

# Assessing Tetanus Vaccine Knowledge and Attitudes Among Emergency Department Physicians: A Comprehensive Investigation

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## ABSTRACT

**Objective:** The primary goal of this study was to assess the knowledge and attitudes of general practitioners and emergency medicine specialists working in emergency departments regarding tetanus vaccines and prophylaxis.

**Materials and Methods:** This cross-sectional prospective study involved administering an online questionnaire to emergency physicians to gauge their knowledge and attitudes toward tetanus vaccination and prophylaxis. Data collection spanned from June 15, 2022, to September 15, 2022. The study compared the knowledge and attitudes of general practitioners and emergency medicine specialists regarding tetanus vaccination and prophylaxis.

**Results:** The study included 167 physicians, comprising 94 males (56.3%), 69 females (41.3%), and 4 unspecified (2.4%). Among them, 97 (58.1%) were emergency medicine specialists and 70 (41.9%) were general practitioners, with an average age of  $32.42 \pm 8.47$  years (range 21–55). Comparisons of knowledge levels about tetanus-suspect injuries (dirty wounds, wounds in contact with feces and saliva, burns, bites, and frostbite) revealed that environmental management systems had significantly higher knowledge levels than general practitioners ( $p=0.005$ ,  $p<0.0001$ ,  $p=0.001$ , and  $p<0.0001$ ). Similarly, emergency medicine specialists exhibited superior knowledge regarding tetanus prophylaxis, particularly in relation to wound cleanliness, vaccination frequency, and years since the last vaccination.

**Conclusion:** The findings indicated that while emergency physicians possess general knowledge about tetanus, their understanding of the tetanus vaccination program and proper application of prophylaxis post-acute injury is insufficient. The study advocates for regular and comprehensive training on tetanus immunization for all emergency department physicians to enhance awareness and application accuracy in clinical settings.

**Keywords:** Injury, Prophylaxis, Rappel dose, Tetanus

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## INTRODUCTION

Tetanus is a central nervous system disease characterized by resistant tonic spasms caused by *Clostridium tetani neurotoxins*.<sup>[1]</sup> Tetanus, a vaccine-preventable disease, results in 100% mortal-

ity in the absence of vaccine protection. The United States Center for Disease Control (CDC) and Prevention reported a total of 264 tetanus cases between 2009 and 2017.<sup>[2]</sup> According to the World Health Organization data, only one neonatal tetanus case

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was reported from our country after 2011, and 18 adult tetanus cases were reported in 2019.<sup>[3]</sup> The Tetanus vaccination program that started in 1937 in our country has gained momentum with the National Vaccination Campaign since 1985.<sup>[4]</sup> It is implemented throughout our country within the framework of the Expanded Immunization Program of the Ministry of Health.<sup>[5]</sup> Within the scope of the neonatal tetanus elimination program, tetanus vaccine has been administered to pregnant women since 1990. In addition, a monovalent tetanus vaccine is administered to men during military service.<sup>[6]</sup> It is also recommended that tetanus vaccination be repeated every 10 years for adults. As in the whole world, there are inadequacies in the implementation of these reminder doses recommended within the scope of adult immunization in our country. Another important point that contributes to the prevention of tetanus, which has a high mortality rate, is the appropriate treatment of patients presenting to emergency departments with injuries. Therefore, in case of any injury, the person should be carefully evaluated for tetanus vaccination and/or tetanus immunoglobulin administration according to previous immunization status, the condition, and shape of the wound.<sup>[7]</sup> The tetanus prophylaxis recommended by the CDC and prevention in the USA in cases of injury is based on the characteristics of the wound (Table 1) and the immune history of the patient (Table 2).<sup>[8,9]</sup> Wounds with non-viable tissues or dirt/rust contamination, open fractures, penetrating injuries, and abscesses are considered wounds at risk of tetanus

because they provide an anaerobic environment for *C. tetani*.

Despite tetanus vaccination programs, tetanus continues to be seen in our country. The reasons for this include the lack of regular administration of additional doses of vaccines, insufficient social awareness, the increase in the number of people whose vaccination schedule is unknown due to regular and irregular migration as a result of the turmoil in neighboring countries in recent years, and deficiencies in prophylaxis in tetanus-related injuries. To overcome these deficiencies, it is of great importance that our physicians working in emergency departments perform tetanus prophylaxis appropriately. Our study was planned to comparatively examine the level of knowledge and attitudes of general practitioners and emergency medicine specialists working in emergency departments about tetanus vaccination and tetanus prophylaxis.

## MATERIALS AND METHODS

The study was a cross-sectional prospective study. Physicians working in the emergency department were administered an online questionnaire containing questions about their knowledge and attitudes about tetanus vaccination and tetanus prophylaxis. Data were collected between June 15, 2022, and September 15, 2022, through responses to online survey questions. Information on recommendations and practices regarding tetanus prophylaxis in trauma patients was evaluated with a 20-question questionnaire. The first 5 questions assessed demographic characteristics and 15 questions assessed knowledge about tetanus vaccination and tetanus prophylaxis practices in trauma patients. According to the responses obtained, the knowledge levels and attitudes of general practitioners and emergency medicine specialists about tetanus vaccination and tetanus prophylaxis were compared. This study was conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments. Ethical approval was obtained from the İstanbul İstinye University Human Research Ethics Committee (June 08 2022, 22/95) before the study. Written informed consent was obtained from all participants before their inclusion in the study.

**Table 1.** Wound characteristics

Not at risk of tetanus	At risk of tetanus
<6 h	(Time since injury) >6 h
<1 centimeter depth	>1 centimeter depth
Clean	Contaminated
Linear	Star-shaped
Nerves and vessels intact	Denervated, ischemic, frostbite
Not Infected	Infected

**Table 2.** Tetanus prophylaxis recommendations for injury

History of immunization	Clean and minor wounds	All other wounds
Unknown or <3	Td vaccine	TIG
≥3	No (Yes, if >10 years have passed since the last dose)	No (Yes, if >5 years have passed since the last dose)
Age <7 years	DBT vaccine	DBT vaccine
Age ≥7 years	Td vaccine	Td vaccine

Advisory Committee on Immunization Practices (ACIP) recommendations. Td: Tetanus and diphtheria, DBT: Diphtheria, tetanus, and pertussis, TIG: Tetanus immunoglobulin.

## Statistical Analysis

Descriptive statistics are presented as frequency, percentage, mean, standard deviation, median, minimum, maximum, 25th percentile, and 75th percentile. In the analysis of categorical data, Fisher's Exact test was used if the percentage of cells with an expected value  $<5$  was  $>20\%$ , and the Pearson Chi-square test was used if the expected value was  $<5$ . The normality assumption was checked with the Shapiro-Wilk test. In the analysis of the difference between the numerical data of the two groups, the Mann-Whitney U-test was used because the data did not fit the normal distribution. Analyses were performed with the SPSS 23.0 program.  $P < 0.05$  was considered statistically significant.

## RESULTS

A total of 167 physicians, 82 (65.6%) male, and 32 (32%) female, participated in the study. Age was reported by 166 of the participants. The mean age was  $32.42 \pm 8.47$  (21–55). It was determined that 58.1% (97) of the participants were emergency medicine specialists. Descriptive information about the physicians who participated in the survey is shown in Table 3. It was found that 94 (56.6%) physicians had no difficulty remembering the tetanus vaccination schedule and 97.6% (163) recommended tetanus vaccination for rabies prophylaxis. When asked about the conditions to be taken into consideration when administering tetanus prophylaxis to a patient presenting with an injury, eight physicians gave the incorrect answer intradermal and 59 (35.3%) physicians gave the incorrect answer patient age. The comparison of the knowledge levels and attitudes of general practitioners and emergency medicine specialists working in the emergency department about tetanus vaccination is shown in Table 4.

## DISCUSSION

The most common conditions requiring tetanus prophylaxis are traffic accidents, gunshot wounds, penetrating sharps injuries, and traumas. Lack of appropriate wound care and tetanus prophylaxis after these injuries contributes to the increased incidence of the disease. Therefore, physicians working in emergency departments should perform tetanus prophylaxis appropriately. In our country, emergency medicine specialists and general practitioners work together in emergency departments in hospitals without a Department of Emergency Medicine. Our study aimed to measure the level of tetanus vaccine prophylaxis knowledge and attitudes of physicians working in emergency departments and to compare the level of tetanus vaccine prophylaxis knowledge and attitudes of emergency medicine specialists and general practitioners. Of the participants, 97 (58.1%) were emergency medicine specialists and 70 (41.9%) were general practitioners.

**Table 3.** Descriptive findings on participants' gender, field of specialization, titles, institution of employment, and duration of employment

	N	%
Gender		
Female	69	41.3
Male	94	56.3
Unspecified	4	2.4
Specialization branch		
General practitioner	70	41.9
Emergency medicine	97	58.1
Title		
General practitioner	70	41.9
Residencies staff	33	19.8
Expert	46	27.5
Assistant professor	5	3
Associate professor	7	4.2
Professor	6	3.6
Current institution		
University hospital	55	32.9
Training and research hospital	51	30.5
State hospital	61	36.6
Duration of employment		
1–5 years	133	79.6
6–10 years	24	14.4
11–15 years	6	3.6
16–20 years	3	1.8
Over 20 years	1	0.6

Those who present with trauma should be evaluated for tetanus suspicious injuries. In our study, when the knowledge levels of general practitioners and emergency medicine specialists were compared for tetanus suspicious injuries (dirty, feces, and saliva contact wounds, burns, bites, and frostbite), the knowledge level of emergency physicians was found to be statistically significantly higher ( $p=0.005$ ,  $p<0.0001$ ,  $p=0.001$ , and  $p<0.0001$ , respectively). In a study by Dabas et al.<sup>[10]</sup> involving nurses and family physicians, it was shown that the sample group had low knowledge about adult tetanus immunization and only 48.3% of physicians knew the correct indication for tetanus vaccination. However, since our study included more emergency physicians compared to Dabas et al.<sup>[10]</sup> we think that our rate of identifying the correct indication for tetanus vaccination is higher. Correct identification of tetanus suspi-

**Table 4.** Comparative analysis of knowledge and attitudes on tetanus vaccination among general practitioners and emergency medicine specialists

	General practitioner (%)	Emergency medicine specialists (%)	p
Tetanus suspected injuries			
Contact with dirt, feces, and saliva	50 (71.4)	86 (88.7)	0.005 <sup>1</sup>
Burns	44 (62.9)	90 (92.8)	<0.0001 <sup>1</sup>
Bites	55 (78.6)	93 (95.9)	0.001 <sup>1</sup>
Freezing	18 (25.7)	62 (63.9)	<0.0001 <sup>1</sup>
Recommendation for tetanus prophylaxis in a patient presenting to the emergency department with an injury and unknown vaccination status			
Adult-type tetanus toxoid, reduced diphtheria toxoid (Td)	40 (57.1)	40 (57.1)	<0.0001 <sup>2</sup>
Recommendation for tetanus prophylaxis in a patient presenting to the emergency department with a clean injury and unknown vaccination status			
Tetanus vaccine only	52 (74.3)	92 (94.8)	<0.0001 <sup>2</sup>
Recommendation for tetanus prophylaxis in a patient presenting with a clean minor injury, >3 doses of tetanus vaccine, and less than 10 years since the last dose of tetanus vaccine			
I do not recommend vaccination and immunoglobulin	38 (54.3)	67 (69.1)	0.024 <sup>2</sup>
Recommendation for tetanus prophylaxis in a patient presenting to the emergency department with a dirty wound and unknown vaccination dose			
Tetanus vaccine and tetanus immunoglobulin	52 (74.3)	89 (91.8)	0.004 <sup>2</sup>
Recommendation for tetanus prophylaxis in a patient presenting to the emergency department with a dirty wound, who has received ≥3 doses of tetanus vaccine and 5 years have not passed since the last dose of vaccine.			
I do not recommend vaccination and immunoglobulin	30 (42.9)	38 (39.2)	0.859 <sup>1</sup>
Recommendation for tetanus prophylaxis in a patient with ≥3 doses of tetanus vaccine presenting to the emergency department with a dirty wound and 5 years since the last dose of tetanus vaccine			
Tetanus vaccine only	25 (35.7)	25 (25.8)	0.188 <sup>2</sup>
In these cases, human tetanus immunoglobulin should be recommended for dirty wounds, regardless of previous vaccination status.			
Human immunodeficiency virus infection	61 (87.1)	87 (89.7)	0.609 <sup>1</sup>
Severe immunosuppression	67 (95.7)	95 (97.9)	0.651 <sup>2</sup>
Do you recommend tetanus vaccine for patients aged 65 years and over?			
I recommend it for patients with additional diseases	1 (1.4)	0	0.608 <sup>2</sup>
I recommend to all patients	26 (37.1)	35 (36.1)	0.718 <sup>2</sup>
Tetanus vaccine contraindications			
Previous vaccination after Td's history of pain in the region	7 (10)	0	0.002 <sup>2</sup>
Previous vaccination after Td's history of rash in the region	6 (8.6)	2 (2.1)	0.07 <sup>2</sup>
After a previous Td history of neurologic reaction	57 (81.4)	68 (70%)	0.096 <sup>1</sup>
History of severe hypersensitivity after previous Td	61 (87.1)	61 (87.1)	0.038 <sup>1</sup>

P<sup>1</sup>: Pearson Chi-square test; P<sup>2</sup>: Fisher Exact test. Different letters in the same row indicate that the column rates are statistically different from each other. P<0.05 is statistically significant. Td: Adult-type tetanus toxoid, reduced diphtheria toxoid.

cious injury in patients presenting with trauma will make a significant contribution to tetanus immunization in the adult age group. It is of great importance to whom the booster doses administered to patients admitted to emergency departments with injuries should be administered. In classical guidelines, the indication for prophylaxis is evaluated according to the patient's vaccination history and wound characteristics. In our study, tetanus prophylaxis knowledge levels were found to be statistically significantly higher in emergency medicine specialists in patients who presented with injury, whose last dose of tetanus vaccine was unknown, who had a clean injury, and whose last dose of tetanus vaccine was unknown, who had a clean minor injury, who had >3 doses of tetanus vaccine and whose last dose of tetanus vaccine had not been given for 10 years ( $p < 0.0001$ ,  $p < 0.0001$ , and  $p = 0.024$ ).

When the knowledge levels and attitudes toward tetanus prophylaxis of patients who presented to the emergency department with a dirty wound, who had received  $\geq 3$  doses of tetanus vaccine, and who had been vaccinated for 5 years since the last dose were compared, no statistically significant difference was found for both participant groups ( $p = 0.188$  and  $p = 0.859$ ). The level of knowledge was found to be quite low in both groups. Talan et al.<sup>[11]</sup> showed in a study that 35% of 2000 patients admitted to the emergency department with injury did not receive the necessary prophylaxis according to wound type and indications and 8% received unnecessary prophylaxis.

Many studies have shown that tetanus antibody levels decrease with age and age is an important risk factor for tetanus immunity.<sup>[9]</sup> Regardless of whether the tetanus-diphtheria (Td) vaccine has been given in the last 10 years and if so, when, individuals aged 65 years and older should receive 1 dose of Td vaccine. The CDC recommendation is to give a booster every 10 years to individuals aged 65 years and older.<sup>[9]</sup> The knowledge and attitudes of both groups of physicians who responded to our questionnaire regarding the recommendation of tetanus vaccination for patients aged 65 years and older were not different. The rate of those who recommended vaccination was low in both groups (36.1% and 37.1%, respectively). Tetanus prophylaxis by emergency physicians, who constitute an important pillar of immunization, in patients aged 65 years and older, regardless of the wound status, will make a significant contribution to reducing the incidence of the disease.

The studies conducted in our country on tetanus immunization are studies in which the level of knowledge of patients or healthcare professionals about tetanus immunization or tetanus immunization is questioned.<sup>[12]</sup> This is the first study comparing the level of knowledge and attitudes of general practitioners and emergency medicine specialists working in emergency departments in our country on tetanus immunization.

Our study showed that all physicians working in the emergency department who will administer tetanus immunization have sufficient general knowledge about tetanus, but they do not have sufficient knowledge about tetanus vaccination programs and correct tetanus prophylaxis after acute injury. Emergency medicine specialists and physicians in training had higher general knowledge about tetanus and tetanus prophylaxis than general practitioners.<sup>[13]</sup> We think that this is a result of the tetanus immunization training received by emergency medicine specialists during their training.

## CONCLUSION

Tetanus is still an important public health problem in Turkey. Interruption of the immunization program is the main factor in the re-emergence of tetanus. To increase awareness of this issue, we believe that it would be beneficial to give training to all physicians working in emergency departments at regular intervals and to repeat them.

## Limitations

Our study had an observational and cross-sectional design and included only specialists and general practitioners working in the emergency department. Therefore, there may be bias because only physicians working in the emergency department were included, rather than comparing their attitudes and general knowledge about tetanus vaccine and/or booster recommendations with the general population of physicians who have knowledge about tetanus vaccine recommendations. On the other hand, as this survey focused on physician attitudes and general knowledge, it could not investigate specific patient preferences for obtaining records to refuse or accept booster vaccination. Further work to support this process is needed to improve the study.

## DECLARATIONS

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**Ethics Committee Approval:** The study was approved by İstanbul İstinye University Human Research Ethics Committee (No: 22-95, Date: 08/06/2022).

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