

Health counseling, genetic background, and safety against tetanus in women referring to premarital center

Jamshid Ayatollahi ¹, Narges Danaee ^{2,*}, Seyed Alireza Mousavi ¹, Seyed Hossein Shahcheraghi ^{1,*}

¹Infectious Diseases Research Center, Shahid Sadoughi Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

²Infectious and Tropical Diseases, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

**Corresponding authors: Narges Danaee, Infectious and Tropical Diseases, Shahid Sadoughi University of Medical Sciences, Yazd, Iran. E-mail: danadana1362@gmail.com; Seyed Hossein Shahcheraghi, Infectious Diseases Research Center, Shahid Sadoughi Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran. E-mail: shahcheraghih@gmail.com*

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ABSTRACT

Since immunization of women of childbearing age through vaccination and antibody transfer to the fetus, reduces the likelihood of the infant getting the tetanus. This study was conducted for examining the safety status of tetanus in women referred to premarital center. This study was performed on 181 women referring to a clinic in Yazd, Iran. Blood samples were measured by ELISA method and data were analyzed by SPSS software. The immunity status of individuals against tetanus was significantly correlated with vaccination status and occupation but with number of family children (genetic status) and several parameters was no a significant correlation. By measuring the antibody, it is possible to identify groups at risk for immunization against tetanus and modify the vaccination.

Keywords: Tetanus, premarital, immunization, vaccination, family children

INTRODUCTION

Tetanus specially neonatal form, defined as tetanus occurring within the first 28 days of life, and maternal tetanus, defined as tetanus occurring during or within the first 6 weeks after pregnancy, which is caused

by *Clostridium tetani*, is still a source of concern all over the world and has mostly been reported in poor countries like the developing countries [1].

It is responsible for approximately 14 % of all annual neonatal deaths [1,2]. The symptoms of disease include generalized

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rigidity and convulsive spasms of skeletal muscles [2].

The disease can, however, be easily prevented mainly by maternal immunization with Tetanus Toxoid (TT) vaccine and by aseptic obstetric and postnatal care practices [3].

Although vaccination is the only indicator of protection, it may not reflect the actual biological level of protective immunity [3,4].

The TT vaccine is offered at no cost to women and is one of the least utilized vaccines in developing countries [5,6]. Totally, the efficacy of the TT vaccine in the prevention of neonatal tetanus before and during pregnancy has been demonstrated [5,7].

The WHO guidelines for the immunization of primarily unimmunized or partially immunized women in developing countries recommend the use of five doses of TT during reproductive age to ensure long-term immunity [8-10]. Tetanus antitoxin specific IgG has been identified as the index protection and the minimum level of antibody, 0.1 to 0.15 IU/mL, is considered as protective [11,12].

Although the TT vaccine has been available for years, neonatal tetanus still remains one of the major causes of infant mortality in many developing countries. These points

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highlight the importance of the current study, which was designed to evaluate the safety status of tetanus in women referred to clinic for premarital counseling in the central area of Iran.

MATERIALS AND METHODS

This study is a descriptive-analytical study that was conducted as cross-sectional during 2019. Taking into account the significance level of 5 % and the test power of 80 % and according to the same results of previous studies and to reach the difference of at least 1.44 in the anti-tetanus antibody titer average and using the following statistical formula, the sample number obtained 181:

$$n = \frac{(Z_{1-\frac{\alpha}{2}})^2 \times 2S^2}{d^2}$$

After coordination with Haji Maghsoudi Clinic in Yazd, which is a place for premarital counselors, 181 women entered the study with written consent after explaining the objectives of the study as inclusion criteria. Individuals who did not agree to participate in the study or whose test results were inadequate due to poor blood sampling, insufficient blood samples, or clotting were also excluded. While keeping the patient secrets in accordance with the Helsinki Treaty, patients were

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assured that their information would be confidential and used only for research purposes. Also, no additional costs were incurred for patients during this study.

5 ml of blood samples were taken to check the level of IgG antibodies and kept at -20 °C. After sampling, the ELISA anti-tetanus IgG antibody titer was measured using a Spanish VIRCELL kit and based on the manufacturer instructions in the laboratory. Less than 9 IU/ml titers for tetanus were considered susceptible. Also, 9 to 11 titers were considered as protective for tetanus and titers over 11 were considered as full protection. The mean antibody titer of tetanus in individuals was expressed according to variables such as age, level of education, previous vaccination history and place of residence, place of birth, indigenous or non-indigenous and use of a reminder dose. The results of the study were expressed in two ways, one based on the qualitative antibody titer and the other based on the quantitative anti-tetanus antibody titer. The data were supplemented by a questionnaire designed for this purpose, which included age, level of education, vaccination history, place of residence, place of birth, and whether or not

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they were indigenous, and then the ELISA test results were recorded in it.

The obtained information was entered into SPSS software version 21. They were then analyzed by statistical methods such as descriptive statistics methods (frequency and relative percentage) and statistical tests of Chi-Square test, independent T test and paired T test. A significant level of 0.05 was considered.

RESULTS

The highest numbers were in age group of 19 to 25 years old and followed by people under 18 years that is indicating a low age of marriage in Yazd. Everyone considered the complete vaccination history (5 times), but according to the vaccination card, 17 people (9.4 %) did not have their card available and other people did the full vaccination based on the vaccination card. In terms of education, 16 women (8.8 %) were undergraduates, 73 (40.3 %) were graduates, 75 (41.4 %) were postgraduates or bachelors, and 17 (9.4 %) were masters or doctorates. Demographic specifications are given in Table 1.

Table 1. Demographic specifications of patients

Variable	Number (N)	Percent (%)
Vaccination history based on vaccine card		
Complete	164	90.6
Inaccessibility	17	9.4
Occupation		
Student	63	34.8
Housewife	42	23.2
High school	36	19.9
Employee	34	18.8
Other	6	3.3
Place of birth		
City	176	97.2
Village	5	2.8
Indigenous or non-indigenous		
Indigenous	148	81.8
Non-indigenous	33	18.2
Age distribution of patients (year)		
18 >	44	23.4
19-25	98	54.1
26-35	30	16.6
36 <	9	5
Place of residence		
Yazd	152	84
Villages around Yazd	10	5.5
Cities other than Yazd	19	10.5

The majority of those studied (89 %) had received their last dose of the vaccine before the age of 15. More than half of people have been vaccinated for less than five years. 34.8 % between 6 and 10 years and 13.3 % more than 10 years have passed since the last their vaccination. Also, 162 people (89.5 %) were completely safe, 10 people (5.5 %) were relatively safe and 9 people (5 %) were without safety.

17.6 % of those whose cards were not available were unsafe, which was significant ($p = 0.018$). Also, the quality of safety in students was better compared to other jobs and the quality of antibodies was significantly related to people job ($p = 0.012$). Also, the amount of antibody titer was not significantly related to the level of education ($p = 0.18$) and the history of tetanus vaccination following injury ($p = 0.49$). Also, antibody titer was not

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significantly associated with indigenous or non-indigenous status of individuals (p = 0.48) (Table 2).

The results of study also showed that the place of residence, the age group, the number of children in the family, as well as the distance from the last time of the

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vaccine injection did not have a significant relationship with antibody titer with p =0.64, p=0.25, p=0.46 and p=0.07, respectively (Table 3).

Table 2. Frequency distribution of antibody titer against tetanus based on vaccination history, occupation and level of education

Antibody titer	< 9 (Negative) N (%)	9-11 (Relative safety) N (%)	11< (Complete safety) N (%)	Total N (%)	p-value
Vaccination card					
Yes	6 (3.7)	8 (4.8)	150 (91.5)	164 (100)	0.018
No	3 (17.6)	2 (11.8)	12 (70.6)	17 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	
Occupation					
Student	2 (3.2)	0 (0)	61 (96.8)	63 (100)	0.012
Housewife	4 (9.5)	4 (9.5)	34 (81)	42 (100)	
High school	0 (0)	2 (5.6)	34 (94.4)	36 (100)	
Employee	3 (8.8)	2 (5.9)	29 (85.3)	34 (100)	
Other	0 (0)	2 (33.3)	4 (66.7)	6 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	
Level of education					
Under diploma	0 (0)	3 (18.8)	13 (81.3)	16 (100)	0.18
Diploma	3 (4.1)	3 (4.1)	67 (91.8)	73 (100)	
Associate Degree/Bachelor	4 (5.3)	2 (2.7)	69 (92)	75 (100)	
Master/Doctorate	2 (11.8)	2 (11.8)	13 (76.5)	17 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	
History of tetanus vaccination following injury					
Yes	1 (12.5)	0 (0)	7 (87.5)	8 (100)	0.49
No	8 (4.6)	10 (5.8)	155 (89.6)	173 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	
Indigenous or non-indigenous					
Indigenous	6 (4.1)	8 (5.4)	134 (90.5)	148 (100)	0.48
Non-indigenous	3 (9.1)	2 (6.1)	28 (84.8)	33 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	

Table 3. The relationship between antibody titer with the place of residence, the age group, the number of children in the family and the distance from the last time of the vaccine injection

Antibody titer	<9 (Negative) N (%)	9-11 (Relative safety) N (%)	11< (Complete safety) N (%)	Total N (%)	p-value
place of residence					
Yazd	7 (4.6)	9 (5.9)	136 (89.5)	152 (100)	0.64
Villages around Yazd	0 (0)	0 (0)	10 (100)	10 (100)	
Cities other than Yazd	2 (10.5)	1 (5.3)	16 (84.2)	19 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	
Age group (year)					
< 18	1 (2.3)	2 (4.5)	41 (93.2)	44 (100)	0.25
19-25	4 (4.1)	6 (6.1)	88 (89.8)	98 (100)	
26-35	2 (6.7)	1 (3.3)	27 (90)	30 (100)	
> 36	2 (22.2)	1 (11.1)	6 (66.7)	9 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	
The number of children in the family (Genetic status)					
1	0 (0)	0 (0)	6 (100)	6 (100)	0.46
2, 3	5 (4.5)	4 (3.6)	101 (91.8)	110 (100)	
≥ 4	4 (6.2)	6 (9.2)	55 (84.6)	65 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	
The distance from the last time of the vaccine injection (year)					
< 5	2 (2.1)	3 (3.2)	89 (94.7)	94 (100)	0.07
6-10	4 (6.3)	4 (6.3)	55 (87.3)	63 (100)	
10 <	3 (12.5)	3 (12.5)	18 (75)	24 (100)	
Total	9 (5)	10 (5.5)	162 (89.5)	181 (100)	

DISCUSSION

Tetanus is an infectious disease usually caused by contamination of the wound with soil containing the spores of *Clostridium tetani* (CT) [13]. Mortality from neonatal tetanus is still challenging but vaccine-

preventable [14]. It can be only prevented by vaccination because immunity against tetanus is rarely acquired [14]. Currently, tetanus vaccination is the most important strategy for preventing neonatal tetanus [15].

The present study was conducted for the first time in Yazd province with the aim of

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examining the safety status against tetanus in referring women for premarital counseling and showed that 100 % of people knew their vaccination history, of which 17 didn't have a vaccination card and the rest had a complete vaccination based on the vaccination card, which indicates that the vaccination status is appropriate for women of childbearing age in Yazd province. The antibody titer average was 2.53 ± 2.21 , which indicates the total safety of individuals, but in terms of quality control of antibody according to the instructions of the manufacturer of the kit, among referring people 162 people (89.5 %) had complete safety, 10 people (5.5 %) relative safety and 9 (5 %) were unsafe. The safety status of people was significantly related to the history of vaccination based on the vaccine card and the job of the individuals, and the safety status was better in people who had the vaccination card as well as students who had not been vaccinated for a long time. Also, the safety status against tetanus was not significantly related to the level of education, history of vaccination based on injury, place of birth (city or village), locality, place of residence, number of children in the family, time interval from the last time of vaccination and age.

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A study in Yazd, Iran found that 18.6 % of mothers in rural areas and 38.3 % in urban areas didn't receive the vaccine during pregnancy and gestational age. According to the records of vaccination status of pregnant mothers, it was found that the vaccination coverage of tetanus was complete in 65.2 % of mothers and incomplete in 34.8 % of them. However, in the present study, based on the vaccination card, 9.4 % didn't know their background due to the unavailability of the vaccination card and according to the antibody titer, only 5 % were unsafe and the rest had complete and relative immunity which shows the improvement of vaccination status in Yazd province during these years, although the statistical population and the sample were different between the two studies. In mentioned study, there was a significant statistical relationship between maternal age, her level of education, pregnancy rank and distance from previous pregnancy with the status of maternal tetanus vaccination in pregnancy, which was not consistent with the present study. The reason for this difference is probably due to the way in which the vaccination status was assessed and the vaccine was given to pregnant women on visits during pregnancy, while in the present study, people were screened for premarital

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counseling. In addition, the mentioned study found that 20.6 % of people under the age of 20 had incomplete vaccination, while in the present study 2.3 % of people under the age of 18 and 4.1 % of people aged 19 to 25 years were unsafe [16].

A study in the United States found that more than half of women over the age of 20 did not have adequate safety against tetanus. Also, high age and low level of education were associated with lower safety status [17]. Also, in the UK, about 20 % of the population aged 4 to 34 was sensitive to tetanus, and the results of a study showed that with the enhancement of age, there was a decrease in immunity [8], which was consistent with the present study. In addition, more than 60 % of Egyptian women received the required dose of the vaccine during pregnancy care, and 42.6 % of them were protected against the disease. Vaccination was linked to socioeconomic status, education, and women's knowledge about the importance of vaccinating against tetanus [12].

In Cambodia, 88 % of women between the ages of 15 and 39 were immune to tetanus and 12 % were not immune to the disease. However, in the present study, only 5 % were sensitive to tetanus and the rest were immune. The mentioned study also found

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that the safety rate for tetanus in women under the age of 19 was less than the age of 25, which was not consistent with the present study. In addition, the safety rate against tetanus in urban areas was higher than in rural areas, while in the present study there was no difference between the two variables [7].

In Dukem Town, Eastern Ethiopia, 422 women with a mean age of 29.25 years were surveyed, with 33.9 % not vaccinated. The study linked health care providers, distance from health care centers, maternal literacy levels and place of childbirth to people's safety [18].

Another study found that 476 women between the ages of 16 and 49 were 87 % covered by the tetanus vaccine in Yemen, and there was a significant association between non-vaccination, older age, rural life and malaria infection with safety during childbirth. In this study, the safety status of pregnant mothers during pregnancy was not appropriate [19].

CONCLUSION

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The results of the present study showed that the vaccination status of women of childbearing age in Yazd province is appropriate. Due to the role of serological studies as a suitable tool for epidemiological studies, the assessment of specific antibodies has led to a better understanding of the immune status against tetanus in the community and can identify high risk groups. Therefore, by measuring antibodies against tetanus in premarital counseling, it is possible to identify at-risk women and, if necessary, correct the vaccination program and prevent possible disease.

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