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## Original Article

### TETANUS IMMUNIZATION: PERCEPTION OF RESIDENTS IN A TERTIARY CARE TEACHING HOSPITAL IN WESTERN INDIA

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## ABSTRACT

**Background:** Prevention of tetanus is far easier than its treatment where mortality is very high. Most cases of tetanus occur due to lack of proper vaccination against the disease and incomplete immunization on exposure. Residents in a tertiary care teaching hospital constitute the first contact physicians for patients. **Aim:** To assess the perception about Tetanus immunization among residents in a tertiary care teaching hospital of Pune city. **Methodology:** A pre tested questionnaire was used to assess the knowledge & recommendations about tetanus immunization among randomly selected 157 residents. **Results:** 73.25% residents were not aware of the number of doses of tetanus vaccine recommended for children under the age of 16 years. Around 50% residents were not aware of the recommended number of doses of tetanus vaccine for adults over the age of 16 years and during pregnancy. Nearly 60% of the residents considered the wound after every injury to be tetanus prone. 75.8% of residents thought burn injuries to be prone to the development of tetanus while 13.4% and 36.9% of the residents did not consider animal bite and human bite to be tetanus prone respectively. 99.4% residents considered tetanus toxoid administration in wound with rusted iron. The knowledge regarding tetanus immunization in relation to the wound categories depending on the immunization status of the patients was very poor amongst the residents. **Conclusion:** Better awareness and adherence of tetanus prophylaxis recommendations is needed in residents who are the first tier of health care providers in teaching hospitals.

**Keywords:** Tetanus, immunization, awareness

## INTRODUCTION

Tetanus is an acute, often fatal, disease caused by an exotoxin and highly potent neurotoxin, tetanospasmin, which is produced during the growth of the anaerobic bacterium *Clostridium tetani*. Spores of the bacteria *C. Tetani* lives in the soil and are found around the world. In the spore

form, *C. Tetani* may remain inactive in the soil, but it can remain infectious for more than 40 years.<sup>1</sup> Infection begins when the spores enter the body through an injury or wound.<sup>2</sup> The spores release bacteria that spread and make a poison called tetanospasmin. This poison blocks nerve

signals from the spinal cord to the muscles, causing severe muscle spasms.<sup>3</sup> The time between infection and the first sign of symptoms is typically 7 to 21 days.<sup>4</sup> Most cases of tetanus occur in those who have not been properly vaccinated against the disease and do not receive the correct treatment on exposure.

Unlike many infectious diseases, recovery from naturally acquired tetanus does not usually result in immunity to tetanus. This is due to the extreme potency of the tetanospasmin toxin; even a lethal dose of tetanospasmin is insufficient to provoke an immune response.

Tetanus can be prevented by vaccination with tetanus toxoid (TT).<sup>5</sup> The CDC recommends that adults receive a booster vaccine every ten years<sup>6</sup>, and standard care practice in many places is to give the booster to any patient with a puncture wound who is uncertain of when he or she was last vaccinated, or if he or she has had fewer than three lifetime doses of the vaccine. The booster may not prevent a potentially fatal case of tetanus from the current wound. In children under the age of seven, the tetanus vaccine is often administered as a combined vaccine, DPT vaccine, which also includes vaccines against diphtheria and pertussis. For adults and children over seven, the DT vaccine (tetanus and diphtheria) is commonly used.<sup>7</sup>

Prevention of wound related tetanus is primarily through the administration of the toxoid along with the use of Human Tetanus Immunoglobulin (HTIG) depending on the risk of the wound to develop tetanus. Tetanus immunoglobulin is necessary for immediate protection to tide over the period that the toxoid needs to achieve levels of protective immunity.<sup>8</sup>

Wounds can be divided into categories A and B based on the type and duration of wounds. Category A wounds are defined as wounds that were less than 6 hours old, clear, non-penetrating and with negligible tissue damage & category B included all other types of wounds.<sup>9</sup> The schedule recommends the use of TT for Category A wounds and TT and HTIG for Category B

wounds. The schedule also considers the immunization status of the patient while planning tetanus prophylaxis.<sup>10</sup>

It was observed that any patient with injury was given tetanus toxoid without elucidating previous history of vaccination. Neither patient was followed up to ensure the completeness of primary immunization. It was also observed that patients requiring anti-human tetanus immunoglobulins were treated with only tetanus toxoid. Repeated administration of tetanus toxoid can cause over the immunization leading to hypersensitivity reactions even up to anaphylactic reactions.<sup>11</sup>

In a study of doctors in Delhi, the authors found low knowledge levels regarding tetanus immunization in the study participants.<sup>12</sup> Studies conducted at 5 university-affiliated emergency departments (ED) in the United States found substantial under immunization in the ED particularly with regard to use of tetanus immunoglobulin), leaving many patients, especially those from high-risk groups, unprotected.<sup>13</sup>

Residents in our setup of a tertiary care hospital in western India are first contact physicians for patients. Their knowledge and awareness of tetanus immunization is essential for prevention of newer cases of tetanus in future & also appropriate management of suspected patients with tetanus. Improper knowledge or attitude of these residents may put patients at risk of developing tetanus or on the other end unnecessary adverse effects of hyper immunization. The present study was therefore planned to assess the awareness and importance of tetanus immunization among residents of a tertiary care hospital in Pune city, India.

## **MATERIALS AND METHODS**

This was an observational, cross-sectional study conducted among residents of Bharati Hospital, a tertiary care teaching hospital in Pune, during September-October 2012. An extensive search of literature available failed to reveal any

information regarding the prevalence of knowledge regarding tetanus immunization among residents in a medical college. The sample size calculations were thus based on the assumption that 50% of the residents had the correct knowledge regarding the immunization guidelines with a 95% confidence limit and 10% allowable error and applying the formula<sup>14</sup>  $[z^2 p(1-p)/d^2]$  the sample size (n) was calculated to be 400. However since the study population (N) was 257, the revised sample size calculation with finite population correction given by the formula<sup>7</sup>  $Nz^2p(1-p)/[d^2(N-1)+z^2p(1-p)]$  [Where N=study population, z=1.96 for 95% confidence, p=estimated proportion in study population, d=acceptable margin of error] gave the corrected sample size of 157. These 157 residents to be interviewed were selected by random sampling from a total of 257 residents after complete enrolment. 33 residents were from the pre & para clinical departments, 53 from medical branches & 71 from surgical branches.

The study was approved by the Institutional Ethics Committee of the Bharati Vidyapeeth Medical College, Pune BVDUMC/6 dated 27/02/2012. Before commencement of interviews, the objectives of the study and the contents of the questionnaire were explained to each of the subjects. Information sheet was given and written consent for participation obtained. Participants were assured that the data which was collected

would be used only for research purposes and findings will not be revealed by name to anybody. A pre-tested, pre-designed questionnaire was adapted. Before adaptation of the questionnaire a thorough peer review and discussions were undertaken. The questionnaire consisted of five parts: the residents' profile, evaluation of the residents' knowledge on the number of doses of tetanus vaccine in children, adult and pregnant women as per the National Immunization Schedule followed in India, the types of injury that are tetanus prone, factors to be considered while giving TT immunization and lastly TT & HTIG administration in relation to various types of wounds according to the immunization status of the patient.

#### Statistical analysis

The collected data were entered in Microsoft excel and analysed using the features of excel to get the results in percentages.

#### RESULTS

All the 157 residents participated in the study. Out of these, 33 were from the pre & para clinical departments, 53 from medical branches & 71 from surgical branches.

To evaluate the responses given by the study participants, guidelines cited by Smith JWG et al in his article on recommendations for prevention of tetanus in the wounded have been used.<sup>15</sup>

**Table 1: Knowledge of correct doses of Tetanus toxoid as per National Immunization Schedule**

	Correct Answer	Incorrect Answer	Don't Know	Guidelines <sup>15</sup>
Children < 16 Yrs	18.47%	73.25%	8.28%	6 Doses
Pregnant Women With No Previous H/O Immunization	65.61%	32.48%	1.98%	2 Doses
Pregnancy (Within 3 Years) With 2 Doses of T.T In Last Pregnancy	56.69%	31.82%	11.46%	1 Dose
Adult > 16 Yrs	24.84%	50.95%	24.2%	1 Dose

**Table 2: Number of residents who considered a particular wound to be tetanus prone**

	YES	NO	Don't Know	Guidelines <sup>15,18</sup>
After Every Injury:	59.87 %	40.13 %	0 %	NO
After Burn:	75.80 %	16.56 %	7.64 %	YES
After Animal Bite:	75.16 %	13.38 %	11.46 %	YES
After Human Bite:	47.13 %	36.94 %	15.93 %	YES

**Table 3: Important considerations for tetanus immunization**

	YES	NO	Don't Know	Guidelines <sup>15</sup>
Age Of Wound	70.70 %	25.48 %	3.82 %	YES
Type Of Wound	79.62 %	14.65 %	5.73 %	YES
Previous Immunization Status	89.80 %	8.28 %	1.91 %	YES
Wound With Rusted Iron:	99.36 %	0 %	0.64 %	NO

**Table 4: Knowledge of residents about tetanus immunization in Cat-A wound according to immunization status of the patients**

Complete Course T.T /Booster Taken	Nothing Required	T.T 1 Dose	T.T 1 Dose + HTIG	T.T Complete Course	T.T Complete Course + HTIG	Guidelines <sup>15</sup>
Within Last 5 Years	68.79%	31.21%	0%	0%	0%	Nothing Required
5-10 Years Before	12.10%	65.60%	8.92%	13.38%	0%	TT 1 Dose
10 Years Before	0%	43.31%	28.66%	19.75%	8.28%	TT 1 Dose
No Past Immunization	0%	13.38%	5.09%	29.49%	42.04%	TT Complete Course

**Table 5: Knowledge of residents about tetanus immunization in Cat-B wound according to immunization status of the patients**

Complete Course T.T /Booster Taken	Nothing Required	T.T 1 Dose	T.T 1 Dose + HTIG	T.T Complete Course	T.T Complete Course + HTIG	Guidelines <sup>15</sup>
Within Last 5 Years	14.01%	63.06	18.47	4.46	0%	Nothing Required
5-10 Years Before	0%	31.85	47.13	17.83	3.18	TT 1 Dose
10 Years Before	0%	11.46	27.39	29.94	31.21	TT 1 Dose + HTIG
No Past Immunization	0%	6.37	5.09	10.19	78.34	TT Complete + HTIG

Table 1 shows the summary of the participant's knowledge about tetanus immunization in different target groups: 81.53% residents were not aware of the number of doses of tetanus vaccine recommended for children under the age of 16 years and 75.15% residents were not aware of the number of doses of tetanus vaccine recommended for adults over the age of 16 years. Surprisingly only 65.6% residents who participated in the study knew the correct schedule of tetanus immunization for pregnant women with no history of previous immunization while 33.8% of them had inadequate knowledge about the correct number of doses to be administered to pregnant mothers who had their last childbirth within 3 years.

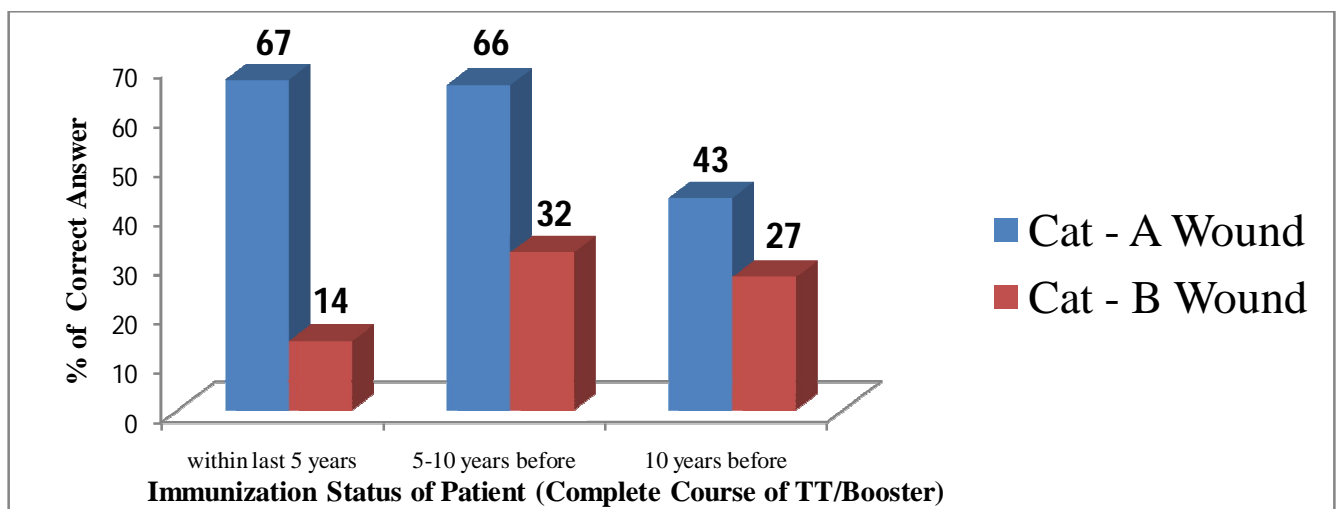
As seen in table 2, more than half of the study population (59.87%) considered every cut injury to be tetanus prone. The majority of the residents (>75%) considered burn injury and animal bite wounds to be tetanus prone while most of them (52.87%) were unaware of the risk with human bite.

More than 70% of residents were aware that age of the wound, type of wound and previous

immunization status of patients as important considerations before immunizing a patient against tetanus. (Table 3) Almost every resident considered that wound with rusted iron requires tetanus immunization without considering the age and type of wound or previous immunization status.

When respondents were questioned about recommendation for tetanus immunization in category A wounds, their knowledge was good (>65%) for patients who were immunized within last 5 yrs or 5-10 yrs before. (Table 4) The correct response for tetanus immunization in patients immunized 10 yrs before was only 43.31% while that for an unimmunized person was very poor (<30%).

Table 5 shows that the knowledge of the study participants was very poor for tetanus immunization in category B wounds, for patients who were immunized within last 5 yrs, 5-10 yrs or 10 yrs before. Surprisingly majority of them recommended correct schedule for patients with no history of previous immunization with such wounds.



**Fig.1: Comparison of correct responses about tetanus immunization in Cat-A and Cat-B wounds**

It is clearly evident from the figure-1 that the respondents had correct knowledge about

immunization for category A wounds better than that for category B wounds.

## DISCUSSION

One of the objectives of the study was to evaluate the knowledge of Tetanus Immunization in resident doctors who are the first contact physicians in tertiary care teaching hospitals. Based on the recommendations of the WHO the National Immunization Schedule of India has proposed 3 doses of DPT in the first year of life as primary immunization and then one booster of DPT at 16-24 months and then at 5-6 years one dose of DT and at 10 years and 16 years one dose of TT respectively.<sup>16</sup> The results reveal that around 3/4<sup>th</sup> of the student residents lacked the adequate knowledge of the vaccine schedule in children below 16 years. Majority of the residents were not aware of the booster dose of tetanus toxoid recommended at 16 years of age one.

Mortality from neonatal tetanus still remains an important but preventable, cause of neonatal mortality in India. The Government of India had set the goal of neonatal tetanus elimination by the year 2005 through the coverage of all pregnant women with 2 doses of tetanus toxoid. It is indeed surprising that even then the goals of elimination of neonatal tetanus in India are yet to be achieved as in the year of 2011 total number of cases of neonatal tetanus reported were 734 and out of them 14 deaths were reported.<sup>17</sup> Thus the knowledge of TT immunization in pregnant women is essential among all levels of health care workers including residents to prevent neonatal tetanus. Vaccination with two doses of TT immunization given at least 4 weeks is the chief priority in preventing neonatal tetanus. A single booster dose of the toxoid is recommended for repeat pregnancies within a period of 3 years since the last pregnancy.<sup>18</sup> The vaccine is cheap and available at the government sub-centres for free. In the present study, around 30-40% residents lacked the required knowledge of TT immunization in pregnant women which was really surprising. This knowledge is essential not only for residents of obstetrics and gynaecology

department but for all, as these doctors link the chain of health care professionals.

Almost 60% residents were seen overcautious as they considered every injury to be tetanus prone. Similar result was found in a study in UK among various staff members in the accident and emergency (A&E) departments, where 22.1% of respondents considered any cut injury to be tetanus prone.<sup>2</sup> Burn wounds are prone to tetanus and all patients with 2<sup>nd</sup> and 3<sup>rd</sup> degree burns also need to have up-to-date tetanus shots if individual has not been immunized within the last 5 years. In the present study, most of the residents were aware about the risk of tetanus following burns and had recommended tetanus immunization. Even after animal and human bite injury there is a possibility of contracting tetanus.<sup>19</sup> The bite itself does not cause tetanus but it allows a break into the skin that can provide the tetanus bacteria with a way to enter the body. In any dog bite, the focus is on rabies prevention, which is well founded. But the possibility of tetanus should also be kept in mind. More than 75% residents in the study recommended tetanus immunization after animal bite but many of them lacked the knowledge about the same after human bite. A single case of human bite leading to tetanus has been reported.<sup>20</sup> Proper guidance about such rare but possible cases is recommended in residents to control the incidence of tetanus in India.

Antibiotic prophylaxis against tetanus is neither practical nor useful in managing wounds thus proper immunization plays an important role in prevention of tetanus. The need for active immunization, with or without passive immunization, depends on the condition of the wound and the patient's immunization history. In the present study residents were asked about important considerations before immunizing a person for tetanus. 70-80% residents considered age and type of wound as important factors for decision on immunization against tetanus. 10% residents did not consider previous immunization status of an individual important for deciding on tetanus immunization in any situation.

A common association which many people have on their minds is the 'rusty nails and Tetanus'. But this concept is somewhat misleading. Rust itself does not cause tetanus nor does it contain more *C. tetani* bacteria. The rough surface of rusty metal merely provides a prime habitat for a *C. tetani* endospore to reside, and the nail affords a means to puncture skin and deliver endospore into the wound. Because *C. tetani* is an anaerobic bacterium, it and its endospores survive well in an environment that lacks oxygen. Hence stepping on a nail, whether it is rusty or not, may result in a tetanus infection. The major considerations which most of us forget to correlate with such cases are condition of the wound and previous immunization status of the person. Tetanus immunization should be recommended only after considering these facts. Nearly all the residents in the study had this myth of rust on their mind.

It has been observed that the use of HTIG as passive immunization against tetanus is very meagre even after category B wounds are reported in casualties or any surgical departments. Though respondents in this study recommend the use of HTIG in unimmunized person with category B wounds but this does not reflect in actual practice. The reason behind this may be the high cost & unavailability of HTIG readily in such setups.

## CONCLUSION

Better awareness and adherence of tetanus prophylaxis recommendations is needed in residents who are the first tier of health care providers in teaching hospitals.

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