

Original Article

Factors Affecting Maternal Tetanus Vaccination in Dakahlia Governorate, Egypt

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Abstract

Background: Tetanus toxoid (TT) vaccine is still recommended for pregnant women even in countries that declared elimination of neonatal tetanus (NT) and consequently the maternal tetanus (MT). Many factors may affect TT vaccination during pregnancy.

Objective(s): This study was conducted to identify the factors affecting maternal tetanus vaccination among a sector of Egyptian women in Dakahlia governorate.

Methods: A cross-sectional study design was used throughout the study. Two-stage cluster sampling technique was used to interview a total number of 3780 women with children of 0–11 months old in the eighteen districts of El-Dakahlia governorate, Egypt. Women were interviewed by using the "standard WHO EPI TT immunization of women cluster form".

Results: About two thirds (63.2%) of surveyed women received the full recommended doses of TT vaccine. Receiving of TT vaccine was significantly higher among women who had one or two parities, and 1.5 times higher among women who had at least four antenatal follow up visits. Factors that hindered TT vaccination were not being advised by doctors, and inconvenient time of vaccination sessions as reported by 54.8% and 34% of interviewed women, respectively. Lack of awareness about vaccine importance, and vaccine schedule were reported by 18.9%, and 16.2% of surveyed women, respectively.

Conclusion: Number of parity, frequency of seeking antenatal care, advice of healthcare providers, and lack of awareness were the main identified factors that affected receiving TT vaccine during pregnancy.

Key words: Maternal tetanus vaccination; Egypt

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INTRODUCTION

Tetanus is a fatal acute disease induced by the released neurotoxin of the *Clostridium tetani* bacterium. Unclean delivery is the main risk factor of maternal and neonatal tetanus (MNT). In addition, pregnancy is associated with immune suppression that makes pregnant women more susceptible for many infections such as tetanus.⁽¹⁾ World Health Organization (WHO) reported that neonatal tetanus (NT) kills over 200,000 newborns each year; almost all of these deaths occur in developing countries, while it is very rare in developed nations.⁽²⁾ A sum of 1199 of NT cases was reported in the Eastern Mediterranean Region by WHO, out of them 36 NT cases were reported in Egypt during the year 2008.⁽³⁾ Beside clean delivery among pregnant women, tetanus toxoid (TT) vaccination is considered the feasible cost-effective intervention, that proved to ameliorate the burden of this disease by increasing immunity among pregnant women and hence neonates, against tetanus infection. Tetanus

vaccination aims at achieving global MNT elimination and ensuring lifelong protection against tetanus in population.⁽⁴⁾

Maternal tetanus (MT) is considered to have been eliminated in areas where NT has been eliminated. Elimination of NT is defined as having an annual rate of <1 case of NT per 1000 live births in each district in a country. The Egyptian program to eliminate MNT was initiated in 2001, with many supplementary immunization activities. The number of reported cases of NT dropped from 194 in 2001 to 44 in 2006 and became 11 in 2009.^(5, 6) In February 2007, the Ministry of Health and Population, in collaboration with WHO and United Nations Children's Fund (UNICEF), carried out a community-based survey that indicated elimination of NT in many districts in Egypt.⁽⁵⁾ Tetanus vaccination for pregnant women is one of the Egyptian health priorities.⁽⁶⁾ Maternal acceptance of recommended vaccinations is a main key for improving maternal immunization rates. Socio-cultural and psychological factors were reported to be of significant influences for maternal vaccine

acceptance.^(7, 8) Family disagreement on MT vaccination is one of the hindering factors of vaccine uptake.⁽⁹⁾ Pregnant women may ignore receiving TT vaccine due to their mistrust of the healthcare system and poor accessibility to vaccination sites.^(10, 11) Moreover, obstetricians have a great influence on women's decision to receive TT vaccine or not.⁽¹²⁾

Determination of the barriers of maternal TT vaccination program in developing countries will assist the program strengthening and improve maternal and newborn health.⁽¹³⁾ Hence, TT vaccine is still provided for Egyptian pregnant women because tetanus spores cannot be removed from the environment⁽⁵⁾, therefore the aim of the present study was to determine the factors affecting the TT vaccination among pregnant women in Dakahlia governorate.

METHODS

Study setting and design: A cross-sectional survey was conducted in El-Dakahlia governorate that included 18 districts during the period from March 2013 to April 2014. This governorate is one of the largest governorates of the delta region. It includes both urban and rural communities, and within which Mansoura University exists.

Study population and sampling: A total number of 3780 women with children of 0–11 months old were interviewed in the eighteen districts of Dakahlia governorate. This number of interviewed women was determined according to principles of two-stage cluster sampling technique according to the immunization coverage survey manual, WHO 2005⁽¹⁴⁾. In the first stage, 30 clusters from each district were sampled. In the second stage 7 women with children aged 0–11 months were sampled from each cluster. The sample size was 30 clusters multiplied by 7 sample units (7 women). This was determined according to Probability Proportion to Size (PPS). The PPS ascertains that the probability of a particular sampling unit being selected in the sample is proportional to the population size of the sampling unit. So, the total number of women to be studied in each district should be 210, with 7 women in each cluster, assuming $p=0.05$, confidence limit= 95%, absolute precision (d)= 10%, design effect= 2. Sampling frame composed of a list of healthcare units/centers with the population density was obtained from the Ministry of Health and Population. This list was used to determine the number of clusters that would be obtained from each sub-district. The starting household to be visited was selected randomly.

In rural areas the first household was selected by randomly choosing a direction from a central location in the cluster. Then the households along that directional line to the edge of the cluster area were

counted and randomly one of them was selected. In urban areas if subdivisions exist, one subdivision was selected at random to indicate the subdivision in which the initial household is located. In areas where there were no clear subdivisions, the urban area was divided into subunits of approximately equal population. Consequently, the method described for rural areas was used.

Selecting subsequent houses depended on whether the houses are single-family dwellings or multi-family dwellings. For single-family dwellings, the second household to be visited was the one which is nearest to the first. For multi-family dwellings, one floor was chosen at random and then the first household to be visited was randomly selected from that floor. The second household to be visited was the door nearest to the first. After visiting all the households on the floor, a direction (i.e. up or down) was randomly chosen and all the households on that floor were visited. Then visits were continued from floor to floor visiting the next nearest floor, which had not been previously visited. After the whole building has been visited, data collector went to the nearest door of the nearest building and repeated the process.⁽¹⁴⁾

Data collection method and tools: The "standard WHO Expanded Program on Immunization (EPI) TT immunization of women cluster form" was adopted.⁽¹⁴⁾ The form included questions about the demographic characteristics of mothers such as their residency areas, education, and ages. Other questions concerned with the lifetime number of pregnancies and number of TT vaccine doses obtained in last and previous pregnancies, number of follow up antenatal visits during last pregnancy, and the different reasons of not being vaccinated for all or some doses of TT vaccine.

Statistical analysis

SPSS version 20 software was used in analyzing the entire data. Chi square test was used to find the difference among categorical data. The probability of receiving TT vaccine based on antenatal visits' frequencies was tested by odds ratio.

Ethical considerations

All required approvals were conducted by Egyptian Ministry of Health and Population, while this current work was done in parallel to the national immunization program survey. Oral informed consent was obtained from each interviewed woman.

RESULTS

Table (1) demonstrates that 72.2% of surveyed women were residents of rural areas, and 75.9% of them were educated. The mean age of those mothers was 24.5 ± 9.3 years old. Of the surveyed women 30.6% reported one lifetime pregnancy and 32.2% reported two lifetime pregnancies.

Table 1: Distribution of surveyed women according to their personal characteristics

Characteristics	Surveyed Women (n=3780)	
	No.	%
Residency		
Urban	1050	27.8
Rural	2730	72.2
Level of education		
Educated	2870	75.9
Non- educated	910	24.1
Age/ years (mean±S.D)	24.5±9.3	
Number of lifetime pregnancies		
One pregnancy	1155	30.6
Two pregnancies	1218	32.2
Three pregnancies	933	24.7
Four pregnancies and more	474	12.5

Table (2) shows the distribution of surveyed women according to their TT vaccination status. About two thirds (63.4%) of surveyed women reported that they received all the recommended doses of TT vaccine. While 26.2% of surveyed women received a number of TT vaccine less than the recommended doses and only 10.5% did not receive any dose of TT vaccine.

It was observed from table (3) that the number of fully vaccinated women declined with the increased number of pregnancies. The highest percentage of fully vaccinated women was observed among women who experienced one pregnancy (24.2%), followed by women who experienced two pregnancies (22.4%). However, the lowest percentage of fully vaccinated women was observed among women who experienced 4 pregnancies or more (4.5%). These results were statistically significant ($p \leq 0.05$).

Table 2: Distribution of surveyed women according to their TT vaccination status

Vaccination status	Surveyed Women (n=3780)	
	No.	%
Received all recommended TT doses	2390	63.4
Received number of TT doses less than the recommended doses	994	26.2
Completely unvaccinated	396	10.5

TT= tetanus toxoid vaccine

Table 3: Distribution of surveyed women according to their TT vaccination status in relation to number of lifetime pregnancies

Received TT doses	Number of pregnancies								Total	
	1		2		3		4+			
	No.	%	No.	%	No.	%	No.	%	No.	%
Received full recommended doses	913	24.2	848	22.4	456	12.1	173	4.5	2390	63.2
Received less than the recommended doses	242	6.4	368	9.7	479	12.6	301	7.9	1390	36.8
Total	1155	30.6	1216	32.2	935	24.7	474	12.5	3780	100
χ^2	376.2									
<i>p</i>	0.00001*									

*Statistically significant ($p \leq 0.05$)

The odds of receiving the recommended doses of TT vaccine in the last pregnancy was 1.5 times higher among women who had at least 4 antenatal follow up visits (2760 women, 73%) compared to women who had less than 4 antenatal follow up visits (252 women, 6.6%) (Table 4).

Table (5) shows the negative influences for receiving TT vaccine as reported by unvaccinated and partially vaccinated women. Among the health services related negative influences factors, lack of doctor

motivation and not receiving of antenatal card, were mentioned by 54.8% and 49.6 % of women, respectively, followed by inconvenient time session and long distance to reach healthcare unit (34% of women each). Individual negative influences such as lack of awareness about vaccine importance, vaccine schedule, as well as time and place of vaccination session were reported by 18.9%, 16.2%, and 6.1%, respectively. Social factors included undocumented early marriage among 21.7% of women and family troubles in 4.1%.

Table 4: Antenatal follow up visits during last pregnancy in relation to TT vaccination doses

Follow up visits during last pregnancy	Surveyed women (n= 3780)						Odds Ratio (C.I. 95%)	p
	Women received the recommended doses		Women did not receive the recommended doses		Total			
	No.	%	No.	%	No.	%		
At least 4 visits	2760	73	671	17.7	3431	90.8	1.5 (1.2; 2.0)	0.001*
Less than 4 visits	252	6.6	97	2.5	349	9.2		
Total	3012	79.7	768	20.3	3780	100		

*Statistically significant ($p \leq 0.05$)**Table 5: Distribution of partially or non- vaccinated women according to their mentioned negative influences for receiving TT vaccine**

Negative Influences	Non-vaccinated or partially vaccinated women (n= 1390)	
	No.	%
Health services and healthcare providers factors		
Lack of doctor motivation	763	54.8
Antenatal card not received	690	49.6
Inconvenient time session	34	2.4
Long distance to reach healthcare unit	34	2.4
Individual factors		
Lack of awareness about vaccine importance	264	18.9
Lack of awareness about vaccination session time and place	226	16.2
Lack of awareness about vaccination schedule	86	6.1
Fear of vaccine side effects	34	2.4
Rumors	27	1.9
Cultural and social factors		
Undocumented early marriage	302	21.7
Family troubles	57	4.1

DISCUSSION

International organizations such as WHO and UNICEF collaborate with national agencies all over the world to achieve the global maternal and neonatal tetanus elimination (MNTE) and to ensure lifelong protection against tetanus of general population. ^(2,4)

The present study revealed that more than two thirds of surveyed women in Dakahlia governorate received all the recommended doses of TT vaccine. This percentage of vaccinated women did not reach the target coverage that was indicated in the Global Vaccine Action Plan (GVAP). The vaccination coverage by the year 2020, should reach 90% at national coverage and 80% in every district or equivalent administrative unit for all vaccines in national programs. Countries that have succeeded in eliminating MNT must ensure that the majority of pregnant women are immunized against tetanus (at least >80%). ⁽¹⁵⁻¹⁷⁾ Accordingly, Dakahlia governorate was still below the GVAP indicated coverage. Thus the present study is in agreement with the WHO recommendations that emphasize the continued

strengthening of routine TT immunization of pregnant women to maintain the elimination of MNTE in Egypt. ⁽⁵⁾ Meanwhile it was found that 26.2% of surveyed women received a number of TT vaccine less than the recommended doses and 10.5% of them did not receive any dose of TT vaccine. These findings did not differ from the previous trend of MT immunization in Egypt, that was fluctuating from 69.5% in the year 1995, increased to 72.7% in 2000, and then decreased again to 69% in the year 2004. ⁽¹⁸⁾ The situation in Egypt is on the same line with other countries such as Pakistan and Turkey in which TT vaccination rate ranged from <60% to 74%. ^(19,20)

Many factors would affect the receiving of TT vaccination among pregnant women. In developing countries, it was observed that the attendance to antenatal care was correlated with the number of received doses of TT vaccine. ⁽¹³⁾ The current study revealed that higher parity and less attendance to antenatal care were significantly associated with lower number of TT vaccine doses. The lowest percentage of fully vaccinated women was observed among women who experienced four or more pregnancies and had

less than four antenatal follow up visits (4.5% and 6.6%, respectively). These findings are in agreement with the Turkish situation in which the vaccinated women were significantly higher among women of lower parity and had attended more antenatal care visits than the unvaccinated women.⁽²¹⁾ In a study in India, it was found that higher numbers of antenatal visits was associated with higher tetanus vaccination rate during pregnancy.⁽²²⁾ In the present study it has been observed that women in Dakahlia governorate extensively utilized the antenatal care. The majority of them (90.8%) reported ≥ 4 antenatal follow up visits during their most recent pregnancy. The overall utilization of antenatal care in Dakahlia governorate is higher slightly than that of the national antenatal care coverage (90%).⁽²³⁾ Singh et al., in India stated that 59% of women did not attend any antenatal visits during their most recent pregnancy.⁽²⁴⁾

Many studies emphasized the role of healthcare providers in motivating pregnant women to receive TT vaccine^(25- 27). Nearly half of unvaccinated women reported that their doctor did not motivate them to receive TT vaccine. It was found that healthcare system factors such as knowledge and attitude of healthcare providers and women themselves would affect tetanus immunization during pregnancy.⁽¹³⁾

In the current work, nearly one third of women mentioned that they did not receive TT vaccine because of the inconvenient time of vaccination sessions and the long distance to vaccination sites. Other factors include lack of awareness about vaccine importance, vaccine schedule, as well as time and place of vaccination sessions. In a study in Pakistan 15% were not aware of the importance of TT vaccine, while 40% reported that they missed doses due to the long distance to vaccination centers.⁽²⁸⁾ Moreover, Togora et al., in Benin found that timing of vaccination session and fear of side effects were main factors of low TT vaccine coverage during pregnancy.⁽²⁶⁾

In the present study, early marriage including undocumented marriage was reported by 21.7% of unvaccinated women. This was considered as a crucial social factor that prevents receiving TT vaccine. Previous study in Bangladesh found that TT vaccine coverage was lower among women aged less than 20 years old.⁽²⁹⁾

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, this study identified important factors that might affect receiving TT vaccine during pregnancy. These were the number of parity, frequency of seeking antenatal care, advice of healthcare providers, and lack of awareness regarding vaccination issues. In addition to the social factors that contribute to early marriage.

Based on the illustrated results we recommend the following actions:

1. Raising awareness campaigns to strengthen the knowledge and attitude of women about the importance of seeking antenatal care and receiving TT vaccine.
2. Strengthening the role of healthcare providers as vaccinators and/or vaccination consultants during pregnancy
3. Collaborative efforts with other community sectors to face the problem of early marriage

Conflict of interest: None to declare.

REFERENCES

1. Mor G, Cardenas I. The immune system in pregnancy: A unique complexity. *Am J Reprod Immunol.* 2010;63(6):425–33.
2. World Health organization. Expanded program on immunization. Tetanus Neonatal Tetanus (NT), 2015. (Cited 2017 Dec 4). Available from: http://www.wpro.who.int/immunization/factsheets/tetanus_nt/en.
3. World Health Organization. World Health Statistics 2010. W Health. 2010; 177.
4. World Health Organization. Tetanus vaccines: WHO position paper, February 2017 - Recommendations. *Vaccine*: 3–5. (Cited 2017 Nov 14). Available from: <http://doi.org/10.1016/j.vaccine.2017.02.034>.
5. World Health Organization. Validation of neonatal tetanus elimination in Egypt by lot quality assurance cluster sampling. *Week Epidemiol Rec.* 2007;26(27):237- 42.
6. United Nations Development Programme. Egypt's progress towards achieving the millennium development goals. (Cited 2017 Nov 8). Available from: http://www.eg.undp.org/content/egypt/en/home/library/mdg/publication_2.html; 2010
7. Linn ST, Guralnik JM, Patel KV. Disparities in influenza vaccine coverage in the United States, 2008. *J Am Geriatr Soc.* 2010;58(7):1333-40.
8. Logan JL. Disparities in influenza immunization among US adults. *J Natl Med Assoc.* 2009;101:161-6.
9. Frew PM, Saint-Victor DS, Owens LE, Omer SB. Socioecological and message framing factors influencing maternal influenza immunization among minority women. *Vaccine.* 2014; 32: 1736 -44.
10. Panda B, Stiller R, Panda A. Influenza vaccination during pregnancy and factors for lacking compliance with current CDC guidelines. *J Matern Fetal Neonatal Med.* 2011;24:402-6.
11. Kissin DM, Power ML, Kahn EB, Williams JL, Jamieson DJ, MacFarlane K, et al. Attitudes and practices of obstetrician-gynecologists regarding influenza vaccination in pregnancy. *Obst Gynecol.* 2011;118(5):1074–80.
12. Power ML, Leddy MA, Anderson BL, Gall SA, Gonik B, Schulkin J. Obstetrician-Gynecologists' practices and perceived knowledge regarding immunization. *Am J Prev Med.* 2009;37(3):231–4.
13. Pathirana J, Nkambul, J, Black S. Determinants of maternal immunization in developing countries. *Vaccine.* 2015;33(26):2971–7.
14. Steve Lwanga, Steve Sapirie, Robert Steinglass, George Stroh, Alisdair Wylie. Immunization coverage cluster survey: reference manual World Health Organization.. 2005. Available from: <http://apps.who.int/iris/handle/10665/69087-2017>.
15. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, et al. Global, regional, and national causes of child mortality: An updated systematic analysis for 2010 with time trends since 2000. *The Lancet.* 2012;379 (9832):2151–61.
16. World Health Organization. Maternal immunization against tetanus: integrated management of pregnancy and childbirth (IMPAC). Standards for maternal and neonatal care. Geneva: Department of Making Pregnancy Safer. World Health Organization. 2006.

17. World Health Organization. Global Vaccine Action Plan 2010-2020. (Cited 2017 Nov 8). Available from www.who.int/immunization/global_vaccine_action_plan/GVAP_doc_2011_2020/en/ 2013.
18. Safi-El-Dine A, El-Shamy KAI. The trend of mandatory vaccination among children in Egypt. *Open Vaccine Journal*. 2009;2:77-84.
19. Lambo JA, Nagulesapillai T. Neonatal tetanus elimination in Pakistan: Progress and challenges. *IJID*. 2012;16(12):e833-e42.
20. Inakc HI, Simsek Z, Koruk I, Koruk ST. Coverage of tetanus vaccine after national tetanus vaccination campaign and basic determinants in Sanlurfa. *TAF Preventive Medicine Bulletin*. 2009;8(6):453-8.
21. Maral I, Baykan Z, Aksakal F, Kaykicioglu F, Bumin M. Tetanus immunization in pregnant women. *Public Health*. 2001;115(5):359-64.
22. Juneja K, Khaliq N, Ansari A, Ahmad A, Khan H. Effect of utilization of antenatal services on pregnancy outcome in Aligarh -A Community based study Citation Effect of utilization of antenatal services on pregnancy outcome in Aligarh -A Community based study. *Indian J Comm Health*. 2016;28(1):54-8.
23. Ministry of Health and Population. Egypt demographic and health survey, 2014. Available from: <https://dhsprogram.com/pubs/pdf/PR54/PR54.pdf>.
24. Singh A, Pallikadavath S, Ogollah R, Stones W. Maternal tetanus toxoid vaccination and neonatal mortality in rural north India. *PLoS ONE*. 2012;7(11):1-7.
25. Wilson RJ, Paterson P, Jarrett C, Larson HJ. Understanding factors influencing vaccination acceptance during pregnancy globally: A literature review. *Vaccine*. 2015;33(47): 6420-9.
26. Togora M, Kpoehouen A, Saizonou J, Sossa C, Ouegraogo L, Makoutode M. Factors associated with low coverage of tetanus-toxoid vaccine in pregnant women in the Health Zone Zogbodomey-Bohicon-Zakpota, Benin. *Mali Medical*. 2014;29(3):40-8.
27. Vilca ML, Esposito S. The crucial role of maternal care providers as vaccinators for pregnant women. *Vaccine* 2017; In press. <http://doi.org/10.1016/j.vaccine>. 2017.08.017.
28. Hashmi FK, Islam M, Khan TA, Tipu, MK. Vaccination coverage of mothers during pregnancy with tetanus toxoid and infants after birth. *Pak J Pharm*. 2011;24(2):35-9.
29. Pery H, Weierbach R, Hossain, I, Islam R. Tetanus toxoid immunization coverage among women in zone 3 of Dhaka City: The challenge of reaching all women of reproductive age in urban Bangladesh. *Bull World Health Org*.1998;76(5):449-57.