

Missed opportunity of tetanus toxoid immunization among pregnant women in Southern Ethiopia

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Abstract: This study attempted to assess the presence of missed opportunity for tetanus toxoid immunization using a Community and Family Survey (CFS) data collected in the five densely populated zones of the SNNPR. The study established the existence of a true missed opportunity for tetanus toxoid immunization among antenatal clients after examining the data for possible sources of biases. A bivariate and multivariate analysis using logistic regression model suggested the absence of both recall and life long protection biases in the data. Accordingly, 11.6% of the women represented a true missed opportunity for tetanus toxoid immunization in the study area. The level of missed opportunity was found to be about 13% in the rural area as compared to only 4% in the urban parts of the study area. Missed opportunity was also high among those women who initiated antenatal visit in their third trimester of pregnancy and those women who had only one visit in the whole course of pregnancy. In the light of the findings, in-depth operational studies are recommended to better understand the reasons behind missed opportunity for tetanus immunization in the study area. [*Ethiop. J. Health Dev.* 2000;14(2):143-148]

Introduction

Tetanus is an important cause of death among neonates in Ethiopia. UNICEF estimates that about 63% of neonatal deaths in Ethiopia are due to tetanus and that 60% of infant deaths occur during the first month of life (1). Neonatal tetanus is most common when the delivery takes place in unhygienic environment and nonsterilized instruments are used for cutting the umbilical cord. Tetanus typically develops during the first or second week of life and is fatal in 70% to 90% of cases (2). Neonatal tetanus is however a preventable disease. Two doses of tetanus toxoid vaccine given to the pregnant women one month apart during early pregnancy are nearly 100% effective in preventing tetanus among newborns (3). Monitoring the coverage of tetanus immunization is thus an important global maternal and child health priority (4).

Tetanus immunization is a fundamental component of effective antenatal care (ANC).

However, recent studies carried out in developing countries showed that a significant proportion of women who received antenatal care did not receive tetanus toxoid immunization (5). This represented a substantial amount of missed opportunity for tetanus immunization. This is an important indicator of the quality and effectiveness of antenatal care provided to pregnant women.

In Ethiopia the use of antenatal care services is very low and ranges between 20% in rural area to 60% in the urban parts of the country (6). Coverage with tetanus toxoid immunization among pregnant women is similar to or sometimes even lower than the coverage of antenatal care in the country. Like in any other developing countries, there is a possibility that some antenatal clients are not provided with tetanus toxoid immunization during pregnancy. There is, however, lack of empirical evidence on the level and differential of missed opportunity for tetanus toxoid immunization in the country. Therefore, the objective of this study is to assess the existence of a true missed opportunity for tetanus toxoid immunization by analyzing the possible sources

of biases in the study area and also to estimate the magnitude of the problem. The study also attempts to assess the differentials of missed opportunity for tetanus toxoid immunization in the study area.

Methods

The data for this study came from a Community and Family Survey (CFS) carried out in the five densely populated zones of the Southern Region (Sidama, Semen Omo, Kembata-Alaba-Timbaro or K.A.T, Hadya, and Guraghe). The survey was conducted between May and June 1997.

Since the survey was multi-purpose and complex, a reasonably large and convenient sample size was employed in the study. A total of 2317 households was included in the study (498 or 78% urban and 1819 or 21.5% rural). However, the 1994 Population and Housing Census for the Region showed that about 6.8% of the Region's population lived in urban areas (7). Therefore, in the survey the urban sample is over represented. In order to make results of this survey representative of the five densely populated zones of the region, sample weighting was employed on the original data. In this particular study a total of 1401 women who had at least one live birth were included. Since this group of women was also subjected to unequal probability of selection between urban and rural areas, sample weighting was applied on the original 1401 women and subsequent analysis was performed on the weighted data.

The sampling design combined stratified and random sampling proportional to population size. All urban and rural areas in the five densely populated zones were included in the sampling frame. The selection of rural sample involved four stages: selection of weredas, selection of peasant associations (PAs), selection of enumeration areas (EAs), and selection of households. First, two Weredas were randomly selected from each zone which resulted in a total of ten Weredas from the five

zones. Using simple random sampling two PAs were selected from each selected wereda, ie, a total of 20 PAs were included in the study. From each selected PA, one enumeration area was selected, following sampled EA, using systematic sampling with a random start. The urban sample size is representative of the surveyed zones as a whole. Ten EAs were selected using a simple random sampling method, from a total of 224 EAs found in the five zones. One third of the households in the ten selected EAs were chosen for inclusion in the study using a systematic sampling procedure with a random start (8).

Information was collected using a set of standard pre-tested questionnaires which were administered in Amharic by experienced and trained enumerators. The survey collected basic socio-economic and demographic information, maternal and child health, and other relevant population and development issues.

In order to assess the existence of true missed opportunity (which is free from life long protection and recall biases) for tetanus toxoid immunization (TTI), the data were examined for possible sources of biases. In this study the life long protection and recall biases were examined using bivariate and multivariate analysis [using logistic regression]. In addition, selected differentials of missed opportunity for TTI were examined using a simple bivariate analysis. Data entry and statistical analysis were performed using SPSS software.

Life long protection bias: According to WHO life long protection for tetanus is achieved after five doses of vaccines (9). If a woman already had five doses of tetanus vaccines in her previous pregnancies, then she does not need to be vaccinated for her most recent pregnancy. Therefore, this woman should not be considered as missing the opportunity of tetanus vaccination when she reports not having vaccination for her most recent

pregnancy. In the case where she is erroneously considered as missing the opportunity of tetanus vaccination, this will result in life long protection bias.

To test the existence of life long protection bias, the data was examined for parity and (maternal) age-specific immunization rates. This assumption is plausible: the higher the parity and the age, the higher the probability of having been immunized five times previously. If there is a "life-long protection bias" tetanus toxoid immunization rates should decrease with parity and age, assuming that the probability of being fully immunized would increase with parity and age. If the data does not show any relationship between tetanus immunization and parity or maternal age, it would suggest that there is no life-long protection bias.

Recall bias: Asking for information about injections in the last six years could introduce a recall bias. Women may have difficulty remembering if they had an injection earlier, even on a birth-specific basis. If these injections are unreported or incorrectly attributed to births occurring some five or six years ago, recall bias will be introduced. The presence of any recall bias may then be seen in any negative relationship between immunization rates and the length of the open birth interval, or the duration since the last birth.

Result

Life long protection and recall biases: As shown in Table 1, no relationship was observed between parity and tetanus immunization rate and also with mother's age, suggesting an absence of life-long protection bias. Likewise, as shown in Table 1, among last births, there is no linear relationship between the length of the open birth interval and tetanus immunization, suggesting the absence of recall bias.

Table 1: Percentage (weighted) distribution of women who had ANC by TTI according to selected characteristics, Southern Ethiopia, 1997.

| Characteristics | Among women with ANC | |
|---------------------------------|----------------------|--------------------------|
| | % with out TTI | N(Weighted) ¹ |
| Age the most recent child | | |
| < 12 mon | 8.2 | 88366 |
| 12-24 mon | 16.9 | 66951 |
| 24-36 mon | 12.4 | 36946 |
| 36-48 mon | 18.0 | 20301 |
| 48-72 mon | 10.9 | 58896 |
| Parity | | |
| 1 | 19.2 | 40270 |
| 2 | 10.1 | 47342 |
| 3 | 10.7 | 47612 |
| 4 | 8.0 | 27322 |
| 5+ | 10.8 | 108915 |
| Age of Mother | | |
| 15-19 | 9.7 | 12269 |
| 20-34 | 12.2 | 192053 |
| 35-49 | 9.2 | 67137 |
| Total | 11.6 | 271460 |

¹Sample weighted on the original 1401 women

These two potential biases are further explored (as shown in Table 2) using a multivariate logistic regression analysis by controlling residence and education. As shown in Table 2, none of the variables related to recall or life long protection biases appeared to be significant in the model which further suggests the existence of none of these biases in the data.

Level and differentials of missed opportunity for TTI: The examination of the data for possible sources of biases suggests that the data are free from both types of biases. Therefore, another explanation is that these represent true missed opportunities for tetanus injections. Table 3 showed that 11.6% of the women who received antenatal care represented missed opportunity for TTI.

Table 2: Logistic Regression Coefficients of some selected independent variables on the probability of having TTI among antenatal attendees, Southern Ethiopia, 1997.

| Variables | β |
|--|------------|
| Mother's age (20-34) | |
| 15-19 | 1.0941 |
| 35-49 | 1.0890 |
| Parity (5 +) | |
| 1 | 0.3009 |
| 2 | 2.2293 |
| 3 | 0.1246 |
| 4 | 3.1463 |
| Years between survey & last birth (1yr) | |
| 2yrs | 0.5948 |
| 3 yrs | 0.0050 |
| 4 yrs | 0.1845 |
| 5 yrs | 0.3214 |
| 6 yrs | 0.5051 |
| constant | -3.0853*** |
| Model Chi-square | 18.541*** |

Adjusted for residence and women's education

P<0.001 *P<0.001

The reference category is in parenthesis

The level of missed opportunity was three times higher in rural areas as compared to urban areas. In the rural area, 12.9% of the women missed tetanus toxoid immunization as compared to only 4.3% in the urban parts of the study area. There was very little variation among zones. The level of missed opportunity ranged from 10.1% in Hadya Zone to 14.5% in Gurage Zone. There was, however, significant variation in the level of missed opportunity by mode of delivery of the antenatal service. Those women who received antenatal care through outreach programs are less likely to miss tetanus immunization as opposed to women who received antenatal care in stationary health facilities (7.5% versus 13.3%), and the difference was statistically significant.

Table 3 also presented the relationship between missed opportunity for tetanus toxoid injection and the stage of pregnancy at the first visit. The result showed that 18% of those women who visited antenatal clinic for the first time in their third trimester of pregnancy were not given tetanus injection. On the other hand, those women who visited the service for

Table 3: Percentage (weighted) distribution of ANC attending women who missed TTI according to selected characteristics, Southern Ethiopia, 1997.

| Characteristics | Among women with ANC | |
|---|----------------------|--------------------------|
| | % with out TTI | N(Weighted) ¹ |
| Residence | | |
| Urban | 4.3 | 40411 |
| Rural | 12.9** | 231049 |
| Zone | | |
| Hadya | 10.1 | 63109 |
| Sidama | 11.4 | 118346 |
| Semen Omo | 11.3 | 27358 |
| KAT | 12.7 | 29851 |
| Gurage | 14.5 | 32797 |
| Mode of ANC delivery | | |
| Outreach | 7.5 | 78179 |
| Stationary | 13.3* | 193282 |
| Stage of pregnancy at the first visit of the ANC | | |
| 1st trimester | 9.4 | 33272 |
| 2nd trimester | 7.2 | 136517 |
| 3rd trimester | 18.1*** | 101672 |
| Number of ANC visits | | |
| 1 | 37.5*** | 43213 |
| 2-3 | 5.2 | 12947 |
| 4+ | 8.7 | 98769 |
| Total | 11.6 | 271460 |

¹Sample weighted on the original 1401 women

*p<0.05 **p<0.001 ***p<0.0001

the first time in their first and second trimesters had a relatively lower level of missed opportunity, which is estimated at 9.4% and 7.2%, respectively. It is also revealed that the number of antenatal visits is significantly associated with missed opportunity for tetanus toxoid injection. Over 37% of those women who had only one visit during the whole course of their pregnancy did not receive tetanus injection. On the other hand the level of missed opportunity was relatively small for those women who had 2-3 visits (5.2%) and at least four visits (8.7%).

Discussion

The study established the existence of a true missed opportunity for tetanus toxoid

immunization among antenatal care clients in the study area. The examination of the data for possible biases suggests the absence of both life long protection and recall biases. A similar study which was carried out in Ghana showed the absence of these biases (4). The World Health Organization recommends that all women receive two tetanus toxoid injections during their first pregnancy, a third dose 6-12 months later or during their next pregnancy, a fourth dose at least a year later or during subsequent pregnancy and a fifth dose at least one year latter or during subsequent pregnancy. The fifth dose is thought to provide life long protection (9). The absence of life long protection bias in our data might be due to the fact that the WHO recommendations on life long protection are not well taken by health providers in the study area. This in turn reflects the possibility that all women are vaccinated at each pregnancy independently of their immunization history. Not to take immunization history into account simplifies the organization of the immunization and is sometimes the only possibility in the absence of good immunization records. In the absence of information about previous immunization, the objective of health services should be to immunize all pregnant women.

It is highly unlikely to assume that women are unable to recall what happened to them during each pregnancy. Pregnancy and childbearing are special events to the mother and she is expected to recall most of the events related to each pregnancy. In line with this expectation, in the present study, most women were able to recall if they had received tetanus injection during a particular pregnancy in the five years preceding the survey.

This study revealed that missed opportunity for tetanus toxoid immunization was 11.6% which is comparable to a number of studies done in developing countries by the Demographic and Health Surveys (DHS). According to result of the DHS, missed opportunity for TTI was found to be 5.4% in Kenya, 14.2% in Nigeria, 14.0% in Uganda, 10.8% in Zimbabwe,

13.3% in Cameroon, and 12.7% in Zambia (5).

The data also showed that the level of missed opportunity was three times higher in rural areas as compared to urban areas. There could be a number of factors that could explain this difference. Antenatal clinics in the rural areas may not be fully operational or lack all the necessary facilities including tetanus vaccine. The other possible explanation could be that rural women have little knowledge about the different components of antenatal care and are less likely to inquire for tetanus vaccination when the health personnel negligently failed to immunize the clients. The study revealed that women who received ANC through outreach facilities were less likely to miss tetanus injection as opposed to those women who received the service through stationary facilities. However, the nature the present study does not allow to give proper explanation to the observed difference by mode of service delivery. Since this study was based on a cross-sectional design and also limited to bivariate analysis, it is difficult to give good explanation as to why outreach facilities are better in terms of missed opportunity for tetanus immunization. Nevertheless, experiences show that specially in rural areas outreach maternity care facilities would be more appropriate to reach populations living in inaccessible areas and, therefore, it is important to strengthen such facilities to serve those populations living in inaccessible areas.

The number of antenatal care visits and the time of the first antenatal check-up are important for the health of the mother and outcome of pregnancy. According to a study done in the Southern Region, only 12.5% of the women had their antenatal visit in their first trimester of pregnancy and most of these women (79%) had, at most, four visits (10). The present study pointed out the importance of early and repeated visits for the receipt of tetanus injection in the study area. Specially those women who initiated the first visit in their third trimester of pregnancy and those

who had only one visit in the whole course of pregnancy were highly likely to miss tetanus injection. There could be different reasons for such high level of missed opportunity among these women. The present research does not provide appropriate explanation for the observed situation among these groups of woman, however it is believed that early and repeated ANC visits should be encouraged not only for tetanus injection but also to maintain better maternity care during pregnancy. Finally, in order to better understand the reasons behind the observed missed opportunity for tetanus immunization in the study area, in-depth operational studies which focus on the availability and utilization of tetanus immunization are highly recommended.

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