Determinants of incomplete immunization among children age 12-23 months in Southwest, Ethiopia: Case Control Study

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Abstract

Background: Vaccination is recognized as an important immunization tool which is used in preventing and eradicating communicable diseases. Even though an increase in global vaccination coverage, many children in the world particularly in low resource countries still are left unvaccinated and it remains to be a public health problem. So, the main objective of this study was to identify determinants of incomplete vaccination among children 12-23 months of age in Semen Bench district, Bench Maji Zone, Southwest Ethiopia, 2018. Methods: A community based unmatched case-control study was undertaken among randomly selected children aged 12 to 23 months and with a total sample size of 312 (104 cases and 208 controls). Simple random sampling was used to get representative cases and controls. Data was collected using a structured questionnaire and analyzed using SPSS version 21 statistical software. Bivariate and multiple logistic regression analyses were done to identify independent factors for incomplete immunization status of children. P values <0.05 with 95% confidence level were used to declare statistical significance Results: From the total of selected 104 cases and 208 controls, all of the cases and controls participated in the study with a response rate of 100. Based on the multivariable analysis the incomplete immunization status of children was significantly associated with having no antenatal care visits, [AOR=8.3(95%CI; 1.87-36.91], home delivery [AOR=4.5(95%CI; 1.411-14.27], having no postnatal care visit [AOR=4.2(95%CI; 1.67-10.41], and inconvenient appointment time [AOR=3.44(95% CI:1.65-7.16)]. Conclusion: Children of mothers having no antenatal and postnatal care, children of mothers having home delivery, children of mothers with an inconvenient appointment time, were significantly associated with incomplete immunization. To reduce the number of children with an incomplete immunization status, the district needs to consider specific planning for mothers with no ANC, and focus on promoting facility delivery and address concerns of inconvenient appointment time at a community level. This can be accomplished by integrating the immunization service to other elements of primary health care

Background

Immunization is one of the most worthwhile public health interventions to prevent child mortality and morbidity (1). Each year, immunization averts more than 2 million vaccine-preventable deaths globally (2,3). Despite this enormous use, immunization coverage in developing countries has reported being low. In 2011 alone, 1.5 million children died from Vaccine-Preventable Diseases (VPDs) (4-8).

In 2013, coverage of third-dose diphtheria, tetanus, and pertussis vaccine (DTP3) among children aged < 12 months was 84% globally, ranging from 75% in the African Region to 96% in the Western Pacific and European Regions. About 14.8 million (68%) children who did not receive the DTP3 vaccine during the first year of life lived in 10 countries including Ethiopia (9).

Even though vaccination offers greater benefits of health, well-being, and survival of children than any other interventions, vaccine-preventable diseases are still responsible for about 25% of deaths of under-

five children. Most of the deaths are from diarrheal diseases, acute respiratory infections, and measles. More than a quarter of these are reported in low- income countries including Ethiopia (10-14)

In Ethiopia, a routine immunization program was launched by providing six traditional antigens in 1980. The Program was revised subsequently and was capable of providing 10 vaccines to under 1 year of age at the moment. In addition to the traditional vaccines that are given without any charge, new vaccines are continuously introduced into the Immunization Program. Recently, the program has successfully introduced additional antigens which have resulted in the protection of millions of children from vaccine-preventable diseases (15). Based on the Ethiopian demographic health survey (EDHS 2016 report) around 39% of children aged between 12 to 23 months receive all basic vaccination and in the study area 24.4% of children aged between 12-23 months have not received all basic vaccination (15-16). In Ethiopia Measles is one of the five major causes of childhood illnesses, which together contribute to 70% of under-five morbidity and mortality (15).

According to the WHO measles burden estimator, Ethiopia contributes to 46% of the cases and 51% of the deaths from measles among eight eastern African countries (5,9,10). Previous studies done in Ethiopia indicated that the main factors lead to incomplete vaccination are multiple such as mothers age, educational status of the father, mother's knowledge on vaccination, fear of side effects, shortage of vaccines in the health facility, inconvenient appointment time, and political instability (15,17). High immunization coverage is essential to control and eventually eliminate vaccine-preventable diseases (VPDs) and understanding the level of immunization among children is vital to design appropriate interventions. This study was therefore conducted to determine and identify factors associated with incomplete vaccination among children aged 12–23 months

Methods

Study design and setting

A community-based unmatched case-control study was conducted from February to March 2018 in Semen Bench district, Bench Majii Zone, Southwest Ethiopia. The district is known for frequent outbreaks of vaccine-preventable diseases, especially measles. It has 31 kebeles and an estimated total population of 138,556. The study was conducted in seven kebeles (the smallest administrative units in Ethiopia

Source population

All households with mothers/caregivers who had children in the age group 12-23 months of age residing in semen Bench district for both cases and controls.

Study population

The study population for cases: Selected eligible households with mothers/caregivers who had children in the age group of 12 to 23 months who did not complete the recommended vaccination.

The study population for controls: Selected eligible households with mothers/caregivers who had children in the age group of 12 to 23 months who completed the recommended vaccination.

Sample Size Determination

Sample size was determined by using Stat Calc program of the Epi Info version 7; Used to calculate the sample size with exposure among controls is 84.4% from previous study in Tigray region (18), and 5% marginal error, 95% confidence interval, power of 80%, case to control ratio of 1:2 and 10% of non-response rate was considered. Calculated sample size in all Independent (exposure) variables are considered and place of residence is chosen as an independent variable since it gave maximum sample size as compared to other exposure variables. The larger sample size was 282+30 (10% non-response rate) =312 (104 cases and 208 controls)

Sampling Technique and Procedures

A simple Random sampling technique was used to reach the household level. The seven districts were selected by simple random sampling (lottery method). And the calculated sample size was allocated proportionally according to their population. From the two years, the family folder list of cases and controls were selected then by Computer Generated Simple Random Sampling Techniques the required number of cases and controls were selected. From Sporty distract 38 sample case 13 control 25: Muya distract 47 sample case 16 control 31: Yikir Demoze distract 58 sample case 19 control 39: Kasha distract 50 sample case 17 control 33: Boseka distract 30 sample case 10 control 20: Endekal distract 53 sample case 17 control 36: Genga distract 36 sample case 12 control 24

Operational Definition

Complete (full) vaccination: The childhood vaccination status once a child has received all recommended vaccines, including BCG, three doses of pentavalent, three doses of PCV, two doses of Rota vaccine, three doses of polio and measles vaccines by the age of 12 months(18).

Incomplete (partial) vaccination/Defaulter: The childhood vaccination status if the child missed at least one of the recommended vaccines (the recommended vaccines include BCG, three doses of pentavalent, three doses of PCV, two doses of Rota vaccine, three doses of polio and measles vaccines by the age of 12 months) (18).

Poor knowledge: Those mothers /respondents who scored below the mean score of the knowledge questions.

Good knowledge: Those mothers /respondents who scored equal and above mean score of the knowledge questions.

Data collection tool and quality control

The data were collected using a structured questionnaire adapted from a previous study [4-12]. Before undertaking data collection, the questionnaire was pretested on other similar population taking 5 % of the total sample outside the study area and necessary modifications were made. The questionnaire was prepared originally in English and translated to the local language. The questionnaire was further translated from the local language to English to check for consistency. The primary respondent was the mother of the child. In case of her absence, the questionnaire could also be completed by the father or another adult in the household acting as the primary caregiver. The data were collected by trained, diploma midwife, fluent in the local language, using the structured questionnaire translated to the local language. Three health professionals with bachelor's degrees in health supervised the data collection process. Before data collection, the data collectors and supervisors were recruited and training was given on the objective of the study and techniques of data collection for two days

Data Processing and Analysis

Data were entered using EPI- Info version 7 and analyzed using SPSS-version 21 statistical software. Descriptive statistics were used to summarize the data, and a bivariable analysis was carried out to describe associations between exposure variables and childhood immunization status and assessed by chi-square and odds ratio with a significance level of p-value ≤ 0.05. Variables with p-value ≤ 0.25 were included in the final model. In the multivariable analysis, additionally, model fitness was checked by Hosmer and Lemeshow goodness of test and p-value ≤ 0.05 was applied to identify independent factors of incomplete childhood immunization.

Results

Socio-Demographic Characteristics of respondent

A total of 208 controls and 104 cases (with a 100% response rate) were included in the study. The majority of respondents for controls 198(95.2%) and for cases 85 (81.7%) were mothers. With regard to religion, most caretakers/mothers for cases and controls were protestant which accounts for 85(81.7%) and 169(81.3%) respectively. Regarding maternal educational status, 82.7% of cases and 61.1% of controls were no formal education (Table 1)

Respondents characteristics of health-related service utilization

All cases and controls of respondents reported that there is a vaccination site in their district. Of the mothers/ caretakers, 50(48.1%) of cases and 33(15.9%) of controls were turned home without getting a vaccination for their child due to inconvenient appointment time. The majority of respondents were two to four birth orders which comprise 67.3% of cases and 63.9% of controls. Regarding ANC visits 75(72.1%) and 208(98.6%) of cases and controls have ANC visits respectively (Table 2).

Mothers or caretakers Knowledge about vaccination

The majority of mothers/ caretakers were knowledgeable about vaccination which accounts for 88 (84.6%) for cases and 202 (97.1%) for controls (**Table 3).**

Factors Associated with incomplete vaccination

The result of the multivariable analysis showed that the relationship of mother/caretaker with child, father education, Postnatal care (PNC), place of birth, Antenatal care (ANC) visit, and Inconvenient appointment time were independent factors associated with incomplete vaccination. Those mothers who had no Antenatal care attendance were 8.3 times more likely to default vaccination than others, [AOR (95%CI) =8.3 (1.869-36.907). Those women who gave birth at home were 4.5 times more likely to incomplete vaccination than those who gave birth at health institutions, [AOR (95%CI) = 4.5(1.411-14.27). Those children who get care by caretakers (other than their mother) were 5.3 times more likely to default to complete vaccination than those who get care from their mother. [AOR (95% CI) = 5.3(1.988-14.094). Inconvenient appointment time is a predictor of incomplete vaccination, those respondents who have inconvenient appointment time were 3.4 times more likely to default to complete vaccination than others [AOR (95% CI) = 3.443(1.654-7.165). Respondents who do not have Postnatal care visits were 4.2 times more likely to default to complete vaccination than those who have Postnatal care visits [AOR (95% CI) = 4.2(1.67-10.41) (**Table 4).**

Discussion

The finding of this study showed that having an antenatal care visit was statistically significant predictors on multivariate analysis. The finding of this study is consistent with the same study Conducted in Mozambique, wonago district and central Ethiopia (19,20,21).

Similarly giving birth at home was found to be an independent factor that leads to incomplete vaccination status of the child. The finding of this study is consistent with the same study conducted in other parts of Ethiopia (20.21) and Nepal (22). The explanation related to this may be due to those mothers who give birth at health institutions are more like to use the health service than those mothers who gave birth in the home. In this study father's educational status was an independent predictor for incomplete vaccination. This may be due to as educational level increases the health-seeking behavior of family may possibly increase and this, in turn, may have a positive impact on childhood vaccination. The finding of this study showed that a mother's educational status is not a significant predictor for incomplete vaccination. This is contrary to the study conducted in Jamaica which revealed that having maternal education level collage and above were more likely vaccinate a child than others (23). Inconvenient appointment time was a significant factor for incomplete vaccination. This is also consistent with other studies conducted in Ethiopia (20,21). The reason might be the unavailability of vaccines on the appointed dates due to vaccine stock-outs. When mothers came to immunize their child and were denied the service because of a vaccine shortage, they are unlikely to bring their child back for vaccination. In these study children and mothers/ caretaker's relationship was a significant factor for incomplete vaccination. This may be due to a mother being able to give good care for her own child

including vaccinating her child timely and completely. In contrast to this study, a study conducted in Jamaica revealed that there is no association between mothers/caretakers and child Vaccination (23).

Conclusions

The finding of this study showed that the absence of antenatal and postnatal care attendance, having home delivery, low level of father educational status and the inconvenient appointment time was significant for incomplete vaccination. Based on the finding of the study we recommend that governmental and non-governmental organizations working in neonatal and child health improvement should intervene and strengthened to promote awareness of the community on the importance of post-natal care, anti-natal care, and institutional delivery to optimize children's complete vaccination status. In addition, to reduce the number of children with incomplete immunization status, the Bench Majii Zone needs to consider specific planning for mothers with these risk profiles. A focus on strengthening healthy communication activities to raise immunization awareness and address concerns of vaccine side effects in the community. This could be achieved by integrating the immunization service to other elements of primary health care

List Of Abbreviations

AOR: adjusted odds ratio, ANC: Antenatal care, COR: crude odds ratio EDHS: Ethiopian Demographic and Health Survey, PNC: postnatal care

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from Arba Minch University, college of medicine and health science, Institutional Ethical Review Board and was communicated to the Bench District Health Bureau. Prior to data collection, the purpose of the study was clearly explained and written consent was obtained from the mothers

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Competing interests

The authors have no conflicts of interest to declare for this study.

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Authors' contributions

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Tables

Due to technical limitations the tables are available as a download in the Supplementary Files.
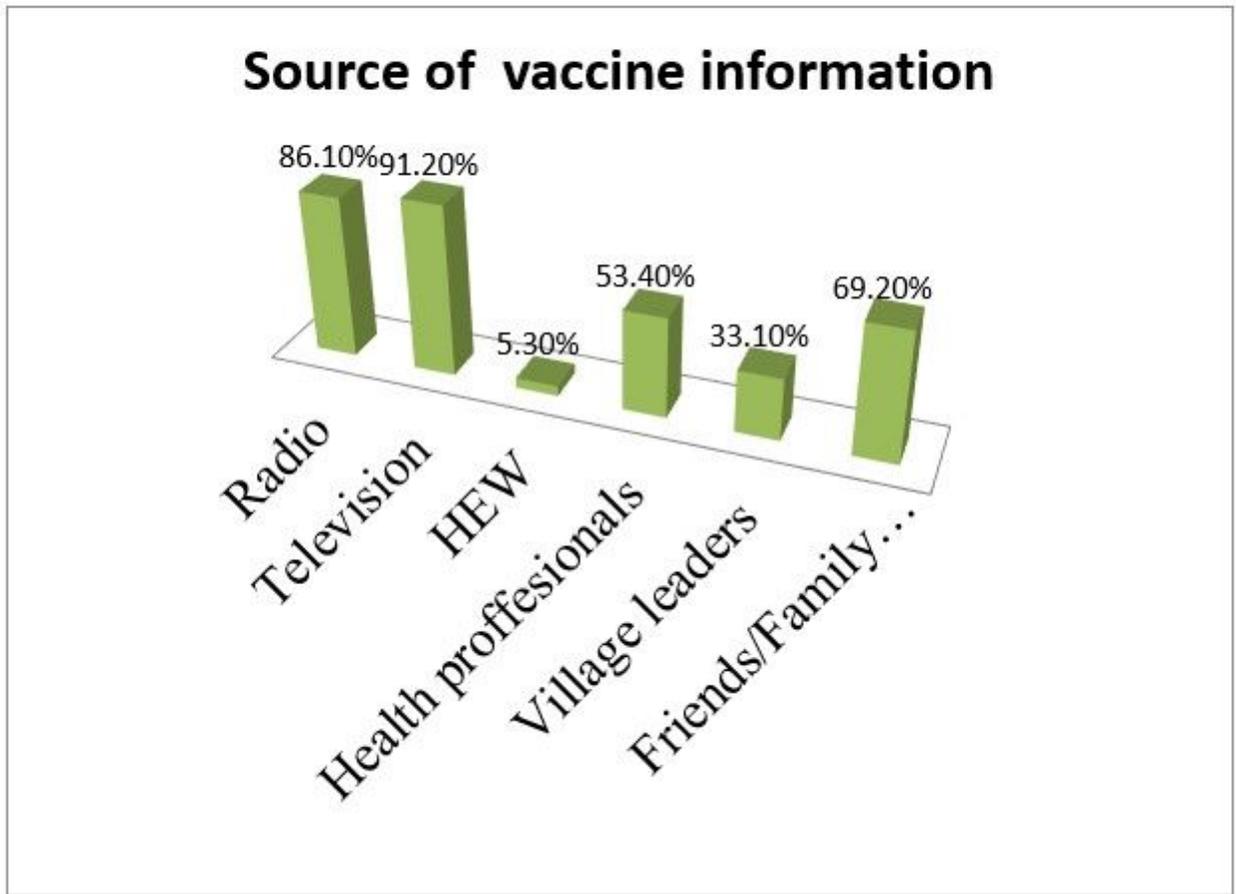
Figures

Figure 1

Respondents source vaccine of information in Semen Bench district, Bench Majii zone, Southern Ethiopia 2018

Supplementary Files

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- Tables.pdf