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 6924women 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)], 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.

Background

Maternal tetanus is bacterial devastating disease acquired during pregnancy or postpartum period, irrespective of whether the pregnancy ended with a live or dead childbirth(1). African region suffers nearly 110,000 deaths per year from maternal and neonatal tetanus (2). UNICEF report showed neonatal tetanus perishes at least four neonatal lives each hour. In 2017, it was estimated 31,000 neonatal deaths from neonatal tetanus (3), with a small drop according to 2018 WHO report of 25,000 neonatal deaths from similar cause (4).

Tetanus is a vaccine preventable disease (VPD). WHO and the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) recommend all women should receive at least five TT doses in their reproductive life (5). A fully immunized woman with TT, develops protective antibodies against tetanus for about 3, 5, 10, and 30 years, for TT2, TT3, TT4 and TT5 respectively(1). It is further emphasized by WHO that if a woman previously received 1 to 4 TT vaccines, should receive another single dose in subsequent pregnancies (6). According to research evidence, maternal vaccination protects the newborn baby against tetanus for a period of three months during postpartum period, and prevents neonatal deaths by 94% (1).One trial done in Colombia showed fewer cases of neonatal tetanus among TT immunized women (6). There are still high cases of home deliveries in African countries, including Tanzania (7, 8), which are attended in poor conditions under untrained attendants; increasing the risk of maternal and neonatal tetanus and its associated deaths, especially in rural communities (9, 10).

Only75% of women of reproductive age have been reported to receive at least TT2 + vaccine worldwide, while in Africa is 63% (1). In Tanzania, according to TDHS-MIS 2015/16, only 48% of women of reproductive age receivedTT1 or TT2 in their last pregnancy (11). However, for effective protection of neonatal tetanus and associated deaths, the pregnant woman should receive not less than two doses of TT vaccines during their last pregnancy (9, 11).

Adequate antenatal care (ANC) services utilization provides a convenient time for pregnant women to receive TT vaccines (12). Studies conducted elsewhere in Pakistan and Ivory Coast indicated that ANC service utilization promotes TT vaccine coverage among pregnant women (10, 13). A study done in Ethiopia showed a positive association between early ANC booking and TT vaccine uptake (14). On the other hand, sociodemographic characteristics are also linked to adequacy of TT vaccine uptake. Two studies from Ethiopia showed that younger women are more likely to attend ANC clinics for TT vaccine (15, 16). Maternal education also matters in TT vaccine uptake as primary education or none was found to be an obstacle from a myriad of studies (10, 15, 17, 18). Maternal education level is linked to the knowledge level of health services and its advantages, hence improving its use (19, 20). Other women are barred by their place of residence to receive the required TT doses during pregnancy (1, 18). Besides, high parity was linked with high uptake of TT vaccine in a study done in Nigeria(21), although the recent study done in Ivory Coast argued against its association(10). Several research evidence support maternal economic status as one of the sociodemographic factors contributing to TT vaccination uptake (22−24).

Geographical location of the woman is predicted to contribute to inadequate TT vaccine uptake since it impacts the number and timeliness of ANC services utilization. One study done in Sierra Leone indicated the disparity of ANC service utilization to some locations of the country due to geographical differences (25). Sometimes the differences could be contributed by the differences of sociocultural factors between geographical locations (26).

WHO suggested three main strategies to prevent maternal and neonatal tetanus infection; high coverage of TT vaccine among WRA including pregnant women, clean delivery and appropriate action in high-risk areas (2). Tanzania, as a country has played a great role to exempt reproductive health services including TT vaccination. However, still there is low TT vaccine coverage in the country (27). The predictors for TT vaccine uptake among women of reproductive age in Tanzania have not been analyzed yet. Therefore, this necessitates the need for analysis of data from the 2015-16 TDHS-MIS to uncover the predictors.

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

Table 1
Socio-demographic Characteristics

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
	n (%)	n (%)		
Place of residence				
Urban	1119(61.8)	692(38.2)		
Rural	2325(45.5)	2788(54.5)	142.422	< 0.001
Age group				
15−19	325(60.1)	216(39.9)		
20−34	2439(53.5)	2118(46.5)		
35−49	680(37.2)	1146(62.8)	163.314	< 0.001
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

Predictors for uptake of Tetanus Toxoid Vaccination

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	
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								
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			
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			
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							
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

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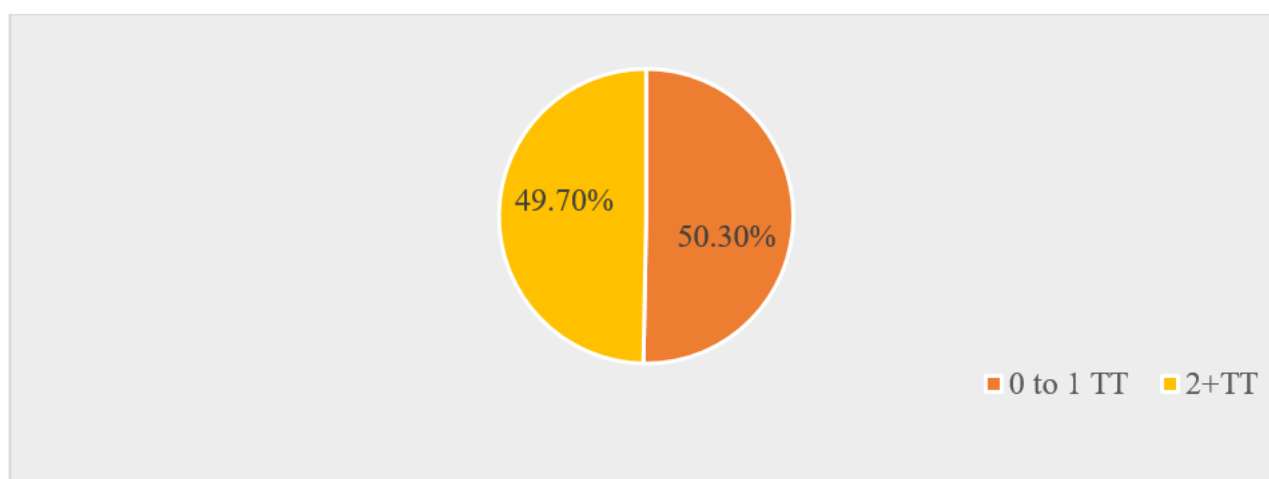
Figures

49.70% 50.30%

■ 0 to 1 TT ■ 2+TT
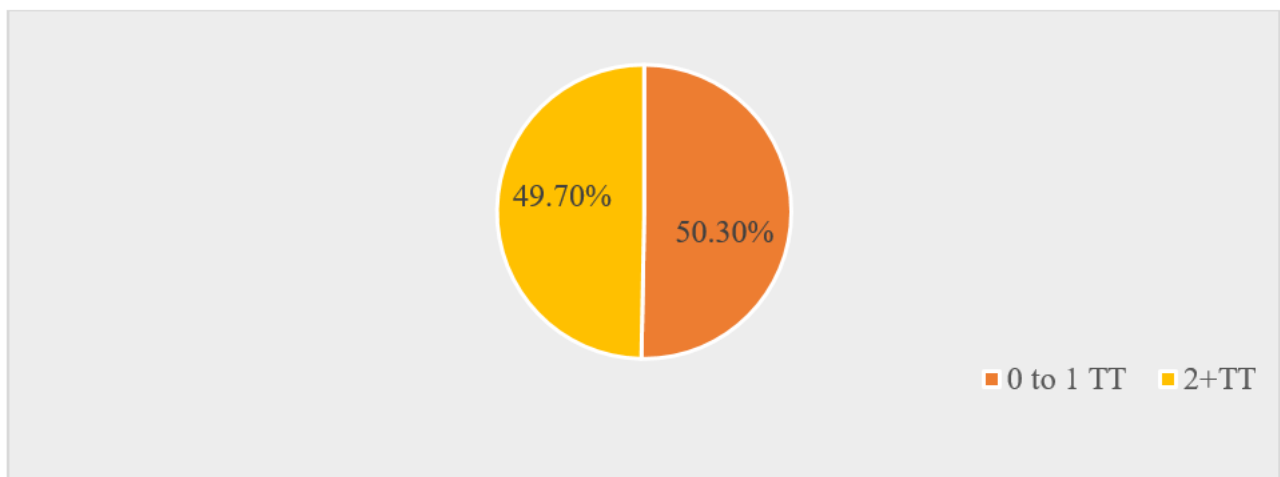
Figure 1

Uptake of Tetanus Toxoid vaccination

Figure 1

Uptake of Tetanus Toxoid vaccination

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