given to data collectors regarding purpose of study and ethical issues. Pretest was done on 5% of the actual study subjects out of the study area. After pretest, vague terms and questions were discarded. The result of pretest is not included in the study result.

3.12. Data Processing and Analysis. The data was cleaned, coded, and entered in EpiData version 3.1 and transferred to SPSS version 20.0 for analysis. Descriptive and inferential statistics were used to present the data. Descriptive statistics like frequency and percentage were used to summarize the sociodemographic characteristics of the study participants. Variables showed statistical significant in bivariate analysis, that is, P value < 0.05 , and were entered in the final model of multivariate analysis. And P value of less than 0.05 in multivariate analysis was considered as statistically significant at 95% CI.

3.13. Operational Definitions

Complete Vaccination. A child who received ten basic vaccines (one dose of BCG, three doses each of the DPT-HepB-Hib (pentavalent), three doses of polio vaccines, three doses of PCV, two doses of Rota vaccine, and one dose of measles vaccine before first birth date) is considered to be completely vaccinated.

Incomplete Vaccination. A child who received some of the vaccines and/or not the full dose of the ten vaccines before

TABLE 1: Sociodemographic characteristics of parents in Debre Markos town, Amhara Regional State, North West Ethiopia, September 2016. (N = 288).

Variables	Frequency (N)	Percentage (%)
Relation of the respondent to the child		
Biological parent	269	93.4
Nonbiological parent	19	6.6
Age		
15–25	61	21.2
26–35	193	67
36–45	34	11.8
Religious affiliation		
Orthodox Christian	279	96.9
Muslim	5	1.7
Protestant	4	1.4
Marital status		
Not married	17	5.9
Married	254	88.2
Divorced	11	3.8
Widowed	6	2.1
Ethnicity		
Amhara	285	99
Oromo	1	0.3
Tigre	2	0.7
Educational status		
Not educated	25	8.7
Primary education	36	12.5
High school	164	56.9
College/university	63	21.9
Occupational status		
Employed	245	85.1
Non employed	43	14.9
Family size		
≤3	68	23.6
>3	220	76.4
Household monthly income in Ethiopian Birr		
<1000	18	6.3
1000–25000	42	14.6
>2500	228	79.1
Living condition		
Both parents are alive	257	89.2
Mother only	12	4.2
Both parents are not alive	19	6.6

first birth date is considered to have received incomplete vaccination.

3.14. Ethical Considerations. Ethical clearance was obtained from research and publication committee of Debre Markos University, College of Health Sciences. The purpose and importance of the study was explained to mothers and caregivers. And informed written consent was obtained from the mothers/caregivers of the children. Privacy and confidentiality was maintained throughout the study.

4. Result

4.1. Sociodemographic Characteristics of Parents. The study included a total of 298 eligible participants. Among this, 288 of participants voluntarily agreed to participate in this study. This made the response rate of the study to be 96.6%.

Majority of the participants, 193 (67%), were in age groups between 26 and 35. The mean age of the participants was 30.01. And about 279 (96.9%) of the participants were Orthodox Christian followers (Table 1).

TABLE 2: Characteristics of children aged 12–23 months in Debre Markos town, Amhara Regional State, North West Ethiopia, September 2016. ($N = 288$).

Variables	Frequency (N)	Percentage (%)
Sex of the child		
Male	130	45.1
Female	158	54.9
Average birth weight in grams		
<1500	22	7.6
1500–2500	36	12.5
≥2500–4000	230	79.9
Birth order		
First	131	45.5
Second	79	27.4
Third	64	22.2
Fourth	14	4.9

TABLE 3: Obstetrics history of the mothers in Debre Markos town, Amhara Regional State, North West Ethiopia, September 2016. ($N = 288$).

Variables	Frequency (N)	Percentage (%)
Gestational age in weeks		
<32	1	0.3
32–36	16	5.6
37–42	262	91
≥42	9	3.1
ANC follow-up (at least two)		
Yes	260	90.3
No	28	9.7
TT vaccination (at least two)		
Yes	250	86.8
No	38	13.2
Place of delivery		
Health institution	254	88.2
Home	34	11.8
Type of pregnancy		
Wanted	227	78.8
Unwanted	61	21.2

4.2. *Characteristics of the Child.* About 158 (54.9%) of the children were females and majority were first in birth order (Table 2).

4.3. *Obstetrics History.* While about 260 (90.3%) of the mothers had ANC follow-up, 254 (88.2%) gave birth at health care institutions (Table 3).

4.4. *Level of Vaccination.* Among 288 children, 264 (91.7%) were completely vaccinated, 19 (6.6%) were partially vaccinated, and 5 (1.7%) were not vaccinated at all. The overall dropout rate was 5% (Table 4).

About 274 (95.1%) of the mothers/caretakers perceived vaccination as important. The main reasons that respondents vaccinated their children were protection, immunity, and

TABLE 4: Type of vaccines received by children aged 12–23 months in Debre Markos town, Amhara Regional State, North West Ethiopia, September 2016. ($N = 288$).

Variables	Frequency (N)	Percentage (%)
BCG		
Yes	278	96.5
No	10	3.5
Polio O		
Yes	273	94.8
No	15	5.2
Polio 1		
Yes	279	96.9
No	9	3.1
Polio 2		
Yes	269	93.4
No	19	6.6
Polio 3		
Yes	266	92.4
No	22	7.6
Penta 1		
Yes	279	96.9
No	9	3.1
Penta 2		
Yes	267	92.7
No	21	7.3
Penta 3		
Yes	265	92
No	23	8
PCV 1		
Yes	277	96.2
No	11	3.8
PCV 2		
Yes	267	92.7
No	21	7.3
PCV 3		
Yes	265	92
No	23	8
Rota 1		
Yes	278	96.5
No	10	3.5
Rota 2		
Yes	269	93.4
No	19	6.6
Measles		
Yes	264	91.7
No	24	8.3

good health, prevention of infections, advice from professionals, and being compulsory, 272 (96.1%), 247 (87.3%), 17 (6%), and 2 (0.7%), respectively.

4.5. *Factors Associated with Complete Immunization.* Relation to the child, occupational status, child's sex, type of

TABLE 5: Factors associated with complete immunization of children aged 12–23 months in Debre Markos town, Amhara Regional State, North West Ethiopia, September 2016. ($N = 288$).

Variables			Complete immunization		P value
	Yes	No	COR (95% CI)	AOR (95% CI)	
Relation to the child					
Biological parent	249	20	3.32 (1.00–1.95)		
Nonbiological parent	15	4	1		
Occupational status					
Employed	229	16	3.27 (1.30–8.21)		
Unemployed	35	8	1		
Child's sex					
Male	124	6	2.66 (1.02–6.91)	3.24 (1.16–9.04)*	0.025
Female	140	18	1	1	
Type of pregnancy					
Wanted	213	14	2.98 (1.25–7.10)	2.89 (1.17–7.17)*	0.022
Unwanted	51	10	1	1	
Place of delivery					
Health institution	236	18	2.81 (1.03–7.66)		
Home	28	6	1		
ANC (at least 2 follow-ups)					
Yes	242	18	3.67 (1.32–10.19)	4.04 (1.35–12.06)*	0.012
No	22	6	1	1	
Vaccination schedule					
I know	228	16	3.17 (1.26–7.94)		
I do not know	36	8	1		
Distance from vaccination site					
≤20 minutes	231	16	3.5 (1.39–8.82)	3.38 (1.29–8.86)*	0.013
>20 minutes	33	8	1	1	

1 = reference; * P value < 0.05 (significant).

pregnancy, place of delivery, ANC follow-up, knowledge of time of vaccination schedule, and distance from vaccination site were found to be significant on bivariate analysis. And child's sex, type of pregnancy, ANC follow-up and distance from vaccination site were found to be associated with complete vaccination on multivariate analysis (Table 5).

5. Discussion

In this study, it was found that 91.7% of children were completely vaccinated, 6.6% were partially vaccinated, and 1.7% were not vaccinated at all and there is 5% overall dropout rate. The result showed increased vaccination coverage when compared to previous studies done in different areas [4, 7]. This may be due to increasing access of vaccination and community awareness from time to time.

Adjusting for other factors, child's sex was significantly associated with complete immunization. Males were three times more likely to be completely vaccinated 3.24 (1.16–9.04) when compared to females. The result is in line with previous study done in northern Ethiopia [5]. But in a study done in Iran, no correlation was detected between gender and immunization status [10]. The difference might from cultural differences between study populations.

The type of pregnancy was another factor which predicts complete immunization. The odds of wanted pregnancy were two times more likely for complete immunization 2.89 (1.17–7.17) than unwanted pregnancy. The study is not congruent with previous study which showed no statistical association between immunization and wanted pregnancy [11].

Another factor that affects complete immunization was ANC follow-up during pregnancy. Mothers who had at least two ANC follow-ups during pregnancy were four times more likely to vaccinate 4.04 (1.35–12.06) their children when compared to mothers who did not have ANC follow-up during pregnancy. This is in line with a study done previously in which there was inverse correlation between delayed vaccination and the number of periodical visits of health centers [12]. This might be because mothers during ANC visit would receive counseling and education about the importance of postnatal visits and activities.

Distance of home from vaccination site was another predictive factor for children complete vaccination. Parents who are less than or equal to twenty minutes away from vaccination sites were three times more likely to vaccinate their children 3.38 (1.29–8.86) than parents who are more than twenty minutes away. But in a study done previously, no

correlation was detected between vaccination delay time and distance from health centers [12].

6. Conclusion and Recommendation

There was relatively high immunization coverage in the study. About 91.7% were completely vaccinated, 6.6% were partially vaccinated, and 5 (1.7%) were not vaccinated at all and the overall dropout rate was 5%.

Child's sex, ANC follow-up during pregnancy, type of pregnancy and distance from health institution were factors associated with complete vaccination of children.

Preventing unwanted pregnancy through family planning and promoting ANC and postnatal follow-up should be strengthened.

Vaccination sites should also be further expanded and accessible to the community. And health education should also be given largely to the community about the need to vaccinate all children.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

The authors' gratitude is extended to Debre Markos University, Debre Markos town, administrators, data collectors, and study participants.

References

- [1] P. Nieburg and M. Nancy, "Role(s) of vaccines and immunization programs in global disease control," Center for Strategic & International Studies, 2011.
- [2] "Ethiopia National Expanded Programme on Immunization; Comprehensive Multi-Year Plan 2016–2020," Addis Ababa: Federal Ministry of Health, Ethiopia, 2015.
- [3] "National Expanded Program on Immunization Implementation Guideline," 2015, Addis Abab: Federal Democratic Republic of Ethiopia Ministry of Health.
- [4] W. Animaw, W. Taye, B. Merdekios, M. Tilahun, and G. Ayele, "Expanded program of immunization coverage and associated factors among children age 12–23 months in Arba Minch town and Zuria District, Southern Ethiopia, 2013," *BMC Public Health*, vol. 14, no. 1, article 464, 2014.
- [5] M. B. Kassahun, G. A. Biks, and A. S. Teferra, "Level of immunization coverage and associated factors among children aged 12–23 months in Lay Armachiho District, North Gondar Zone, Northwest Ethiopia: a community based cross sectional study," *BMC Research Notes*, vol. 8, no. 1, article 239, 2015.
- [6] "Vaccine-preventable diseases and vaccines," WHO, 2005.
- [7] Control CfD Prevention, "Epidemiology of the unimmunized child: findings from the peer-reviewed published literature, 1999–2009," World Health Organisation, 2009.
- [8] H. Mohammed and A. Atomsa, "Assessment of Child immunization coverage and associated factors in oromia regional state, Eastern Ethiopia," *Science, Technology and Arts Research Journal*, vol. 2, no. 1, p. 36, 2013.
- [9] A. Negussie, W. Kassahun, S. Assegid, and A. K. Hagan, "Factors associated with incomplete childhood immunization in Arbogona district, southern Ethiopia: a case—control study," *BMC Public Health*, vol. 16, no. 1, article 27, 2016.
- [10] N. Nisar, M. Mirza, and M. H. Qadri, "Knowledge, attitude and practices of mothers regarding immunization of one year old child at Mawatch Goth, Kemari town, Karachi," *Pakistan Journal of Medical Sciences*, vol. 26, no. 1, pp. 183–186, 2010.
- [11] R. A. Brenner, B. G. Simons-Morton, B. Bhaskar, A. Das, and J. D. Clemens, "Prevalence and predictors of immunization among inner-city infants: a birth cohort study," *Pediatrics*, vol. 108, no. 3, pp. 661–670, 2001.
- [12] J. Poorolajal, S. Khazaei, Z. Kousehlou, S. J. Bathaei, and A. Zahiri, "Delayed vaccination and related predictors among infants," *Iranian Journal of Public Health*, vol. 41, no. 10, pp. 65–71, 2012.



Hindawi
Submit your manuscripts at
<https://www.hindawi.com>

