



## Original Article

## Immunity to Tetanus Vaccination in Pregnant Women in Zanjan Province, Northwest of Iran

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## A B S T R A C T

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**Background and Aims:** Despite the fact that neonatal tetanus has been eradicated all over the world, it is still a significant health problem in some developing countries. The disease can even result in death. This is a worrying problem but it can easily be prevented by vaccination of the mothers. Vaccinating every pregnant woman with, at least, one dose of tetanus toxoid would be an affordable way to protect against neonatal tetanus and would be a step toward eliminating the mortalities that continue to occur due to this preventable disease. The purpose of this study was to evaluate the immunity in pregnant women in Zanjan province in Iran.

**Materials and Methods:** In this cross-sectional study, 576 pregnant women were surveyed. First the women's serums were separated. Then tetanus antibody was measured in their serums using Immunoaffinity Chromatography Assay.

**Results:** Results indicated that 95 percent of these pregnant women who had received vaccine had acquired immunity but the remaining 5 percent had no immunization.

**Conclusions:** Not only vaccination is important in women, but effectiveness of vaccination is also vital for successful immunization. It is proposed that more attempts should be made in order to gain affordable immunization.

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## Introduction

Tetanus, an infectious disease, 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, 2]. Despite its presence in low-income countries, tetanus-related neonatal mortality has long been controlled [2]. Although vaccination is the only indicator of protection, it may not reflect the actual biological level of protective immunity [3]. Maternal tetanus antitoxin (tetanus-specific immunoglobulin) during passive immunization passes to the fetus via the placenta [4]. Neonatal tetanus disease initially becomes manifest with the loss of ability to suck, followed by generalized rigidity and painful muscle spasms once the disease develops [5]. It is responsible for about 14% of all annual neonatal deaths [6]. According to the World Health Organization (WHO) report in 2009, the incidence of tetanus in Iran amounted to 8 cases while in 2008, the incidence turned out to be 10 [7]. Tetanus immunization transfers from mother to child before or during pregnancy by tetanus toxoid (TT) vaccination [8]. Tetanus antitoxin specific IgG has been identified as the index protection and some studies have suggested that the minimum level of antibody, 0.1 to 0.15 IU/mL, is considered as protective [9]. Tetanus is rare in people with a history of complete vaccination course [7]. Since this immunization does not completely occur most of the times, tetanus immunization status of pregnant women is still a prevalent problem, especially in the developing countries.

Meanwhile, the effectiveness of this kind of immunization has been completely established in the developed countries [6, 10].

This study was designed to evaluate the rate of immunization against tetanus in pregnant women in Zanjan province, the northwest of Iran. Some diagnostic approaches have been commonly applied for measurement of this protective antibody in pregnant women serum like enzyme-linked immunosorbent assay. However, in this study, we for the first time used Immunoaffinity Chromatography Assay (IACH) for Anti tetanus antibody measurement in pregnant women. The aim of this study was to determine the tetanus immunity status of pregnant women by measurement of antibody levels in Zanjan province.

## Material and Methods

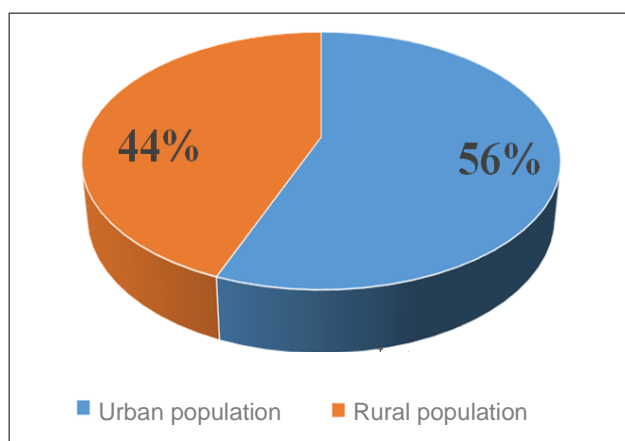
Women being in their second or third month of pregnancy referred for their routine pregnancy screening tests were selected for measurement of tetanus antibody. More than 80 percent of these mothers (n=576) who had received were at the age of 18 to 32 the vaccine. After obtaining informed consent, patients' samples were used for the project. They were also in their first pregnancy screened for the half-life of antibody in their serums. Serum levels of antibody against tetanus were measured by exposing to IACH (Standard Diagnostic (SD) Korea) to evaluate the level of IgG in the serum. More than 100 mIU/ml of this antibody was considered as a protective value (according to kits protocols)

whereas amounts less than this range were regarded unprotected. This study was approved by the Ethics Committee of Zanjan University of Medical Sciences, Zanjan, Iran.

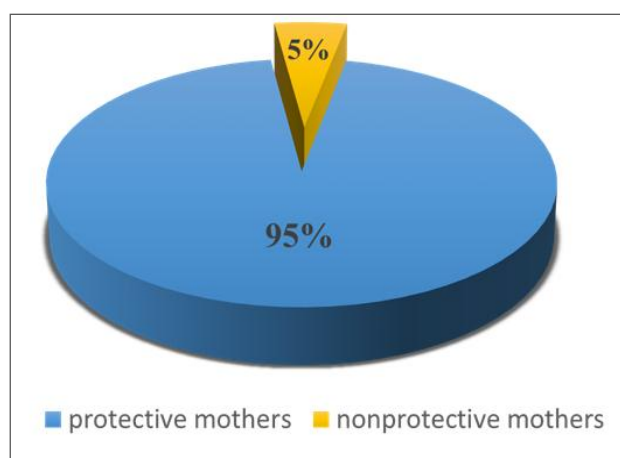
## Results

The results of IACH indicated that about 29

pregnant mothers were not immune against tetanus. The number of the cases of immunity against tetanus that had remained relatively stable was 547. Overall, 95% of the mothers had protective tetanus antibody titers at the time of delivery (Figs. 1 and 2 ).



**Fig. 1.** Distribution of population study



**Fig. 2.** prevalence of protection

## Discussion

Tetanus is an infectious disease that is usually caused by contamination of a wound with soil containing spores of *Clostridium tetani*. Spore of *Clostridium tetani* can germinate and release neurotoxin [7]. Mortality from neonatal tetanus is still challenging but vaccine-preventable [5].

It can be only prevented by vaccination because immunity against tetanus is rarely acquired [7]. Additionally, antenatal checkups, safe and clean deliveries, iron and folic acid supplementations and high-risk approach are also effective in reducing neonatal mortality [2]. Although the

tetanus immunization during pregnancy in maternal and neonatal tetanus has been globally prevented, in many developing countries, TT immunization programs are still noticeable [11]. To establish proper and long-lasting immunity after immunizations, three vaccinations against tetanus are required [12]. Lack of protective antibody levels in some cases may be due to the antibody titer, the number of received vaccines and even the quality of them. It is well evident that the rate of primary immunization in Iran is high. Meanwhile, the rate of booster immunizations seems to be low [7]. According to the latest WHO statistics in 2011, 38 countries of Africa and Asia have not yet eradicated neonatal tetanus successfully [2]. In this study, the evaluation of 576 pregnant women indicated that 5% of individuals had no protective level of antibody. This can be compared with some of our neighboring countries. This rate of unprotection may be due to some reasons. First, they have not received any vaccine. Second, there has not been booster dose of vaccination after 12 years of receiving the first dose. And the last, quality of vaccine has not induced immunity. In other words, immune responses varied based on individual's immunogenetics and immunogenicity of the vaccine. Reduction rate in neonatal tetanus in Pakistan was 50% based on 1998 statistics in comparison to 2010, whereas, this reduction in global area was 82% [2]. Results of a study in Sudan indicated that the overall rate of full protection was found to be 69.2% among pregnant women [13]. It is also suggested that the rate of protected women is 68, 70, 72 and 80% in Egypt, United States, Germany, and

Turkey, respectively [11, 12, 14, 15]. This high incidence of neonatal tetanus is also alarming in India [4]. In Turkey, there is no tetanus immunity between 64% and 80% of persons above the age of 60 years, compared to 7% of adults between 18 and 30 years [16]. Another study in Taiwan indicates that 89% of people above 60 have protective antitoxin levels [17]. A study in the USA has indicated immunity in 80% of persons aged 6-11 years and 28% of persons 70 years old [12]. Eslamifar et al. have reported that a high portion of the adult inhabitants in Arak city have adequate security against tetanus [18]. Afzali et al. have shown that a rapid blood test, tetanus quick stick, can be useful in evaluating the immunity in against tetanus. This test can be helpful in the early assessment of trauma patients [19]. Shokouh et al. has indicated that a large portion of patients older than 50 years are susceptible to tetanus not only in the common population group, but also in military staff who must be assayed and vaccinated routinely by the army [20]. All of the preschool children vaccinated against tetanus have immune level of antibody titer [21]. Consequently, immunity against tetanus is of great importance especially in the developing countries such as Iran. As no study to date has been conducted in Zanzan province, the authors were intended to evaluate the rate of immunity in a population of childbearing women who had received tetanus vaccine before. Results indicated that immunity in these mothers was relatively effective. Nonetheless, there is a need for more attempts to increase this immunity. It is suggested that this evaluation be performed

in other parts of our country for the assessment of the quality of the applied vaccine and even the frequency of receiving. IACH is a simple, rapid and inexpensive technique. Also, IACH assay does not need advanced instruments especially in the un-development countries.

## conclusions

Our findings showed that 95% of the pregnant women had protective tetanus

antibody. Simple and practical serological tests should be used to determine the level of immunity to tetanus, especially in the developing countries.

## Conflict of Interest

There is no conflict of interest in this article.

## Acknowledgment

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