Predictors for Uptake of Tetanus Toxoid Vaccination During Pregnancy Among Women of Reproductive Age in Tanzania; An Analysis of Data from the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicators Survey

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Abstract

Background: Tetanus is a vaccine preventable disease. Tanzania through its Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) recommend all women should receive at least five TT doses in their reproductive life. Little is known on predictors of TT uptake during pregnancy among women of reproductive age in Tanzania.

Method: The study used data from the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicators Survey (2015-16 TDHS-MIS). A total of 6924 women of active reproductive age from 15 to 49 were included in the analysis. Both univariate and multiple regression analyses were used to determine the predictors of TT uptake during pregnancy among women of reproductive age in Tanzania.

Results: More than half, 3480 (50.3%) of the study population had either no or one tetanus injection. A total of 3444 (49.7%) had two or more tetanus injection during pregnancy. After adjusted for confounders, predictors of uptake of tetanus vaccination were early antenatal booking (AOR=1.174 at 95% CI=1.033-1.335, p=0.014), age group of women [20 to 34 years (AOR=1.433 at 95% CI=1.155-1.778, p=0.001), more than 34 years (AOR=1.379 at 95% CI=1.065-1.786, p=0.015)], wealth index [rich (AOR=1.261 at 95% CI=1.083-1.468, p = 0.003), poor], parity [para 2-4 (AOR=0.401 at 95% CI=0.343-0.468, p<0.001), para 5 and above (AOR=0.217 at 95% CI=0.178-0.265, p<0.001)], level of education [primary level, (AOR=0.864 at 95% CI=0.754-0.99, p=0.035) zones [Unguja Zanzibar Island (AOR=0.434 at 95% CI=0.309-0.609, p<0.001), Pemba (Pemba Island) (AOR=0.34 at 95% CI=0.226-0.512, p<0.001)] and adequate ANC visits (AOR=0.649 at 95% CI=0.582-0.723, p<0.001).

Conclusion: Antenatal care service utilization, including both timeliness and the number of ANC visits attended were found important predictors for TT vaccine uptake. Therefore, the responsible ministry of health in the country should strengthen the strategies in place to increase maternal awareness on importance of ANC service utilization.

Methods
Study Area and period

The study was conducted in the United Republic of Tanzania from August 22, 2015, through February 14, 2016. Tanzania is among the countries found in East Africa. It is the largest country that covers 940,000 square kilometers and 60,000 square kilometers is inland water. The country lies south of the equator and shares borders with eight countries: Kenya and Uganda to the North; Rwanda, Burundi, the Democratic Republic of Congo, and Zambia to the West; and Malawi and Mozambique to the South.

Study Design

It was a national-based cross-sectional study utilizing the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) dataset.

Study Population

All women of reproductive age (aged 15–49 years) were the study population. The study used individual file recode (TZIR7BFL) with a total of 13266 women who responded to the survey (97% response rate). The study included only women who remembered the timing for antenatal booking of their youngest child. Those who were not able to recall the timing and those who did not respond to the question were removed from the analysis. A total of 6924 women who had birth within five years preceding the survey were included in the study.

Sampling Technique

Two stages of sampling were used to obtain a sample for urban and rural areas in Tanzania Mainland and Zanzibar. In the first stage, a total of 608 clusters were selected and in the second stage, a systematic selection of households was involved. A total of 22 households were then systematically selected from each cluster, yielding a representative probability sample of 13,376 households for the 2015-16 TDHS-MIS.

Data Collection Tool

The 2015-16 TDHS-MIS used household questionnaires and individual questionnaires. These questionnaires based on the Measure DHS standard AIDS Indicator Survey and Malaria Indicator Survey questionnaires standards. They were adapted and modified to reflect the Tanzanian population. They were translated into Kiswahili, Tanzania's national language. The data presented in this study are from the individual questionnaire.

Study Variables

Dependent

TT vaccine uptake

Independent variables

Sociodemographic characteristics (Maternal age, maternal education, place of residence, Wealth Index, marital status, and parity.

Results

Socio-demographic Characteristics

Majority of study respondents 5113(73.8%) resided in the rural setting of Tanzania, aged 20 to 34 years 4557(65.8%), had primary education 4209(60.8) and were married 5650(86.1%) Table 1
| Variables                  | Frequency | Percent (%) |
|----------------------------|-----------|-------------|
| **Place of residence**     |           |             |
| Urban                      | 1811      | 26.2        |
| Rural                      | 5113      | 73.8        |
| **Age group**              |           |             |
| Less than 20 years         | 541       | 7.8         |
| 20 to 34 years             | 4557      | 65.8        |
| More than 34 years         | 1826      | 26.4        |
| **Educational level**      |           |             |
| No education               | 1329      | 19.2        |
| Primary education          | 4209      | 60.8        |
| Secondary                  | 1326      | 19.2        |
| Higher                     | 60        | 0.9         |
| **Parity**                 |           |             |
| Para one                   | 1595      | 23          |
| Para 2–4                   | 3154      | 45.6        |
| Para 5+                    | 2175      | 31.4        |
| **Wealth index**           |           |             |
| Poor                       | 2734      | 39.5        |
| Middle                     | 1363      | 19.7        |
| Rich                       | 2827      | 40.8        |
| **Marital Status**         |           |             |
| Never in union             | 441       | 6.4         |
| Married                    | 5650      | 86.1        |
| Widow                      | 119       | 1.7         |
| Separated                  | 714       | 10.3        |
| **Respondent currently working** |       |             |
| Not working                | 1498      | 21.6        |
| Working                    | 5426      | 78.4        |
| **Mainland/Zanzibar**      |           |             |
| Mainland urban             | 1618      | 23.4        |
| Mainland rural             | 4357      | 62.9        |
| Unguja (Zanzibar Island)   | 594       | 8.6         |
| Pemba (Pemba Island)       | 355       | 5.1         |

**Uptake of Tetanus Toxoid vaccination**

More than half, 3480 (50.3%) of the study population had either no or one tetanus injection and 3444 (49.7%) had two or more tetanus injection during pregnancy.

**The relationship between women’s characteristics and uptake of TT vaccination**

The variables which showed significant relationship with uptake of TT vaccination were place of residence ($p < 0.001$), age group ($p < 0.001$), education level ($p < 0.001$), parity ($p < 0.001$), ANC booking ($p < 0.001$), wealth index ($p < 0.001$), marital status ($p < 0.001$), zones ($p < 0.001$) and ANC use ($p < 0.001$) Table 2
Table 2
The relationship between women's characteristics and uptake of TT vaccination

| Variables                  | Adequate TT | Inadequate TT | X2   | p-value |
|----------------------------|-------------|---------------|------|---------|
| Place of residence         |             |               |      |         |
| Urban                      | 1119(61.8)  | 692(38.2)     | 142.422 | < 0.001 |
| Rural                      | 2325(45.5)  | 2788(54.5)    |      |         |
| Age group                  |             |               |      |         |
| 15–19                      | 325(60.1)   | 216(39.9)     | 163.314 | < 0.001 |
| 20–34                      | 2439(53.5)  | 2118(46.5)    |      |         |
| 35–49                      | 680(37.2)   | 1146(62.8)    |      |         |
| Educational level          |             |               |      |         |
| No education               | 571(43)     | 758(57)       |      |         |
| Primary education          | 2088(49.6)  | 2121(50.4)    |      |         |
| Secondary                  | 740(55.8)   | 586(44.2)     |      |         |
| Higher                     | 45(75)      | 15(25)        | 59.271 | < 0.001 |
| Parity                     |             |               |      |         |
| Para one                   | 1131(70.9)  | 464(29.1)     |      |         |
| Para 2–4                   | 1598(50.7)  | 1556(49.3)    |      |         |
| Para 5+                    | 715(32.9)   | 1460(67.1)    | 534.498 | < 0.001 |
| ANC Booking                |             |               |      |         |
| Late booking               | 2504(46.9)  | 2834(53.1)    |      |         |
| Early booking              | 940(59.3)   | 646(40.7)     | 74.715 | < 0.001 |
| Wealth index               |             |               |      |         |
| Poor                       | 1215(44.4)  | 1519(55.6)    |      |         |
| Middle                     | 645(47.3)   | 718(52.7)     |      |         |
| Rich                       | 1584(56)    | 1243(44)      | 78.659 | < 0.001 |
| Marital Status             |             |               |      |         |
| Never in union             | 306(69.4)   | 135(30.6)     |      |         |
| Married                    | 2687(47.6)  | 2963(52.4)    |      |         |
| Widow                      | 58(48.7)    | 61(51.3)      |      |         |
| Separated                  | 393(55)     | 321(45)       | 86.940 | < 0.001 |
| Mainland/Zanzibar          |             |               |      |         |
| Mainland urban             | 1041(64.3)  | 577(35.7)     |      |         |
| Mainland rural             | 2101(48.2)  | 2256(51.8)    |      |         |
| Unguja (Zanzibar Island)   | 214(36)     | 380(64)       |      |         |
| Pemba (Pemba Island)       | 88(24.8)    | 267(75.2)     | 275.044 | < 0.001 |
| ANC use                    |             |               |      |         |
| Adequate                   | 1996(57.3)  | 1490(42.7)    |      |         |
| Inadequate                 | 1448(42.1)  | 1990(57.9)    | 158.710 | < 0.001 |
| Respondent currently working|           |               |      |         |
| No                         | 764(51)     | 734(49)       |      |         |
| Yes                        | 2680(49.4)  | 2746(50.6)    | 1.216 | 0.27    |
After adjusted for confounders, predictors of uptake of tetanus vaccination were early antenatal booking (AOR = 1.174 at 95% CI = 1.033–1.335, p = 0.014), age group of women [20 to 34 years (AOR = 1.433 at 95% CI = 1.155–1.778, p = 0.001), more than 34 years (AOR = 1.379 at 95% CI = 1.065–1.786, p = 0.015)], wealth index [rich (AOR = 1.261 at 95% CI = 1.083–1.468, p = 0.003)], parity [para 2–4 (AOR = 0.401 at 95% CI = 0.343–0.468, p < 0.001), para 5 and above (AOR = 0.217 at 95% CI = 0.178–0.265, p < 0.001)], level of education [primary level, (AOR = 0.864 at 95% CI = 0.754–0.99, p = 0.035)] zones [Unguja Zanzibar Island (AOR = 0.434 at 95% CI = 0.309–0.609, p < 0.001), Pemba (Pemba Island) (AOR = 0.34 at 95% CI = 0.226–0.512, p < 0.001)] and adequate ANC visits (AOR = 0.649 at 95% CI = 0.582–0.723, p < 0.001) Table 3
### Table 3
Predictors for the uptake of TT vaccination

| Variable                  | OR  | 95%CI | p-value | AOR  | 95%CI | p-value | Lower | Upper | Lower | Upper | Lower | Upper | Lower | Upper | Lower | Upper |
|---------------------------|-----|-------|---------|-------|-------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| **ANC Booking**           |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Late booking              | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Early booking             | 1.647 | 1.47  | 1.845   | < 0.001 | 1.174 | 1.033   | 1.335 | 0.014 |       |       |       |       |       |       |       |       |
| **Age groups**            |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Less than 20 years        | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| 20 to 34 years            | 0.765 | 0.638 | 0.918   | 0.004 | 1.433 | 1.155   | 1.778 | 0.001 |       |       |       |       |       |       |       |       |
| More than 34 years        | 0.394 | 0.324 | 0.48    | < 0.001 | 1.379 | 1.065   | 1.786 | 0.015 |       |       |       |       |       |       |       |       |
| **Place of residence**    |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Urban                     | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Rural                     | 0.516 | 0.462 | 0.575   | < 0.001 | 0.729 | 0.514   | 1.033 | 0.075 |       |       |       |       |       |       |       |       |
| **Wealth index**          |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Poor                      | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Middle                    | 1.123 | 0.986 | 1.279   | 0.081 | 1.129 | 0.981   | 1.299 | 0.089 |       |       |       |       |       |       |       |       |
| Rich                      | 1.593 | 1.433 | 1.771   | < 0.001 | 1.261 | 1.083   | 1.468 | 0.003 |       |       |       |       |       |       |       |       |
| **Educational level**     |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| No education              | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Primary education         | 1.307 | 1.154 | 1.48    | < 0.001 | 0.864 | 0.754   | 0.99  | 0.035 |       |       |       |       |       |       |       |       |
| Secondary                 | 1.676 | 1.438 | 1.954   | < 0.001 | 0.903 | 0.743   | 1.097 | 0.306 |       |       |       |       |       |       |       |       |
| Higher                    | 3.982 | 2.198 | 7.216   | < 0.001 | 1.374 | 0.73    | 2.588 | 0.325 |       |       |       |       |       |       |       |       |
| **Parity**                |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Para one                  | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Para 2–4                  | 0.421 | 0.37  | 0.479   | < 0.001 | 0.401 | 0.343   | 0.468 | < 0.001 |       |       |       |       |       |       |       |       |
| Para 5+                   | 0.201 | 0.175 | 0.231   | < 0.001 | 0.217 | 0.178   | 0.265 | < 0.001 |       |       |       |       |       |       |       |       |
| **Marital Status**        |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Never in union            | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Married                   | 0.4  | 0.325 | 0.493   | < 0.001 | 0.906 | 0.718   | 1.143 | 0.405 |       |       |       |       |       |       |       |       |
| Widow                     | 0.419 | 0.278 | 0.634   | < 0.001 | 1.059 | 0.679   | 1.651 | 0.801 |       |       |       |       |       |       |       |       |
| Separated                 | 0.54 | 0.42  | 0.694   | < 0.001 | 1.031 | 0.785   | 1.355 | 0.824 |       |       |       |       |       |       |       |       |
| **Mainland/Zanzibar**     |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Mainland urban            | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Mainland rural            | 0.516 | 0.459 | 0.581   | < 0.001 | 1.036 | 0.712   | 1.507 | 0.853 |       |       |       |       |       |       |       |       |
| Unguja (Zanzibar Island)  | 0.312 | 0.257 | 0.38    | < 0.001 | 0.434 | 0.309   | 0.609 | < 0.001 |       |       |       |       |       |       |       |       |
| Pemba (Pemba Island)      | 0.183 | 0.141 | 0.237   | < 0.001 | 0.34  | 0.226   | 0.512 | < 0.001 |       |       |       |       |       |       |       |       |
| **ANC visits**            |     |       |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Adequate                  | 1   | 1     |         |       |       |         |       |       |       |       |       |       |       |       |       |       |
| Inadequate                | 0.543 | 0.494 | 0.598   | < 0.001 | 0.649 | 0.582   | 0.723 | < 0.001 |       |       |       |       |       |       |       |       |

**Discussion**

The proportional of those not using either a single dose of TT during pregnancy revealed to be a half of the total study population, reflecting the general population. Likewise, the study further noted that less than fifty percent of women of reproductive age received either TT2+, despite numerous government interventions to increase the coverage.
Antenatal care service utilization have been recognized important approach to improve uptake of TT vaccine among women of reproductive age (10, 13). Our study showed that early ANC booking determines the uptake of TT vaccine. Similarly, the study showed that having inadequate ANC Visits decreased the likelihood of getting Tetanus Toxoid vaccine. Our findings were in-line with the findings by Mihret and colleagues (14) who asserted that timely initiation of ANC services increased the likelihood of TT vaccine uptake in Ethiopia. Adequate ANC service utilization provides exposure to the woman on health information regarding different ANC services including TT vaccine (28).

The analysis revealed that age of the woman increased the odds of TT vaccine uptake. This was found also in two studies done in Ethiopia which concluded the significance of age in uptake of TT vaccine (15, 16).

In this study, parity was found less likely to promote TT vaccine uptake, which is congruent to findings from Nigeria, were parity had no any statistical association with TT vaccine uptake (21). However, the findings is contrary to what was reported by Yaya and colleagues (10) in their study from Ivory Coast, were parity increased the odds of TT vaccine uptake. It is further claimed that parity of the woman promotes maternal healthcare utilization (29). The difference between the current findings and other studies could be due to sociodemographic characteristics which is claimed to alter ability of maternal healthcare service utilization (30).

Residence of the woman determines TT vaccine uptake that is supported by our study and findings from two community-based cross-sectional studies done in Ethiopia (1, 18). According to Gebremedhin et al., (2020) walking more than 30 minutes to reach health facility decreased the woman's chance to access ANC clinic for TT vaccine uptake.

Moreover, women with high income had higher odds to receive TT vaccine. The findings of several studies done in Africa indicated similar statistical association between the level of income of the woman and TT vaccine uptake (22–24). It is asserted that wealthier women are more likely to afford for access to ANC services for TT vaccine uptake (31) which can be the evidence to our research findings.

Another important findings obtained in this study was that those whose who resided from Zanzibar Islands increased the likelihood of getting TT vaccine compared to residing in Mainland Tanzania. Sociocultural differences could be the reason for the observed disparities. In Ghana, Dapaah and Nachinaab (26) in their study entitled "sociocultural determinants of the utilization of maternal health care services" revealed that religion and traditional belief system contributed to the uptake reproductive health services including TT vaccination.

**Conclusion**

Antenatal care service utilization, including both timeliness and the number of ANC visits attended were found important predictors for TT vaccine uptake. Therefore, the responsible ministry of health in the country should strengthen the strategies in place to increase maternal awareness on importance of ANC service utilization. The healthcare providers should plan for daily basis health education provision to increase awareness. The study, further recommend that where ANC coverage is inadequate, mass vaccination of women of childbearing age could be an alternative initiative to increase the uptake, and hence, the coverage. TT vaccine has a significant impact towards eliminating maternal and neonatal tetanus and its related mortalities.

**Abbreviations**

AIDS Acquired Immune-Deficiency Syndrome

ANC Antenatal care

DHS Demographic Health Survey

MoHCDGEC Ministry of Health, Community Development, Gender, Elderly and Children

TDHS-MIS Tanzania HIV Demographic and Health Survey and Malaria Indicators Survey

TT Tetanus Toxoid

WHO World Health Organization

WRA Women of Reproductive Age

**Declarations**

*Ethics approval and consent to participate*

Data collection and the survey content and protocol were approved by Tanzania's National Institute for Medical Research (NIMR), the Zanzibar Medical Ethics and Research Committee (ZAMREC), the Institutional Review Board of ICF International, and the Centers for Disease Control and Prevention in Atlanta, USA. Participants provided verbal consents and the household interviews took place privately. For participants under the age of 18, written consent was requested from their parent or guardian.

*Consent for publication*

Not applicable
Availability of data and material

The data that support this analysis are available from the 2015-16 Tanzania HIV and Malaria Indicators Survey (THMIS). This survey was conducted by the National Bureau of Statistics (NBS) in collaboration with the Tanzania Commission for AIDS (TACAIDS) and the Zanzibar AIDS Commission (ZAC), the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) (Tanzania) and the USAID-Funded Measure DHS project. Data is available from the authors upon reasonable request and with permission from MEASURE DHS.

Competing interests

Authors declare there is no competing interest.

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Authors’ contributions

FVM did the conceptualization, data analysis and drafted the manuscript and led the process of critical revision of the manuscript. MBT wrote the introduction and discussion section and critical review of the manuscript. All authors read and consent for the manuscript to be submitted for peer review.

Availability of data and materials

Data set is available and can be shared on request.

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**Figures**

![Uptake of Tetanus Toxoid vaccination](image)

**Figure 1**

Uptake of Tetanus Toxoid vaccination

**Supplementary Files**

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