Research Article

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

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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 Ethiopian, 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,
2. Objectives

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

3. Methods

3.1. Study Area. The study was conducted in Debre Marks town. Debre Marks 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 Marks town.

3.5. Study Population. The study population included all mothers/caretakers to children aged 12–23 months pair in Debre Marks 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 Marks 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% non-response 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 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 | AOR (95% CI)     | P value |
|-------------------------------|-----------------------|------------------|---------|
|                               | Yes                   | No               | COR (95% CI) |         |
| Relation to the child         |                       |                  |           |         |
| Biological parent             | 249                   | 20               | 3.32 (1.00–1.95) | 1.00–1.95 |
| Nonbiological parent          | 15                    | 4                | 1         | 1       |
| Occupational status           |                       |                  |           |         |
| Employed                      | 229                   | 16               | 3.27 (1.30–8.21) | 1.30–8.21 |
| Unemployed                    | 35                    | 8                | 1         | 1       |
| Child’s sex                   |                       |                  |           |         |
| Male                          | 124                   | 6                | 2.66 (1.02–6.91) | 1.02–6.91 |
| Female                        | 140                   | 18               | 1         | 1       |
| Type of pregnancy             |                       |                  |           |         |
| Wanted                        | 213                   | 14               | 2.98 (1.25–7.10) | 1.25–7.10 |
| Unwanted                      | 51                    | 10               | 1         | 1       |
| Place of delivery             |                       |                  |           |         |
| Health institution            | 236                   | 18               | 2.81 (1.03–7.66) | 1.03–7.66 |
| Home                          | 28                    | 6                | 1         | 1       |
| ANC (at least 2 follow-ups)   |                       |                  |           |         |
| Yes                           | 242                   | 18               | 3.67 (1.32–10.19) | 1.32–10.19 |
| No                            | 22                    | 6                | 1         | 1       |
| Vaccination schedule          |                       |                  |           |         |
| I know                        | 228                   | 16               | 3.17 (1.26–7.94) | 1.26–7.94 |
| I do not know                 | 36                    | 8                | 1         | 1       |
| Distance from vaccination site|                       |                  |           |         |
| ≤ 20 minutes                  | 231                   | 16               | 3.5 (1.39–8.82)  | 1.39–8.82 |
| > 20 minutes                  | 33                    | 8                | 1         | 1       |

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

Table 5 shows that, in bivariate analysis, child’s sex, type of pregnancy, ANC follow-up, knowledge of time of vaccination schedule, and distance from vaccination site were found to be significant. On multivariate analysis, child’s sex, type of pregnancy, ANC follow-up, and distance from vaccination site were found to be associated with complete vaccination (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 might 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.

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