

Public Attitude and Awareness towards Tetanus and Its Vaccine in Riyadh

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Abstract: ***Objectives:** The objectives of this study were to assess the awareness of the public about tetanus and its relation to the demographic characteristics, the awareness about tetanus vaccine, and to identify the deficient aspects of knowledge in regards to tetanus in Riyadh, Saudi Arabia. **Background:** Tetanus is one of the life threatening, yet easily preventable diseases as it causes for the affected patient involuntary muscle spasms which might lead to death. With the introduction of tetanus vaccine, the prevalence rate was decreased, but still present, thanks to the vaccine. In this study, we aimed to assess the awareness of the public about tetanus and its vaccine in Riyadh, Saudi Arabia. **Method:** A cross-sectional, survey-based study was conducted in different public places in Riyadh using a validated and a reliable questionnaire, with a calculated sample size of 377 people. They were surveyed about their demographics and their knowledge of tetanus and its vaccine. Statistical Package for the Social Sciences (SPSS) was used to analyze the results and to report them as frequencies and proportions. **Results:** Of the 377 Participants, 69.2% of the sample size never heard of tetanus disease. Only 24.2% of females heard of tetanus compared to 34% of the male respondents who heard of it. Older people showed greater knowledge with 60% of people >55 years old knew about tetanus, and the minority of young adults (15.8%) knew about it. Also, people with better income heard of tetanus more than those with less income e.g. 43.8% of people with an income of >20000 SAR knew about tetanus and only 23.3% of people with an income of <5000 SAR heard of it. Furthermore, as the level of education increases the knowledge increases, but, surprisingly, 60% of people who had an education below the high school level heard of tetanus. 69% of the respondents didn't know about tetanus booster vaccine, however, 14.9% of the participants reported that they took the vaccination. **Conclusion:** The awareness of tetanus in Riyadh is generally poor despite the good education and health systems. That warrants more attention to the need of more campaigns which educate about tetanus and its prevention. Although a great number of people have taken the booster vaccine, more investigations are needed to analyze the reasons of the vaccination which might be actually due to the exposure to wounds and other risk factors.*

Keywords: Tetanus, Public Awareness, Riyadh, Vaccine, public attitude

1. Background

The infamous tetanus, that is known since ancient times, is not completely eradicated and still can affect different age groups despite the effective immunization programs that have been implemented all over the world. Although nowadays it's a disease of developing countries, it's still seen in developed ones¹⁻² Tetanus is caused by the toxin-producing and spore-forming *Clostridium tetani* that are ubiquitous in the environments. It is found in the soil, dirt, and feces, and its spores are stable in the environment and it has the capability to cause the disease indefinitely. Therefore, it is difficult to eradicate tetanus despite having an effective vaccine. It enters the body through contaminated skin wounds either by penetrating objects or damaged skin exposed to the dirty environment.³

The clinical types of tetanus are classified to generalized, localized, cephalic and neonatal. The former is the most common form.⁴ The disease is characterized by painful muscular contractions, especially the jaw muscles causing "lockjaw". Other classical presentations that develop late in the course of the disease are the abnormal arched back "opisthotonus" and the sardonic smile "risus sardonicus". It can also lead to death, most commonly due to respiratory failure.² The disease incidence has declined in developed countries that have implemented the immunizations e.g. 233 cases only have been documented during 2001-2008 in the United States. Puncture wound is the most common risk

factor for tetanus but any open wound could be at risk of contamination and infection with tetanus toxins in non-vaccinated individuals particularly if there was no proper wound care. Possible host risk factors for tetanus are diabetes and Intravenous (IV) drug use as reported by the CDC.⁵ During 2001-2008, 15% of reported cases were in IV drug users. Diabetes accounted for 13% of cases during 1987-2008 in USA. According to World Health Organization (WHO), neonatal tetanus (a form of tetanus that affects newborns due to lack of the mother's immunization and unsterile delivery practices) was responsible for 180,000 deaths globally in 2002.⁵⁻⁶ Kingdom of Saudi Arabia (KSA) is one of the many countries that introduced the vaccination program, and tetanus immunization is part of Expanded Programme on Immunization (EPI) since the 1980s.⁷ According to Ministry of health (MOH) in KSA, the incidence of neonatal tetanus is 0.004 per 1000 live births in 2014, and the immunization coverage among infants is 98.1%. In 2014, The total number of tetanus (other than neonatal) reported cases in KSA is 11 cases, 10 of which were in Jeddah city. Surprisingly, 6 of those cases occurred in people aged 15-44, and the remaining 5 cases occurred in the age of 45 and above. However, only 1 Saudi is affected that year and there were no reported neonatal cases.⁸

In a study done in King Abdul-Aziz Hospital and Oncology Center from January 2000 through to December 2002, 11 adult cases were diagnosed with tetanus, 4 of them were

Saudis. Also, the study reported that their immunization status with tetanus toxoid are not updated.⁷ Nevertheless, there is still the possibility of underreported cases due to the fact that the diagnosis is clinical.

Tetanus can affect older people who weren't vaccinated or who were inadequately vaccinated. Nevertheless, a 10-year booster dose is also required to boost the immunity for previously immunized people or the disease can occur. Although the need of boosters is questioned and that primary doses of vaccine are thought to be enough, boosters are recommended by centers like CDC. Also, it's important to mention that there is a variable response and a variable circulating antibodies to the primary immunization series, and in some people the immunity may reach 20-30 years, but boosters are needed to minimize the risk and enhance protection in greater numbers of the population.⁹⁻¹¹

Health knowledge is an important element of human's life, and knowing how to fight diseases, especially preventable diseases, is one way to survive. Also, knowing the effective strategies that were developed against such diseases should be taught to school's children and the public to increase knowledge and promote health. This research aims to assess the current knowledge and awareness about tetanus and its booster vaccine in people who live in Riyadh- KSA

2. Materials and Methods

Study design and setting

A cross-sectional, survey-based study was conducted in Riyadh, Saudi Arabia. The questionnaire was disseminated in different public places e.g. malls, walking tracks, and parks, and the places were chosen with different cardinal directions (north, east, etc.) to cover different socioeconomic groups. Riyadh is the capital of Saudi Arabia and it has the second largest population after Makkah Al-Mokarramah, but it is the largest in terms of Saudi population. The latest statistical data shows that Riyadh has a population of 8 million, 4.5 million being Saudis.¹²

Sample size and Sampling Technique:

Raosoft sample size online calculator was used to determine the sample size. The recommended sample size was 377 with 5 % margin of error and a confidence level of 95 %.¹³ A convenience sampling was done for those who were available at the different public places in 2016.

Data Collection methods and instruments:

A validated questionnaire was taken from a published article, then it was translated by experts from English to Arabic and vice versa and a final Arabic version was formed.³ Then, the questionnaire was modified to meet the objectives of this study and to be related to Saudi population. Two questions were added to ask about the tetanus booster vaccine to assess the prevalence of the vaccination. The modified questionnaire was then assessed for the reliability by pilot testing of a sample of 20 who are not included in the primary study. Cronbach's alpha test was done using Statistical Package for the Social Sciences (SPSS) version 22 for the questionnaire's questions without the section of demographics to assess the reliability of tetanus-related questions, and the reliability coefficient was

found to be 0.791 which indicates a good internal consistency. The studied variables included about tetanus are: the general knowledge and definition, the cause and transmission, and the vaccine knowledge and prevalence. Furthermore, the general knowledge was tested for its relation to the demographic data. The questionnaire was disseminated in different places by the six co-investigators of the research. They were disseminated in the period between October and December, 2016. Non-Saudis were excluded from the research and only Saudis were included to try to indirectly assess the public health in regards to tetanus in Saudi Arabia. All Saudis, males or females, were included, and various age groups were also included but young children were avoided.

Data management and analysis:

The participants were coded as serial numbers in Excel 2016. Then, the data was cleaned i.e. improper sheets (empty papers, incomplete answers, or multiple answers) were removed, and 377 sheets were collected in the end. All variables were categorical and even age and income were categorized. Statistical Package for Social Sciences (SPSS) version 22 was used to analyze the data. The variables were entered in SPSS and the frequencies and proportions were done as numerical measures to report the results. Tables of frequencies and counts were generated by SPSS too, and a 2x2 cross tabulation was generated for the general knowledge in association to the demographic characteristics.

Ethical consideration:

King Abdullah International Medical Research Center (KAIMRC) reviewed and approved the research. A consent form that has the title and the purpose of the study was attached as the first page in the questionnaire, and only those who voluntarily agree to participate will be included in the research.

3. Results

Demographic Characteristics:

253 (67.1% of the total sample size) males and 124 (32.9%) females were included in this study. 8 (2.1%) of the participants were <18 years old, 48.5% (183) were 18-24 years old, 38.7% (146) were 25-39 years old, 9.3% (35) were 40-55, and 1.3% (5) were >55 years old. 42.2% (159) of the respondents had an income of less than 5000 Saudi Arabian Riyals (SAR), 28.9% (109) of them had an income within the range of 5000-10000 SAR, 20.4% (77) had an income between 10000-20000 SAR, and 8.5% (32) of them had an income of more than 20000 SAR.

The educational level of the participants was asked for and it showed the following: none of them had had any education, 1.3% (5) had only studied the elementary or intermediate schools, 32.1% (121) had completed high school, 9.8% (37) had diploma degree, 51.7% (195) had Bachelor degree, 4.5% (17) had reached the master degree, and only 0.5% (2) had PhD. Table 1 shows the baseline demographic characteristics of the participants.

Prevalence:

In relation to this study's sample size, 69.2% (261 out of 377) of the respondents have never heard of tetanus as a

disease entity. Furthermore, the association of the knowledge to the baseline demographic characteristics were investigated and it's summarized in Table 2. Among males who responded to the survey, 34% (86) had heard of the disease, while 66% (167) never had heard of it. In comparison, 24.2% (30) of females had known the disease, while 75.8% (94) never heard of the disease. The percentages of those who weren't aware about tetanus in relation to the age are: 62.5% (5) for people who are <18, 84.2% (154) for people who are 18-24, 59.6% (87) for those who are 25-39, 37.1% (13) for those who are 40-55, and 40%(2) for the participants who are > 55 years old. Also, 76.7% (122) of those who had an income of <5000 Saudi Arabia riyals (SAR) reported that they never heard about tetanus, 71.6% (78) of the people who had an income of 5000-10000 SAR never heard of tetanus, 55.8% (43) for those who had an income between 10000-20000 SAR reported that they never heard of it, and 56.2%(18) for the those who have >20000 SAR reported that they never heard of the disease. 40% (2 out the 377) of people who had only finished elementary or intermediate schools, 81% (98) of those who had finished high school reported that they never heard about tetanus, 73% (27) of people with diploma had never heard of tetanus, 64.6% (126) of those with bachelor never heard of tetanus, and 47.1% (8) of people with master degree reported that they never heard about tetanus, and all the people who had PhD (2 out the 377) reported that they heard of tetanus.

72.7% (274) of the total respondents answered with "I don't know" to the fact that tetanus is an infection caused by contaminated wounds, while 5.8% (22) answered with "no", and 21.5% (81) answered correctly with "yes". 77.7% (293) of the total respondents didn't have the knowledge about the source of the disease i.e. the microbe that is found in the surrounding environment and soil, and 4% (15) incorrectly chose "no" as the answer. Regarding the clinical presentation of involuntary muscle spasms and "lockjaw", 82.5% (311) of people chose "I don't know", 7.4%(28) chose "no", while 10.1% (38) chose correctly "yes". People were asked if the disease could be transmitted from person to person, and the results were 71.4% (269) didn't know, 15.1 (57) said it is false, and only 13.5% (51) said it is true. 69% (260) of respondents reported that they don't know about the booster vaccine for tetanus. 85.1%(321) hadn't received the booster vaccine in the past, while 14.9% (56) had received it. People were asked if tetanus can develop in people who are not immunized or in people who didn't boost their immunity with the vaccine, and 83.6% (315) didn't know about the importance of the vaccine, 10.1% (38) answered wrongly with "no" to the statement, and only 6.4% (24) correctly answered with "yes". Finally, they were asked if inadequate immunity with booster vaccines every 10 years and failed immunization in the presence of an open wound that it would results to tetanus, and 74.5% (281) answered with "I don't know", 4.8% (18) answered that it's not correct, and 20.7% (78) answered the correct answer with "yes".

4. Discussion

This study was done to analyze the knowledge and awareness of tetanus and its vaccine in the public of Saudi

Arabia. The importance of this study is to know if there is a need to promote health in regards to tetanus disease or infectious diseases in general, because very much was done to fight and eradicate the disease especially where it's endemic, and it is important to assess how good is the public health and health knowledge in our community. In this study, the majority of respondents 69.2% (261 out of 377) had never heard of tetanus. In comparison to a study that was done in Pakistan, the majority of them had known or heard of tetanus (n= 973; more than 80%).¹⁴ The discrepancy between our study and their study could be related to the lack of public awareness in the media, schools and public campaigns in our community. It could also be due to the high occurrence of minor injuries in Pakistan which was reported in the study. However, another study that was done in Thailand shows similar number to ours with 68.9% of their respondents had never known about tetanus disease.¹⁵ In regards to gender variation in knowledge, males in this study have known tetanus more than females with a percentage of 34% and 24.2% respectively. In comparison, an Indian study done in Delhi demonstrated more knowledge about the disease among female groups.¹⁶ Many reasons can increase the knowledge in a particular population, one of which is the exposure to or the previous infection with tetanus, and males are more prone to be exposed to tetanus since they are more involved in sports, farming, and other activities.

Anyhow, it warrants more attention to female groups in our community regarding health education and awareness, and with educating females, neonatal tetanus can be totally eliminated from the community.

The results also show that the knowledge somehow is related to the age. 60% of people >55 years old knew about tetanus, on the other hand, only 16% of young adults (18-24 years old) knew about it. The age group of people between 40-55 years old showed the highest percentage of knowledge compared to the others age groups with 63% of them were knowledgeable.

This means that the awareness is lower in young people in our population. These results are the opposite of a study done in China which showed that the awareness decreases with older age groups.¹⁷ These results indicate that there may be poor educational programs regarding this issue in the schools, media and public campaigns, and that the knowledge might be more in people who were infected with tetanus since tetanus was more prevalent in the past. The numbers clearly show that there is a problem in the health education in regards to tetanus which may reflect also the deficiency in some public health matters like vaccination and prevention.

When mentioning the level of education of the study participants, we found that when the level of education increases the awareness increases as well. The percentage of people not aware of the disease were 81% of people with high school degree, 73% of people with diploma, 64.6% of those with bachelor, 47.1% of people with master degree. On the other hand, all the people who had PhD (2 out the 377) reported that they heard of tetanus. However, 40% of people who went only to intermediate or elementary schools

reported that they hadn't known about tetanus. Generally, the level of education is strongly associated with the level of awareness. This was similar to the results of a study done in China that studied the public awareness about three infectious diseases (TB, HIV, and HBV).¹⁷ Although the study was about different infectious diseases, the results were similar and showed that people with higher educational level were more aware of the disease. In a study done in Thailand low socioeconomic status was associated with less awareness of the disease which is similar to our study.¹⁵ Our study showed that when the income increases the awareness increases significantly. For example, 76.7% of those who had an income of <5000 Saudi Arabian riyals (SAR) reported that they never heard of tetanus. While 55% and 56% for those who had an income between 10000-20000 and >20000 respectively reported that they never heard of it. This can tell us that the low socioeconomic status is mostly accompanied by less level of education which could explain this finding. It is expected to have a better knowledge and a better health in people with good socioeconomic status. Further investigations of the knowledge aspects were done to determine what the most deficient parts are in order to know which information is lacking in the community. People were asked if tetanus is caused by contaminated wounds and if it is acquired from the environment and from soil and animal feces, 21.5% and 18.3% correctly recognized the answer respectively. They were also asked about the clinical presentation which is the muscle spasms and with the classical name "lockjaw" given to them and only 10.1% of them identified it. Furthermore, 15.1% of the participants thought that the disease could be transmitted from one person to another, 71.4% didn't know how tetanus is transmitted, and only the minority (13.5%) was able to know the mode of transmission. Although 30.8% of them claimed they know tetanus, the majority of them didn't correctly answer every statement about tetanus, and the most deficient aspect was the clinical presentation. It is also important to mention that people mistakenly thought that tetanus can be transmitted between people, and it was the most statement that people answered incorrectly to.

The third section in the survey analyzed the public knowledge and attitude to tetanus booster vaccine. The majority of the respondents (69%) didn't know about the booster vaccine, and 14.9% of people reported that they took the booster vaccine in our population. In 2007, one American study reported that only 3.6% of adults have received the vaccine, and approximately 19% of those who weren't vaccinated had known about the existence of the vaccine.¹⁸ There is more people in our population that took the vaccination compared to the American population, but we think it's either the time difference between the two studies that made such a discrepancy, or it might be really an indication that our vaccination coverage is good if not better. In comparison, 18.6% of the respondents had known about tetanus vaccine in a Canadian study.¹⁹

Another Canadian study showed that 64% of adults remembered that they had taken the tetanus vaccine, however, only 45% of them received the vaccine in the past ten years. In that study, the main reason for the last tetanus immunization was due to the risk of exposure as in injuries, and only few of them took it because of a physician's

recommendation.²⁰ We think more investigations are needed to be done to analyze the reasons for the vaccinations, because as seen in the Canadian population, the one major reason for tetanus vaccination was due to the exposure to the risk factors e.g. injuries. Although, it's not clear if people know the idea of "booster vaccination" and it's possible that they misunderstood it with the primary vaccinations the children required to take. Moreover, the participants were asked if someone could develop tetanus if they haven't been vaccinated against tetanus and 83.6% of them didn't know the answer and 10.1% of them disagreed with the statement. Many people couldn't appreciate the need of the vaccination which was also seen in Thailand where 88.2% of people didn't know its importance.¹⁵ The lack of knowledge of the importance of the booster vaccine to strengthen the immunity against tetanus may be the reason of the vaccine hesitancy. In addition, 20.8% of the respondents were knowledgeable and knew that tetanus may develop if there was an inadequate immunity with the presence of open wounds. This may be related to the fact that 21.5% of the respondents accurately knew that tetanus is caused by wounds contamination. It is important for people to know the risk factors in order to accurately identify the post-exposure steps that are needed to be taken, and campaigns that target both increasing awareness of the primary prevention using the vaccine and the post-exposure management could be helpful to entirely eradicate the disease. Nevertheless, primary prevention by the booster vaccine is much safer for the people to avoid the infection, and achieving a better vaccine coverage not only for tetanus but also for the rest of the diseases that can be prevented by vaccines is not impossible.

5. Conclusion and Recommendations

As per the results, male gender, older age, people with higher monthly income, and people with higher educational level were indicators for more knowledge about the term "tetanus". Moreover, these indicators were associated with more knowledge about the disease manifestations, potential sources, and the presence of booster vaccines. However, most of the population didn't know basic facts about the disease transmission, how it manifests, and even were not aware of the booster vaccine. Therefore, we recommend awareness campaigns to be performed targeting specific populations, including schools, public hospitals, and low-income living districts. Moreover, we recommend the utilization of social media to cover larger population with measures like articles, infographic videos, and celebrities' support. In addition, we recommend further studies to specific age groups, socioeconomic status, and different cities to estimate the real prevalence of community awareness of the disease, the potential causes, the manifestation of the disease, and how to prevent it. Also, the history of previous vaccination is needed to be further investigated to know the cause and if there was really a need for the vaccine.

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Tables:

Table 1: Demographic characteristics for the study participants

Demographic Characteristics		Count	Percentage
Gender	Male	253	67.1%
	Female	124	32.9%
Age	Less than 18	8	2.1%
	18-24	183	48.5%
	25-39	146	38.7%
	40-55	35	9.3%
	More than 55	5	1.3%
Income	Less than 5000	159	42.2%
	5000 - 10,000	109	28.9%
	10,000 - 20,000	77	20.4%
	More than 20,000	32	8.5%
Education level	None	0	0.0%
	Elementary or intermediate	5	1.3%
	High school	121	32.1%
	Diplomat	37	9.8%
	Bachelor	195	51.7%
	Master	17	4.5%
PhD	2	0.5%	

Table 2: Knowledge about tetanus in relation to the demographic characteristics

Demographic Characteristics	Have you ever heard of tetanus?		
	Yes	No	
Gender	Male	34% (n=86)	66% (n=167)
	Female	24.2% (n=30)	75.8% (n=94)
Age groups	<18	37.5% (n=3)	62.5% (n=5)
	18-24	15.8% (n=29)	84.2% (n=154)
	25-39	40.4% (n=59)	59.6% (n=87)
	40-55	62.9% (n=22)	37.1% (n=13)
	>55	60% (n=3)	40% (n=2)
Income	<5000 SAR	23.3% (n=37)	76.7% (n=122)
	5000-10000 SAR	28.4% (n=31)	71.6% (n=78)
	10000-20000 SAR	44.2% (n=34)	55.8% (n=43)
	>20000 SAR	43.8% (n=14)	56.2% (n=18)
Education level	Elementary or intermediate	60% (n=3)	40% (n=2)
	High school	19% (n=23)	81% (n=98)
	Diplomat	27% (n=10)	73% (n=27)
	Bachelor	35.4% (n=69)	64.6% (n=126)
	Master	52.9% (n=9)	47.1% (n=8)
	PhD	100% (n=2)	0% (n=0)