

## Original Article



# Assessment of knowledge among medical interns about tetanus and diphtheria vaccination in traumatized patients: an analytical cross sectional study

Parham Maroufi<sup>1</sup>, Jafar Ghobadi<sup>2</sup>, Mina Mojarrad<sup>3</sup>, Ali Adib<sup>3</sup>

<sup>1</sup>Department of Orthopedic Surgery, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

<sup>2</sup>Department of Emergency Medicine, Ardabil University of Medical Sciences, Ardabil, Iran

<sup>3</sup>Emergency Medicine Research Team, Tabriz University of Medical Sciences, Tabriz, Iran

### Article info

#### Article History:

Received: 04 Dec. 2020

Accepted: 21 Dec. 2020

e-Published: 23 May 2021

#### Keywords:

- Medical students
- Tetanus
- Vaccination

### Abstract

**Introduction:** Considering the importance of tetanus vaccination in both children and adults, recognizing the necessities and priorities of tetanus vaccination is essential for health care providers. Medical interns play a crucial role in the treatment of hospitalized patients, and as future physicians, should be well informed. This study aims to evaluate the knowledge of Tabriz University of Medical Sciences' medical interns about tetanus vaccination in patients presenting with trauma.

**Methods:** All interns of Tabriz University of Medical Sciences were enrolled in this study. Interns who did not want to participate in the study and those who were on-call, were excluded from the study. Eventually, 250 interns were gathered in a conference hall, and a questionnaire composed of 10 questions was given to them presenting a hypothetical traumatic event. Correct and incorrect answers to each question, and the age, and gender of the interns answering to these questions were analyzed.

**Results:** Only three questions were answered correctly by more than half of the participants; questions number 10, 1, and 2, with 67.2%, 59.2%, and 50.8% of correct answers respectively. On the other hand, 5 questions had less than 20% of correct answers. The maximum overall score was 7. Analysis of these results between the two sexes did not show a significant difference in the number of correct answers and each question's correct percentage also did not differ significantly between them. Additionally, age was not shown to be a variable affecting the total score of the participants.

**Conclusion:** Regardless of the age and gender, the knowledge of Tabriz University of Medical Sciences' medical interns about the precise indications of tetanus prevention in adults and children is poor.

### Introduction

Tetanus is an acute disease, which is entirely preventable by wound management and immunization. A dose of tetanus toxoid produces minimal antibody. A more complete antibody response is seen after the second dose about one month after the first injection. Immunological protection is sustained after the injection of a third dose.<sup>1-4</sup> Using the tetanus vaccine, the incidence of tetanus has followed a decreasing trend in the world. Tetanus has a worldwide incidence of 1 million cases per year, with a 20%-40% mortality rate. Most of the traumatic patients who visit the hospital via the emergency department, may be at the risk of tetanus infection, depending on the nature of their trauma. Vaccinating wounded patients with a tetanus booster dose is essential for clinicians.<sup>5-7</sup> Immunity to

tetanus decreases as time goes on. The Centers for Disease Control and Prevention (CDC) recommends booster vaccines every ten years.<sup>8,9</sup> Adults are recommended to receive vaccination according to their age, lifestyle, and medical conditions. Since medical students and health care workers are at a high risk of infection in emergencies, they must be aware and well-informed about tetanus vaccines and the form of immunity they produce; besides to the epidemiology of the disease.<sup>10-13</sup>

As senior medical students and future graduates, medical interns have a pivotal role in treating patients at hospitals and as future professional physicians, in health centers. This study evaluates the knowledge of Tabriz University of Medical Sciences' medical interns about tetanus vaccination in patients presenting with trauma.

\*Corresponding Author: Ali Adib, Email: ali.adib41@gmail.com

© 2021 The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## Methods

In this Analytical cross-sectional study, from a total of 307 interns of Tabriz University of medical sciences, 250 were eligible to participate; the inclusion criterion was being an intern of medicine in Tabriz University of medical sciences at that time. Thirty-five interns were on-call, and 22 did not want to participate in the study. A questionnaire, composed of ten questions assessing the indications of vaccination in traumatic patients based on the 2014 version of Rosen's principle and practice of emergency medicine's textbook was given to the interns presenting a hypothetical traumatic event. After designing the questionnaire, it was reviewed and validated by a team consisting of two orthopedic surgeons and four emergency medicine specialists. The test was taken under supervision, and any kind of consultations or phone calls were disallowed during the test. All questions were evaluated; and then correct and incorrect answers to all questions were analyzed. Finally, interns' knowledge, overall results, and responses to each question were investigated and evaluated. The analysis was performed using SPSS® (version 20.0.0 IBM Corp.: Armonk, New York, USA). We used mean±standard deviation, frequency distribution table, and bar graphs to describe the sample population and the test scores.

Moreover, to evaluate age and sex's effects on the number of correct answers, we used paired T-test and independent T-tests. In all conditions,  $P < 0.05$  was considered statistically significant.

All the interns participated in this study and completed the questionnaire willingly. The collected data were anonymously analyzed. Only general data about the study population were provided.

## Results

Our study included 250 medical interns composed of 127 male interns and 123 females. The average age was  $26.8 \pm 1.6$  (minimum of 24 and a maximum of 30). The average male age was  $26.8 \pm 1.6$ , and the average female age was  $26.9 \pm 1.6$ . There was no significant difference in age between male and female groups ( $P = 0.68$ ). Table 1 shows the percentage of correct answers to each question.

The overall score of participants in our study was in the range of 0 to 7. The average score was  $3.2 \pm 1.36$  in males and  $3.2 \pm 1.4$  in females. There was no significant difference according to independent t-test between the average scores of male and female groups ( $P = 0.85$ ). Figure 1 compares the total scores between male and female participants.

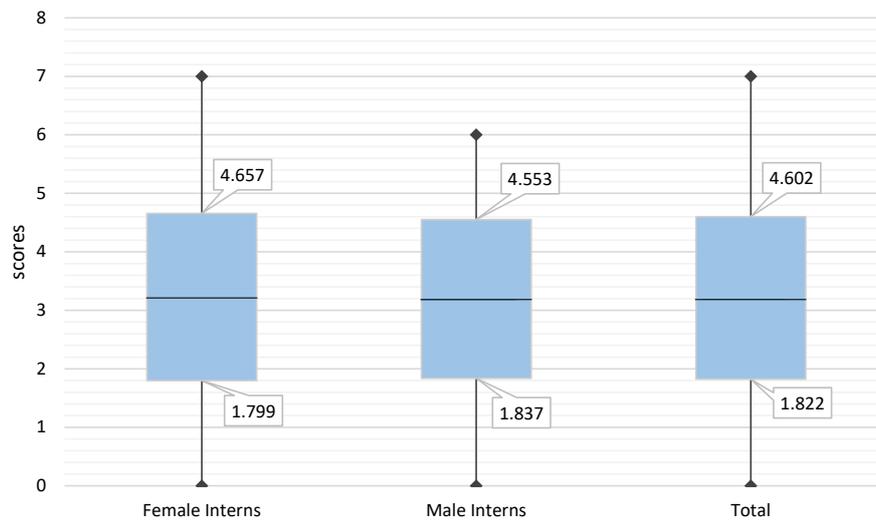
The frequency of total scores from 0 to 7 in each gender is declared as a cluster diagram (Figure 2). The relationship between age and the total score was evaluated, and there was no significant relationship reported ( $P = 0.321$ ). The correlation coefficient between these two variables was 0.63.

## Discussion

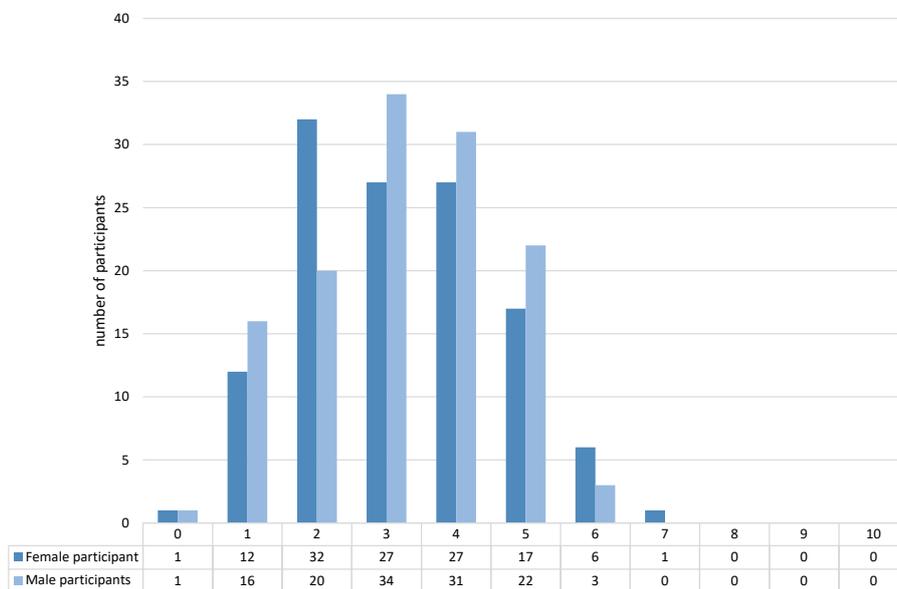
The current study evaluated the awareness of Tabriz University of Medical Sciences' medical interns about the indication of tetanus vaccination using a questionnaire, including ten questions. In most questions, the correct response rate was very low. Only in 3 questions, more than half of the participants chose the correct answers. On the other hand, in 5 questions, the percentage of the correct answer was less than 20%. Question 10, with a 67.2% rate of correct responses, had the highest proportion of correct answers, following by questions 1 and 2 with 59.2% and 50.8% of correct responses, respectively. The total score among all of the participants was seven or lower. There was no significant difference in the analysis of the number of correct answers between male and female interns. Also, age was not indicated as a variable affecting the total score. These results revealed the poor knowledge and awareness among interns about the indications of tetanus vaccination and its prevention in adults and children. In a study conducted by Hoon-Young et al in South Korea, 2012; 64 emergency medicine residents were evaluated for applying tetanus prevention guidelines on wounded patients. It revealed that the residents applied the guideline on more than 80% of trauma patients; however, only 45% of them administered tetanus booster vaccines in the wounded and traumatic patients. There was no significant difference between age groups in the tetanus booster administration rate.<sup>14</sup> Most Emergency Department clinicians have enough information about tetanus prophylaxis guidelines. However, most physicians claimed that the reason for not considering the prevention of tetanus-diphtheria and their vaccination, was related to the idea that most patients have already been vaccinated in due courses. As mentioned, because the population involved in this study consisted of interns (not emergency medicine residents), the level of awareness about vaccination in our study was lower. In Lu et al<sup>15</sup> study in the United States in 2017, awareness about vaccination for disease prevention among adults aged more than 19 years old ranged from 63.4% to 94% (71.5% reported awareness about tetanus, 63.4% reported awareness about HPV, 75.4% reported

**Table 1.** Percentage of correct answers to each question.

Questions	Correct response percentage
Question 1	59.2%
Question 2	50.8%
Question 3	14.4%
Question 4	48.4%
Question 5	4%
Question 6	12.4%
Question 7	8%
Question 8	13.6%
Question 9	43.2%
Question 10	67.2%



**Figure 1.** Depicts a comparison of the overall scores between male and female participants and the whole population. Mean  $\pm$  standard deviation was  $3.195 \pm 1.358$  and  $3.228 \pm 1.429$  in male and female participants respectively and  $3.212 \pm 1.390$  for the whole population.



**Figure 2.** Illustrates the frequency of overall scores based on gender. The vertical axis shows the number of participants and the horizontal axis is for each score. As it is depicted, no one scored 8,9,10 and only one participant scored 7.

awareness about herpes zoster, 70.2% reported awareness about pertussis, 75.8% reported awareness about hepatitis type B, 94% reported awareness about influenza, 83.1% reported awareness about pneumonia). In multivariate analysis, being a college graduate and being a female was associated with a higher awareness of preventable diseases' vaccination. However, despite the high level of awareness, self-reported vaccine coverage was not optimal, and more educate is needed to increase public awareness regarding this matter. Hurley et al<sup>16</sup> studied about a hypothetical 67-year-old patient in 2016, among 352 internal medicine residents and 255 general physicians; 89% of participants ranked seasonal influenza vaccine, and 80% ranked pneumococcal vaccine as very important, whereas

only 47% ranked herpes zoster and 63% ranked tetanus vaccine as very important. For a hypothetical 30-year-old patient, the number of participants who ranked tetanus and seasonal influenza vaccination as very important were respectively 62% and 47%. 295 of participants stated that the adult immunization schedule is somehow confusing. This leads to missing some of the vaccination opportunities. This study, similar to ours, revealed a low level of awareness about vaccination among physicians. A study by McDougall et al<sup>17</sup> in 2015 was conducted to assess healthcare providers' awareness about tetanus, diphtheria, acellular pertussis (Tdap) vaccination in Canada. Out of 1167 participants, only 47.5% claimed that they were immunized, and 58.5% stated offering Tdap for

## Study Highlights

### What is current knowledge?

- Studies show, adult immunization schedule may be confusing for physicians.
- In a previous study, only 45% of participants administered indicated tetanus boosters.
- In general public, sex is an indicator of higher awareness of vaccination protocols.

### What is new here?

- No one among the participating interns scored higher than 7.
- There was no difference in overall scores between male and females interns.
- low awareness of vaccination guidelines is a worldwide issue.

their adult patients on a routine basis. Furthermore, the mean proportion of correct answers for a survey in this study was 63.2%. Sukriti et al<sup>18</sup> studied on 2162 healthcare workers in 2008 in India, and reported that 27.7% had never been vaccinated and 16.4% were unaware of their vaccination status. These studies demonstrated similar results to the results of our study. Further studies can provide us more insight into this matter; studies with similar aims should focus on having a larger sample size and from different universities. They can also shift their focus on vaccinations for other preventable diseases in general, and not just tetanus. Based on the existing low awareness about vaccination, an alternative strategy might provide us with improvements and promotions regarding this situation.

## Conclusion

The results of this study revealed that regardless of age and gender, the knowledge of Tabriz University of Medical Sciences' medical interns about the precise indications of tetanus prevention in adults and children is low.

## Conflict of Interest

No conflict of interest was declared by the authors.

## Ethical Approval

ethics committee approval was received for this study from the ethics board of research deputy of Tabriz University of Medical Sciences.

## Author's Contributions

Concept: PM, MM; Design: PM, JG; Supervision: PM, JG; Resources: MM, AA; Materials: PM, AA; Data collection and/or Processing: MM, AA; Data Analysis and/or Interpretation: PM, JG; Literature Search: MM, AA; Writing Manuscript: JG, MM, AA; Critical Review: PM, JG, AA.

## Acknowledgements

The Authors would like to thank the deputy of research of Tabriz University of Medical Sciences for their support.

## Funding

The authors declare that the study has no financial support.

## References

1. Simonsen O, Badsberg JH, Kjeldsen K, Møller-Madsen B, Heron I. The fall-off in serum concentration of tetanus antitoxin after primary and booster vaccination. *Acta Pathol Microbiol Immunol Scand C*. 1986;94(2):77-82. doi: 10.1111/j.1699-0463.1986.tb02093.x.
2. Ribero ML, Fara GM, Del Corno G. [Duration of tetanus immunity in relation to the number of doses of vaccine]. *Boll Ist Sieroter Milan*. 1980;59(5):464-75.
3. Collier LH, Polakoff S, Mortimer J. Reactions and antibody responses to reinforcing doses of adsorbed and plain tetanus vaccines. *Lancet*. 1979;1(8131):1364-8. doi: 10.1016/s0140-6736(79)92006-3.
4. Volk VK, Gottshall RY, Anderson HD, Top FH, Bunney WE, Serfling RE. Antigenic response to booster dose of diphtheria and tetanus toxoids. Seven to thirteen years after primary inoculation of noninstitutionalized children. *Public Health Rep*. 1962;77(3):185-94.
5. Bleck TP. *Clostridium tetani* (tetanus). In: Madell GL, ed. *Principles and Practice of Infectious Diseases*. New York: Churchill Livingstone; 2000. p. 2537-43.
6. Park JH, Kim JN, Woo KH. A comparison study of childhood immunization level between urban and rural areas. *J Prev Med Public Health*. 1985;18(1):137-47.
7. Jang YS. *Korea's Health and Welfare Trends 2011*. Seoul: Korea Institute for Health and Social Affairs; 2011.
8. Kretsinger K, Broder KR, Cortese MM, Joyce MP, Ortega-Sanchez I, Lee GM, et al. Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine recommendations of the Advisory Committee on Immunization Practices (ACIP) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. *MMWR Recomm Rep*. 2006;55(RR-17):1-37.
9. Tetanus: Make sure you and your child are fully immunized. Available from: <http://www.cdc.gov/Features/Tetanus/>.
10. Marcus AW, Ward AE, Roberts JS, Bryett KA. An evaluation of diphtheria--tetanus (adult) vaccine in unselected human volunteers. *J Int Med Res*. 1989;17(3):262-7. doi: 10.1177/030006058901700309.
11. Middaugh JP. Side effects of diphtheria-tetanus toxoid in adults. *Am J Public Health*. 1979;69(3):246-9. doi: 10.2105/ajph.69.3.246.
12. Lee SY, Kwak GY, Mok HR, Kim JH, Hur JK, Lee KI, et al. The immunogenicity and reactogenicity of Td booster vaccination in Korean preadolescents, aged with 11-12 years old. *Korean J Pediatr*. 2008;51(11):1185-90. doi: 10.3345/kjp.2008.51.11.1185.
13. Hatamabadi HR, Abdalvand A, Safari S, Kariman H, Arhami Dolatabadi A, Shahrami A, et al. Tetanus Quick Stick as an applicable and cost-effective test in assessment of immunity status. *Am J Emerg Med*. 2011;29(7):717-20.

- doi: 10.1016/j.ajem.2010.01.046.
14. Yoon YH, Moon SW, Choi SH, Cho YD, Kim JY, Kwak YH. Clinician awareness of tetanus-diphtheria vaccination in trauma patients: a questionnaire study. *Scand J Trauma Resusc Emerg Med.* 2012;20:35. doi: 10.1186/1757-7241-20-35.
  15. Lu PJ, O'Halloran A, Kennedy ED, Williams WW, Kim D, Fiebelkorn AP, et al. Awareness among adults of vaccine-preventable diseases and recommended vaccinations, United States, 2015. *Vaccine.* 2017;35(23):3104-15. doi: 10.1016/j.vaccine.2017.04.028.
  16. Hurley LP, Bridges CB, Harpaz R, Allison MA, ST OL, Crane LA, et al. Physician attitudes toward adult vaccines and other preventive practices, United States, 2012. *Public Health Rep.* 2016;131(2):320-30. doi: 10.1177/003335491613100216.
  17. MacDougall D, Halperin BA, MacKinnon-Cameron D, Li L, McNeil SA, Langley JM, et al. Universal tetanus, diphtheria, acellular pertussis (Tdap) vaccination of adults: what Canadian health care providers know and need to know. *Hum Vaccin Immunother.* 2015;11(9):2167-79. doi: 10.1080/21645515.2015.1046662.
  18. Sukriti, Pati NT, Sethi A, Agrawal K, Agrawal K, Kumar GT, et al. Low levels of awareness, vaccine coverage, and the need for boosters among health care workers in tertiary care hospitals in India. *J Gastroenterol Hepatol.* 2008;23(11):1710-5. doi: 10.1111/j.1440-1746.2008.05483.x.