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# Magnitude and associated factors of delayed immunization among children aged 11-23 months in Edagahamus town, Tigray, Ethiopia, 2018.

**Teferi Gebru Gebremeskel[1*], Merhawit Gebremeskel Hagos[2], Selam Shushay Kassahun[3], Brhane Haile Gebrezgi[2]**

[1]Department of Reproductive Health, Aksum University, Aksum, Ethiopia

[2]Department of Midwifery, Aksum University, Aksum, Ethiopia

[3]Department of Midwifery, Adigrat University, Adigrat, Ethiopia

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## Abstract

**Introduction: Delayed immunization is a major public health problem that is associated with vaccine-preventable disease epidemics.**

**Objective: The aim of this study to assess the magnitude and factors associated with delayed immunization among 12-23 months old children in Edagahamus town, Tigray, Ethiopia and 2018.**

**Methods: A community-based cross-sectional study was carried out in July 1-30, 2018. A simple random sampling method was used to select study participants. Information was collected using a structured, pre-tested questionnaire. The date of vaccinations was obtained from children's immunization cards and timeliness assessed based on the recommended age ranges. Data were entered and analyzed using SPSS version 20.0. Variable with P-value <0.2 in bivariate was exported to multivariate.**

**Conclusions: From the study, it is concluded that the magnitude of delayed immunization for children aged 12-23 months is high (29.5%) in Edagahamus. Delayed immunizations of children were predicted by the mother's education and mother's consideration in the child's wellness to take the vaccine.**

**Keywords:** Child immunization, Delay to be immunized, Vaccine-preventable diseases.

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## Introduction

Vaccine-preventable diseases cause over three million childhood deaths each year globally especially in developing countries. Of the nearly 8.8 million yearly deaths of under-five children greater than 20% are due to Vaccine-Preventable Diseases (VPD). VPD is a major cause of morbidity and mortality in children under five years of age in developing countries including Ethiopia. Ethiopia has experienced many outbreaks and hence morbidity and mortality from VPD. According to EDHS 2016; childhood mortality rates have declined since 2000, despite that, infant and under-5 mortality rate in Ethiopia was 48/1000 and 67/1000 respectively. Immunization is the most important public health interference for VPD. It presently averts more than 2.5 million deaths every year in all age groups from diphtheria, tetanus, pertussis (whooping cough) and measles. In Ethiopia nearly 4 in 10 children aged 12-23 months have received all eight basic vaccinations; single doses of BCG and measles and three doses for each of pentavalent, PCV, rota and polio vaccine. Immunization is a key element of the health extension program package [1].

## Materials and Methods

### *Study setting*

A community-based cross-sectional study was conducted from July 1-30/2018 at Edagahamus city, Tigray regional state of Ethiopia. Edagahamus is founded in the eastern zone of Tigray, wereda Saesie Tsaida Amba; which is located 885 Km North of the Ethiopian capital city of Addis Ababa, 105 Km east of the Tigray capital city Mekelle and around 20 Km near to Adigrat. Edagahamus is divided into four kebeles and the total population was 21,993; from those 10,031 were male and 11,962 were female (2006/2012 census). There is only one health center in Edagahamus and the total number of under two-year children is 795 and 2 days per week Tuesday and Thursday sessions were held for immunization [2].

### *Participants*

Sampled children aged 12-23 months old living in Edagahamus and who fulfill the inclusion criteria were taken as the study population.

Households that have one living child aged between 12-23 months old who have the vaccination card and who do not have an immunization card are included, While households who have children aged between 12-23 months old who do not complete their vaccination (drop out) were excluded.

### *Sample size determination and sampling technique*

The sample size was calculated using a single population proportion formula with the following assumption: Prevalence of children who had delayed vaccination in Gambia 63.3% (1), 95% of confidence interval (1.96), 5% margin of sampling error tolerated, 10% of non-response rate, then the final sample size is 393. A simple random sampling method was used to select study subjects using a sampling frame obtained from the health extension workers. The mothers' identity and the households' numbers that are used by the health extension workers were used to identify the selected households. In the case of two or more mothers having a child in the same household, one mother was selected using the lottery method. First, a list of all eligible participants was prepared in excel after obtained from the health extension workers. Then, the random number was generated using OpenEpi software and marked the selected one against the excel. Finally, each eligible study participant was contacted through the house to house visits. A second visit was done in case a mother was absent in the house during the first visit. If the mother is not available for the second time, a neighbor's mother with a child was contacted. Samples were allocated to each kebeles using a proportion to the size allocation [3-5].

### *Data collection tools and techniques*

Data was collected by using an interviewer-administered and structured questionnaire adapted from WHO survey questions and related pieces of literature according to the objectives. The questionnaire includes socio-demographic and economic factors, maternal/caregiver factors, child's factors and service-related factors.

### *Data quality assurance and control*

Five Midwife data collectors and supervisors were recruited from another area outside of the study site and they were giventraining for three days. The supervisors followed the process of data collection daily, checked the data completeness consistency and communicate with principal investigators daily.

### *Data processing and analysis*

Data were coded, cleaned, recorded and entered into Epi info 7 and finally export to SPSS version 20.00 for analysis. Simple descriptive summary statistics were done. Tables, statements, charts and graphs were used to present the result of the analyzed data. Associations between independent and dependent variables were analyzed first using bivariate logistic regression analysis. Variables that had $p<0.2$ on bivariate analysis were entered into multivariable logistic regression analysis. The statistical association between the different independent variables to the dependent variable was measured using OR, AOR, 95% CI and P-values <0.05 was considered statistically significant [6].

## Results

### *Socio-demographic character of the study participants*

A total of 393 mothers of children aged between 12-23 months old were interviewed from four kebeles, with a response rate of 100%. Out of the total study subjects, 222(56.5%) have children aged 11-17 months, while 171(43.5%) were aged 18-23 months. The mean (+ SD) age of the children was 17(+ 6) months old. Female children were 208 (52.9%) of the total study subjects. The age range of mothers included in the study was 17-43 years, which is a childbearing age range. The mean (+ SD) age of the mothers was 29.4 (+ 5.3) years old (Table 1) [7].

| Variable | Category | Frequency | Percent (%) |
|---|---|---|---|
| Sex of child | Female | 208 | 52.9 |
| | Male | 185 | 47.1 |
| Age of child | 11-17 months | 222 | 56.5 |
| | 18-24 months | 171 | 43.5 |
| Age of mother | <30 yrs. | 244 | 62.1 |
| | >31 yrs. | 149 | 37.9 |
| Religion | Christian | 328 | 83.5 |
| | Other | 65 | 16.5 |
| Marital status | Married/active | 302 | 76.8 |
| | Ne ver married | 39 | 9.9 |

| | | | |
|---|---|---|---|
| | Separated/widowed and divorced | 52 | 13.2 |
| Ethnicity | Tigray | 372 | 94.7 |
| | Other | 21 | 5.4 |
| Educational level | No education | 57 | 14.5 |
| | Primary | 106 | 27 |
| | Secondary | 191 | 48.6 |
| | University/college | 39 | 9.9 |
| Occupation | Employed | 81 | 20.6 |
| | Unemployed | 56 | 14.3 |
| | Housewife | 256 | 65.1 |
| Average monthly income | <500 birr | 42 | 10.7 |
| | 500-1000 | 119 | 30.3 |
| | >1000 | 192 | 48.3 |
| | Unknown | 42 | 10.7 |
| Birth order of the child | 1st born | 55 | 14 |
| | 2nd born | 161 | 41 |
| | >3rd born | 177 | 45 |

***Table 1.*** Sociodemographic characteristics of the respondents in Edagahamus, Tigray, Ethiopia, 2018 (n=393).

## *Characteristics related to mother*

Overall 327(83.2%) of mothers know the immunization schedule. A total of 278 (70.7%) of the mothers got health education, particularly about immunization during antenatal and postnatal care while they were pregnant and after the birth of the child (Table 2) [7].

| Variable | Category | Frequency | Percent (%) |
|---|---|---|---|
| The child might develop side effect from the shot | Great deal | 314 | 79.9 |
| | A little | 61 | 15.5 |
| | Not at all | 18 | 4.6 |
| Advised you some vaccines had too serious SE during the immunization period | Yes | 246 | 62.6 |
| | No | 147 | 37.4 |
| Satisfaction with the practice of providers | Yes | 251 | 63.9 |
| | No | 142 | 36.1 |
| Lack of vaccine | Yes | 44 | 11.2 |
| | No | 349 | 88.8 |
| Lack of appointment | Yes | 20 | 5.1 |
| | No | 373 | 94.9 |

***Table 2.*** Distribution of service-related characteristics of Edagahamus, Tigray, Ethiopia, 2018 (n=393).

## *The magnitude of age untimely vaccination*

From the total respondents 116 (29.5%, 95% CI26.7%-45%). had experienced a delay in at least one of their immunization. For BCG 41 (10.4%) of the respondents presented after the age of 8 weeks and delayed for up to two months. For the first dose of pentavalent, PCV, Rota and polio vaccines 7 (1.7%) of the

respondents presented after the age of 14 weeks and delayed for up to one month and a half. For the second dose of Pentavalent, PCV, Rota and polio vaccines 13(3.3%) of the respondents presented after the age of 18 weeks and delayed for up to two months. For the third dose of Pentavalent, PCV and polio vaccines 26 (6.6%) of the respondents presented after the age of 24 weeks and delayed for up to two months. For the measles vaccine, 29 (7.3%) of the children presented after the age of 11 months and 5.2% and 1.4% were delayed for up to three and seven months respectively (Figure 1) [8].

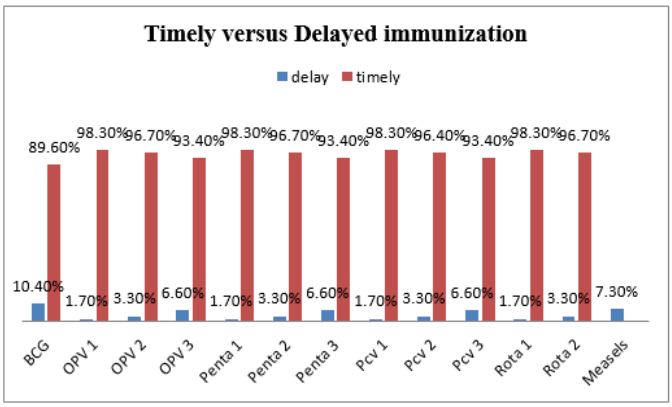


***Figure 1.*** Timely versus delayed immunization among 11-23 months old children in Edagahamus, Tigray, Ethiopia, 2018.

### *Factors associated with delayed immunization*

In the bivariate logistic regression maternal occupation, marital status, educational status, lack of vaccines, lack of appointment, sickness of the child's and "don't know"the due date was associated with delayed immunization at p- the value of <0.2. In multivariate logistic regression analysis sickness of the child, mothers' educations have a significant association. Mothers who had tertiary education (AOR 0.169, 95% CI 0.032-0.882) and secondary education (AOR 0.269, 95% CI 0.114-0.636) were less likely to delay their infant's immunization compared to those mothers with no education. Child sickness on the appointment day was more likely to delay (AOR 11.36, 95% CI 4.68-27.55) than those healthy.

## Discussion

This study aimed to assess the magnitude and factors associated with immunization delay among 12-23 months old children. In this study, the overall prevalence of delayed immunization among the study participants was found to be 29.5% (95%) CI 26.7%-45%. other countries' experiences show the overall prevalence of delayed immunization can vary. For example, the study done in the Gambia showed a prevalence of 63.3%, the study was done in Atlanta showed 25.8% and the study was done among Norwegian children 44.7%. This difference might be attributed to the difference in educational background, degree of knowledge towards immunization, the difference in the study population and Vaccinations are mainly provided by public health nurses and all services are voluntary and free of charge. The educational status of the mother/caretaker was a predictor for delayed child immunization; in this study maternal education beyond the secondary level was positively associated with timeliness, Similar to the study done in Nigeria, Gambia and Iran. This is attributed because highly educated mothers are more willing to seeking care than other mothers. The sickness of the children was also associated with delayed vaccination similar to the study done in Nigeria and Shenzhen, China. This may be around missed opportunities to vaccinate with mild illnesses. Socio-economic status and the number of children in the households were not predictors for delayed child's immunization in this study, which is different from studies in Gambia and Uganda, which indicates income-related factors hindered utilization of immunization services so that children's with several siblings were more likely to have untimely vaccinations, that higher cost and demands can easily discourage to vaccinate their children's. This difference could be explained by the fact that free service for immunization is implementing in Ethiopia so that higher costs and demands were not a problem among families who participated in this study [9,10].

## Conclusion

From the study, it is concluded that the magnitude of delayed immunization for children aged 12-23 months is high (29.5%) in Edagahamus. Delayed immunizations of children were predicted by the mother's education which had the protective effect of delay immunization and consideration of the mother the child was too ill to undertake vaccination when it was due was a risk for delayed immunization. Therefore, it is important to consider education as vital for the attainment of full immunization which intern raises the need of the community and creates maternal awareness about the importance of child immunization. Therefore, it also important to consider improve the child health and health-seeking behavior of mothers for their children to decrease delay immunization. The main limitation of this study was the possibility of recall bias and attitude of the mothers/caretakers, father's/partner's education level/occupational status and other husband characteristics were not studied, which may have an impact on timely immunization.

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## *Correspondence to:

Dr. Teferi Gebru Gebremeskel

Department of Reproductive Health,

Aksum University,

Aksum, Ethiopia,

E-mail: teferigebru12@gmail.com