Factors Affecting Uptake of Optimal Doses of Tetanus Toxoid Vaccine in Six States of Nigeria

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ABSTRACT

Background: Tetanus toxoid (TT) immunization for pregnant women has remained the most effective strategy in eliminating neonatal and maternal tetanus. The vaccine for the pregnant women is supposed to be given five times. Despite the availability of vaccines for almost 50years, tetanus in pregnant women still remained a public health problem and contributor to morbidity and mortality in Nigeria. Many qualitative and quantitative factors contribute to the continued existence of tetanus in pregnant women. The objective of this analysis is to identify individual characteristics that could be associated with maternal immunization against tetanus.

Methods: The data comes from the study conducted by the Federal Ministry of Health Nigeria in collaboration with the National Bureau of Statistics (NBS) and the World Bank in 2013. A total of 1504 pregnant women responded for tetanus related questions in the interview at ANC units in six states of Nigeria. The analysis involved the use of Kruskal Wallis analysis of variance to test the statistical significance difference between each pair of variables for the quantitative data, Chi – square to test the significant relationship between each pair of variables for the qualitative data, and Multinomial logistic regression for multivariate analysis.

Results: A total of 1504 pregnant women responded for tetanus related questions in the interview at ANC units in six states of Nigeria. Among the respondents, 42.1% of the women were from Adamawa state, 1.8% from Benue, 12.2% from Nassarawa, 6.8% from Ogun state, 25.9% from 0ndo and 11.2% from Taraba state. Almost 95.9% of the women were married with median age of 25years, ranging from 13 - 50years. About 39.3% of the women had secondary and higher education, 21.4% did not receive tetanus toxoid vaccine while only 21.4% received more than 2 times. Several factors such as use of tetanus toxoid injection, use of traditional birth attendant services, spouse education, primigravidae, and age, were found to be significant predictors of maternal immunization against tetanus.

Conclusion: The results shows the urgent need for the government to strengthen the immunization coverage in Nigeria, through enlightenment, providing more easily accessible centers, and providing more well trained personnel to carry out the exercise.

Key words: Tetanus, pregnant women, Kruskal Wallis, Chi – square, Multinomial logistic regression

INTRODUCTION

WHO estimated about 787,000 neonatal tetanus related deaths in 1988 [1]. Neonatal mortality due to neonatal tetanus is still among the major health problems in underdeveloped and developing countries [2]. Neonatal tetanus is the tetanus that occurs in a newborn baby between the first 3 days to the first 28 days after birth. Maternal tetanus on the other hand is referred to as the tetanus that occurs during pregnancy period or after pregnancy termination but within the first 6 weeks. It is among the most easily preventable causes of maternal related deaths [3].

The vaccination with tetanus toxoid for pregnant women and those in child bearing age is among the most important methods for controlling both the maternal and neonatal tetanus [4]. The immunization requires administration of 5 doses of the vaccine to pregnant women in order to prevent MNT. Tetanus toxoid vaccine schedule for women in child bearing age is TT1 given during the first contact which gives no protection, after four weeks TT2 which gives 3 years protection, then TT3 at 6months after the 2nd dose which gives 5years protection, TT4 is given 1 year after the 3rd dose and it gives 10years protection, the last one is TT5 that is given 1year after the 4th dose and which gives lifetime/ all child bearing years protection [5].

Many factors promote maternal/neonatal tetanus in underdeveloped/developing countries. Some of these factors include but are not limited to; poor hygienic conditions, lack of access to sterilized childbirth delivery tools, unhygienic practices during childbirth, and limited access to health services. The transmission of the disease is brought about by contact between the bacteria and broken skin or dead tissues, such as the wound resulting when an infant's umbilical cord is cut [6].

The objective of this analysis is to identify individual characteristics that could be associated with maternal immunization against tetanus.

MATERIALS AND METHOD

The data comes from the study conducted by the Federal Ministry of Health Nigeria in collaboration with the National Bureau of Statistics (NBS) and the World Bank in 2013. A total of 1504 pregnant women responded for tetanus related questions in the interview at ANC units in six states of Nigeria. The variables considered are states, education level for the pregnant woman, marital status, husband’s level of education, number of

pregnancy, livestock keeping, health insurance scheme, distance, TBA, Land asset, laboratory test, and age.

The analysis involved the use of Kruskal Wallis analysis of variance to test the statistical significance difference between each pair of variables for the quantitative data, Chi – square to test the significant relationship between each pair of variables for the qualitative data, and Multinomial logistic regression for multivariate analysis.

RESULTS

The data analysis for this study was done using IBM SPSS version 20. The objective of this analysis is to identify individual characteristics that could be associated with maternal immunization against tetanus. A total of 1504 pregnant women responded for tetanus related questions in the interview at ANC units in six states of Nigeria. Among the respondents, 42.1% of the women were from Adamawa state, 1.8% from Benue, 12.2% from Nassarawa, 6.8% from Ogun, 25.9% from 0ndo and 11.2% from Taraba state. Almost 95.9% of the women were married with median age of 25years, ranging from13-50years. About 39.3 of the women had secondary and higher education, 21.4% did not receive tetanus toxoid vaccine while only 21.4% received more than 2 times.

Table 1: Descriptive statistics and bivariate analysis of qualitative variables among respondents

Variables	No. of Respondents	Percentage (%)	Tetanus toxoid vaccine			p-value
			None	1-Time	2 or more	
States						
Adamawa	633	42.1	42	444	147	
Benue	27	1.8	9	10	8	
Nassarawa	183	12.2	64	84	35	<0.001
Ogun	103	6.8	55	41	07	
Ondo	389	25.9	128	198	63	
Taraba	169	11.2	24	129	16	
Education						
Preprimary	417	27.7	54	295	68	

Primary	330	21.9	87	191	52	<0.001
Secondary	515	34.2	107	310	98	
Higher	77	5.1	25	32	20	
No education	165	11.0	49	78	38	
Marital status						
Single	34	2.3	5	22	7	0.652
Married	1442	95.9	313	865	264	
Widowed	15	1.0	1	10	4	
Divorced	13	0.9	3	9	1	
Husband education level						
Preprimary	225	17	23	188	44	<0.001
Primary	189	12.6	43	110	36	
Secondary	633	42.1	144	380	109	
Higher	208	13.8	51	109	48	
No education	219	14.6	61	119	39	
Primigravida						
Yes	588	39.1	102	435	51	<0.001
No	916	60.9	220	471	225	
Tetanus Toxoid Injection						
Yes	1117	74.3	139	734	244	<0.001
No	387	25.7	183	172	32	
Laboratory Test						
Yes	247	30.4	99	264	93	0.367
No	1047	69.6	223	641	183	
Health insurance scheme						
Yes	1117	30.4	99	265	93	0.413
No	387	69.6	223	641	183	
Land asset						
Yes	843	56.1	130	538	175	<0.001
No	661	43.9	192	101	368	

Livestock keeping						
Yes	1085	72.1	208	666	221	0.002
No	419	27.9	114	240	65	
Use of Traditional birth attendant						
Yes	299	19.9	72	153	74	0.001
No	1205	80.1	250	753	202	

Frequency distribution, percentages and chi square test of tetanus toxoid vaccine by characteristics respondent was displayed in table 1 above. The effect of each variable can be directly interpreted using the relative risk ratio with respect to their p-value. It was observed that partial receipt of tetanus toxoid vaccine was almost highest against each variable category. There was statistically significant association between tetanus toxoid vaccine between the states, level of education, spouse education level, primigravida, receipt of tetanus toxoid injection, owning of land or house by household, livestock keeping, and use of traditional birth attendant services.

From the bivariate analysis, tetanus toxoid injection have a significant effect among the pregnant women, based on the result, it was observe that there was increase with receipt of tetanus toxoid injection from 25.7% who had not receive the injection to 74.3% among those that received the injection. Also there was an increased with education from 21.9% who had primary education to 34.2% among those with secondary education ($p<0.001$). Women with first pregnancy were also statistically significant ($p<0.001$) in which 60.9% were not primigravida. Land asset was also significant ($p<0.001$) were households who own either house or land were 56.1% while those that were not having house or land were 43.9%. Livestock keeping was found to be significant ($p=0.002$) in which 72.1% of them were livestock keepers, while 27.9% were not. There was significant decrease in use of traditional birth attendant services from 80.1% who were not served by TBA to 19.9% among those who were served.

Table 2: Descriptive statistics and bi-variate analysis of quantitative variables among respondents

Variable	IPTp Median (IQR)			p-value
	None	1-Time	2-Times	
Age	25(9)	24.5(9)	26(7)	<0.000
Distance	1.00(2)	1.00(1)	1.00(2)	0.030

Quantitative variables were tested using kruskal Wallis analysis of variance test. Based on the result, Age was statistically significant (p<0.001) among the pregnant women. Also distance from their home to the health facility was also statistically significant (p=0.030).

Table 3: Socioeconomic, Demographic and Geographic factors characteristics of TTV used

Variables	Partial TTV versus None				Optimal TTV versus None			
	Odds Ratio	95% CI		p-value	Odds Ratio	95% CI		p-value
		lower	Upper			lower	Upper	
States (ref. Taraba)								
Adamawa	1.540	0.855	2.776	0.151	4.161	1.915	9.038	0.000
Benue	0.263	0.088	0.784	0.016	1.546	0.437	5.472	0.4999
Nassarawa	0.430	0.230	0.806	0.008	1.085	0.465	2.535	0.850
Ogun	0.130	0.066	0.259	0.000	1.118	0.039	0.354	0.000
Ondo	0.229	0.128	0.405	0.000	0.522	0.236	1.157	0.109
Education (ref. No education)								
Preprimary	1.390	0.724	2.667	0.322	0.831	0.379	1.821	0.643
Primary	1.329	0.730	2.419	0.353	0.833	0.402	1.728	0.624
Secondary	1.731	0.936	3.202	0.080	1.427	0.690	2.948	0.338
Higher	1.951	0.385	2.347	0.913	1.518	0.535	4.308	0.443
Marital status(ref. divorced)								
Single	1.641	0.249	10.828	0.607	6.652	0.414	106.8	0.181
Married	1.399	0.308	6.349	0.664	2.786	0.246	31.55	0.408
Widowed	8.863	0.376	208.935	0.176	28.882	0.649	1285.0	0.082

Husband education level (ref. No education)								
Preprimary	2.243	1.090	4.618	0.028	2.481	1.038	5.924	0.041
Primary	1.219	0.665	2.235	0.521	1.609	0.757	3.418	0.216
Secondary	1.080	0.647	1.803	0.768	1.065	0.563	2.014	0.848
Higher	1.040	0.542	1.993	0.907	1.308	0.594	2.878	0.505
Primigravida (ref. No)								
Yes	2.176	1.521	3.113	0.000	0.596	0.372	0.995	0.031
Health insurance scheme (ref. No)								
Yes	0.605	0.268	1.366	0.266	0.804	4.104	7.819	0.000
Livestock keeping (ref. Yes)								
No	1.212	0.861	1.707	0.271	1.222	0.791	1.889	0.366
Distance	0.989	0.906	1.080	0.807	1.505	0.953	1.157	0.323
TBA	0.555	0.377	0.818	0.003	0.960	0.614	1.501	0.857
TTI	5.665	4.104	7.819	0.000	8.553	5.365	13.635	0.000
Land asset	1.120	0.803	1.562	0.505	1.152	0.767	1.730	0.496
Laboratory test	0.778	0.555	1.092	0.147	0.947	0.630	1.442	0.947
Age	1.025	0.996	1.056	0.090	1.051	1.016	1.088	0.005

Multinomial logistic regression analysis result was presented in table 3 above, it was observe that age of the pregnant women was a significant predictor of optimal maternal immunization against tetanus, were a unit increase in age implies an increase in odds of partial tetanus toxoid vaccine (OR = 1.051, 95% CI = 1.016 – 1.088).

First pregnancy was also a significant predictor of both partial and optimal tetanus toxoid vaccination ($p < 0.000$ and $p = 0.031$) respectively. Such that, receipt of partial tetanus toxoid vaccine among women with first pregnancy were 2.176times more likely among those that are not primigravidae (OR = 2.176, 95% CI = 1.521 – 3.113), whereas receipt of optimal tetanus toxoid vaccine among women with first pregnancy were 40.4% lower amongst those that were not primigravidae.

Tetanus toxoid injection was also a significant predictor of both partial and optimal maternal immunization against tetanus ($p < 0.001$) both, were partial tetanus toxoid

vaccination among pregnant women was significantly higher among those who were not injected (OR = 5.665, 95% CI = 4.104 – 7.819), also likelihood of optimal tetanus toxoid vaccination among pregnant women was 8.553times higher among those who were not injected (OR = 8.553, 95% CI = 5.365 – 13.635).

Husband education was also a significant predictor of both optimal and partial tetanus toxoid vaccine (p = 0.041, p = 0.028) respectively. Such that women whom their spouses have preprimary education were highest among those who had received partial tetanus toxoid (OR = 2.243, 95% CI = 1.090 – 4.618) as well as those who received optimal tetanus toxoid vaccine (OR = 2.481, 95% CI = 1.038 – 5.924).

Traditional birth attendant use was significant predictor of partial but not optimal tetanus toxoid vaccine (p = 0.003). Used of traditional birth attendant services were 44.5% less likely than those among women who received partial tetanus toxoid vaccine (OR = 0.555, 95% CI = 0.377 – 0.818).

Regarding state of residence, its effect was mostly on partial tetanus toxoid vaccine among pregnant women, whereby the likelihood of partial maternal immunization against tetanus was 73.7% lower in Benue state (OR = 0.263, 95% CI = 0.088 – 0.784), 57% lower in Nassarawa state (OR = 0.430, 95% CI = 0.230 – 0.806), 87% lower in Ogun state (OR = 0.130, 95% CI = 0.066 – 0.259), and 77% lower in Ondo state (OR = 0.229, 95% CI = 0.128 – 0.408) than in Taraba state. Some states were also significant in optimal tetanus toxoid vaccine among pregnant women residing there, whereby the likelihood of optimal maternal immunization against tetanus was significantly higher in Adamawa state (OR = 4.161, 95% CI = 1.915 – 9.038) at (p < 0.001) than in Taraba state. While optimal tetanus toxoid vaccine was 88.2% lower in Ogun state (OR = 0.118, 95% CI = 0.039 – 0.352) among pregnant women.

Discussion

In this study, out of 1504 pregnant women, only 18.4% received optimal tetanus toxoid vaccine, 62.2% received partial dose while 21.4% did not received the vaccine. Several factors associated with partial and optimal tetanus toxoid vaccine or both in pregnancy were identified. In the study area, it was observed that a unit increase in age implies an increase in odds of partial tetanus toxoid vaccine, receipt of both partial and optimal tetanus toxoid vaccine among women with first pregnancy higher among primigravidae

compared with multigravidae. Also tetanus toxoid injection was higher among pregnant women who received both partial and optimal tetanus toxoid vaccine as well as spouse education level, it was also observed that women whom their spouses have preprimary education were highest among those who had received both partial and optimal tetanus toxoid vaccine. Lastly used of traditional birth attendant services were less likely than those among women who received partial tetanus toxoid vaccine.

Conclusion

Tetanus toxoid vaccine is a safe and insusceptible vaccine which provides long term protection to pregnant women and infants against tetanus. Vaccinating every antenatal woman with at least one dose of TT would be reasonable and effective way to protect them against neonatal tetanus, and would be a step toward eradicating the losses that continue to occur due to this inevitable disease in Nigeria.

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