Ruhusen Kutlu[1]
Metin Dogan[2]
Ali Riza Capa[3]
Mahmut Baykan[2]

[1]Department of Family Medicine, Meram Medical Faculty, Necmettin Erbakan University, Konya, Turkey
[2]Department of Medical Microbiology, Meram Medical Faculty Hospital, Necmettin Erbakan University, Konya, Turkey
[3]Department of Family Medicine, Sorgun State Hospital, Yozgat, Turkey

Corresponding Author:
Ruhusen Kutlu
Department of Family Medicine,
Meram Medical Faculty,
Necmettin Erbakan University,
Konya, Turkey
Phone:+90 332 2236601
mail: ruhuse@yahoo.com

Evaluation of Tetanus Immunoglobulin G Levels According to Age and Sociodemographic Characteristics: A Community-Based Study

ABSTRACT
Objective: In the present study, it was aimed to determine the serum tetanus antibody levels in individuals aged 18 and over and examine whether the antibody levels have changed with advancing age.
Methods: This descriptive research was carried out on 916 adults aged 18 years and over in Konya. A survey containing sociodemographic features was filled and tetanus IgG levels was measured.
Results: In this study, 916 suitable people in total who consisted of 68.4% (n=627) female and 31.6% (n=289) male were included. Of the participants, 756 (82.5%) had protective tetanus antibody levels (≥0.1 IU/mL), and 160 (17.5%) had unreliable protective antibody levels (<0.1 IU/mL). No significant difference was found between male and female gender (p=0.225). Antibody levels of those who had secondary and higher education were found significantly higher than those with primary education or less. Antibody levels decrease significantly with increasing age (p<0.001). Antibody levels were significantly found higher the employees than the unemployed (p<0.001), the unmarried than the married (p=0.004), and the people with high income than those with low income (p<0.001) statistically. Antibody levels of those who were vaccinated earlier were found significantly higher (p<0.001).
Conclusions: In this study, it was determined that tetanus antibody levels of the people at old age, with low educational level and without vaccine were lower. Tetanus is a life-threatening public health problem, so new health policies should be developed in this regard.
Keywords: Tetanus Antibody, Vaccine, Adult, Seroprevalence.

Tetanoz İmmünoglobulin G Düzeylerinin Yaş Ve Sosyodemografik Özelliklere Göre Değerlendirilmesi: Toplum Temelli Bir Çalışma

ÖZET
Amaç: Sunulan çalışmada serum tetanoz antikor seviyelerinin 18 yaş ve üzeri bireylerde belirlenmesi ve ilerleyen yaş ile birlikte antikor düzeylerinin değişip değişmediğinin incelemesi amaçlanmıştır.
Gereç ve Yöntem: Bu tanımlayıcı araştırma Konya'da 18 yaş ve üstü 916 yetişkin üzerinde yapılmıştır. Sosyodemografik özellikler içeren bir anket dolduruldu ve tetanoz IgG düzeyleri ölçüldü.
Bulgular: Çalışmaya % 68,4 (n = 627) kadın, % 31,6 (n = 289) erkek toplam 916 uygun kişi alındı. Katılımcıların 756'sında (%82,5) koruyucu tetanoz antikor düzeyi (≥0,1 IU / mL) ve 160'ında (%17,5) güvenilir olmayan koruyucu antikor düzeyi (<0,1 IU / mL) vardı. Erkek ve kadın cinsiyet arasında anlamlı bir fark bulunmadı (p=0.225). Ortaokul ve daha üstü eğitimlilerde antikor düzeyleri, ilkokul ve daha az eğitim almış olanlara göre anlamlı olarak yüksek bulunmuştur. Antikor seviyeleri yaş arttıkça önemli ölçüde azalıyordu (p<0,001). Antikor düzeyleri, çalışanlarda işsizlere göre (p<0,001), bekarlarda evli olanlara göre (p=0,004) ve gelir seviyesi yüksek olanlarda düşük geliri olanlara göre (p<0,001) istatistiksel olarak anlamlı derecede yüksek bulundu. Daha önce aşılananların antikor düzeyleri anlamlı olarak yüksekti (p<0,001).
Sonuç: Bu çalışmada, ileri yaşta olanlarda, eğitim düzeyi düşük ve aşılanmamış kişilerde tetanoz antikor düzeylerinin düşük olduğu belirlenmiştir. Tetanoz hayatı tehdit eden bir halk sağlığı sorunudur, bu nedenle bu konuda yeni sağlık politikaları geliştirilmelidir.
Anahtar Kelimeler: Tetanoz Antikoru, Aşı, Yetişkin, Seroprevalans.

INTRODUCTION

Tetanus is an acute disease characterised by the action of a highly potent neurotoxin, tetanospasmin, and generalized rigidity in skeletal muscle caused by *Clostridium tetani,* which is an anaerobic bacillus (1). The notification is a mandatory disease and it has high mortality rates, it can be prevented by adequate immunization (1,2). It is estimated that the incidence rate of tetanus is 18 per one hundred thousand. Mortality rate is between 30% and 50% around the world and it is thought that more than one million cases occur. At least half of the deaths occur among newborn infants (1-5).

According to the national immunization program applied in Turkey, primary vaccination starts in the second month of life with DaBT-IPA-Hib vaccine (Diphtheria, acellular Pertussis and Tetanus- inactive Polio – *Haemophilus influenzae* type B vaccine) and the application of three dose vaccine continues at 8 week intervals. Booster dose is performed at 18 months old. In the first class of primary school, DaBT-IPA (Diphtheria, acellular Pertussis and Tetanus, Inactive Polio Vaccine) and in the eighth year Td (Adult type tetanus and Diphtheria) are applied as single booster dose. Besides, women have two doses of tetanus vaccine in pregnancy and men have single dose of tetanus vaccine in the military service (4). However, loss of immunity with increasing age increases the risk to have tetanus. In a multicenter study conducted in the United States (USA), the immunization frequency of 6 years and over was found 72.3% and this frequency was determined as 31% at the age of 70 and over (5). In a study conducted in Turkey, 68% of the individuals >18 years of age showed protective levels (>0.01 IU:ml) of antitetanus antibodies (6).

In the presented study, it was aimed to determine the antibody levels of the individuals aged 18 years and over against tetanus in Konya city center. In addition, it was aimed to examine the relationship between serum antibody levels and age and sociodemographic characteristics and to vaccinate individuals who do not contain sufficient antibodies.

MATERIAL AND METHODS

The Type and the Place of the Study: This descriptive research was carried out on 916 adults over 18 years old. The universe of the study was composed of individuals aged 18 and over who lived in the center of Konya. The presented study was carried out in Family Health Centers number 40, 48 and 72 randomly selected in Meram, Selçuklu and Karatay regions in Konya city center.

Sampling of the Research*:* According to TUIK data, the proportion of population aged 18 and over (70.1%) was 942431 in the center of Konya province for 2017. As it is known that the number of people in the population was known, it was planned to include 888 people in the study using "n=N.t^2.p.q/d^2(N-1)+t^2.p.q" formula. Tetanus seroprevalence was found as 68% from previous study in Turkey (6), sample size was calculated as 95% confidence interval and 3% deviation. This study was carried out with 916 adults.

Ethical Authorisation of the Study: Before the study was started, an ethical approval was received from Necmettin Erbakan University, Meram Medical Faculty, Ethic Committee (Number: 2017/1002). Later, necessary permissions were obtained from Konya Governorship and Konya Provincial Public Health Directorate for the study. Participants were initially informed about the study and their written and verbal consents were obtained according to the principles of the Helsinki Declaration.

Collecting the Data: The questionnaire prepared by the researcher was filled in through face to face interview technique. The age, gender, occupation, educational status, and level of income of the patients and whether they had a disease affecting their immunity were recorded in the questionnaire form. Their situation of vaccination against tetanus, how many doses of vaccines they had, when and why they had last tetanus vaccine, whether they had accidents/ injuries or not, whether they were vaccinated or given serum after the accident or not, whether the women had tetanus vaccine in their last pregnancy or not and whether the men were vaccinated in the military service were all questioned. In this study, the housewives, the retired and the students were categorised in the group of the unemployed; and the officials, the tradesmen and the workers were categorised in the group of the employed. The net amount of minimum wage earned in 2017 was 1404 TL. Accordingly, the monthly income level was evaluated as below 1500TL and above 1500 TL.

Laboratory Analysis: Nearly 7-8 mL venous blood sample was taken from the participants. The samples which were put into non-aerating vacutainer tubes without anticoagulants by means of special needles were centrifuged for 8 minutes in 4000 rpm. Serum samples were sent to Necmettin Erbakan University, Meram Medical Faculty Microbiology Laboratory and they were kept in -80°C after they were put into eppendorf tubes. After the kits were provided, they were kept in 2-8 ºC until they were used according to the instructions of the producer. Tetanus IgG antibodies were tested by using ELISA kits (DRG Instruments GmbH, Germany) according to the information in the manual of the producing company.

Evaluating of the Vaccine Protection Levels: According to the current categorisation in the manual of tetanus antibody ELISA kit that we

used, vaccine protection level and suggested vaccination situations were shown at Table 1 (7). According to the kit results we used, values of <0.1Iu/mL were non-protective against the disease, values of >0.1 Iu/mL were evaluated as protective tetanus antibody (7,8). In this presented study, tetanus antibody titers were evaluated in 3 groups.

For tetanus antibody levels less than 0.1 IU/mL indicated susceptibility to tetanus, antibody levels between 0.1-1.0 IU/mL were protective and levels in excess of 1.1 IU/mL were considered long-term protection.

Table 1. According to tetanus antibody concentration values, levels of protection and recommended vaccine situations (7)

Tetanus IgG Level	Protection status	Recommended Vaccination	n	%
<0,1 IU/mL	Unreliable protection	Booster dose	160	17.5
0,1-0,5 IU/mL	Reliable protection	Booster dose	98	10.7
>0,5-1,1 IU/mL	Reliable protection	Booster dose in 2-5 years	83	9.1
>1,1-5,0 IU/mL	Reliable protection	Booster dose in 5-10 years	552	60.3
>5,0 IU/mL	Reliable protection	Booster dose every 10 years	23	2.5

Statistical Analysis: While evaluating the findings obtained in the study, SPSS (Statistical Package for Social Sciences) for Windows 20.00 program was used for statistical analyses. Descriptive statistics belonging to continuous variables were summarized with standard deviation and descriptive statistics belonging to categorical data were summarised in frequency and percentage at a table. While comparing the categorical data, Chi-Square test was used. Correlation between the parameters was made by Pearson correlation analysis. Correlation coefficient (r) was evaluated as weak between 0.00–0.24, moderate between 0.25–0.49, strong between 0.50–0.74 and very strong relationship between 0.75–1.00. The results were evaluated at 95% confidence interval and significancy was evaluated at $p<0.05$ level.

RESULTS

In this study, 916 suitable people in total who consisted of 68.4% (n=627) female and 31.6% (n=289) male were included. The mean age of the participants was 36.9±14.6 years (min: 18, max: 91). When looking into their educational status, it was seen that 41.5% (n=380) of them had primary and pre-school education and 58.5% (n=536) of them had secondary and higher education. Of the participants, 31.3% (n=287) were employed and 70.4% (n=645) were married.

The mean level of tetanus antibody in the participants was 2.0±1.6 IU/mL. According to tetanus IgG test kit used in the research, the ones whose antibody levels are >0.1 IU/mL are regarded as protective against the disease. Accordingly, when studying the antibody levels of the participants in this study, it was determined that 17.5% (n=160) of them was below the protective level, 82.5% (n=756) of them were at protective level. According to tetanus antibody concentration values, levels of protection and recommended vaccine situations were shown in Table1.

Protective tetanus antibody titers were quite high in the 18-27 age group (47.4%), whereas the protection rate was very low in the over 58 years of age (2.6%). Distribution of tetanus antibody titers according to age groups was shown in Figure 1. It was determined that the median values of tetanus antibody were decreasing with advancing age. This difference was found statistically significant (**p<0.001**).

In Turkey, according to the national vaccination program; routinely immunization against diphtheria–pertussis–tetanus (DPT) vaccine has been applied since 1968. It appears that many elderly people are unvaccinated, and have no protective immunity against tetanus. Distribution of tetanus antibody levels in the individuals born before and after 1968 was shown in Figure 2.
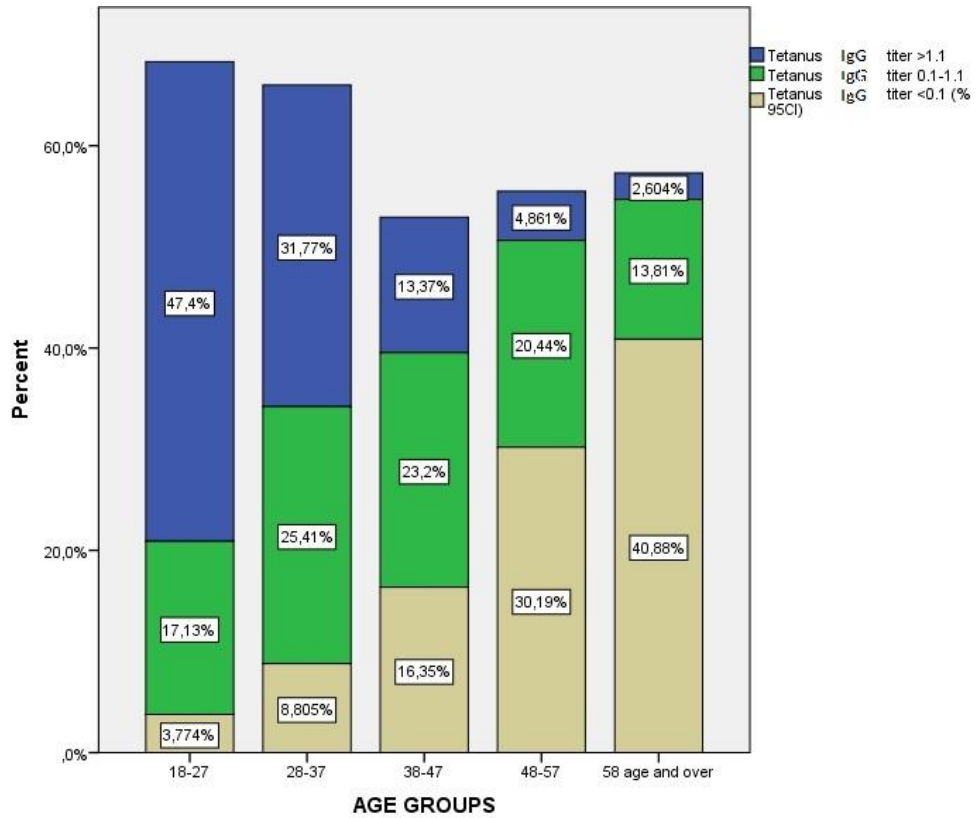
Figure 1. Distribution of tetanus antibody titers according to age groups.
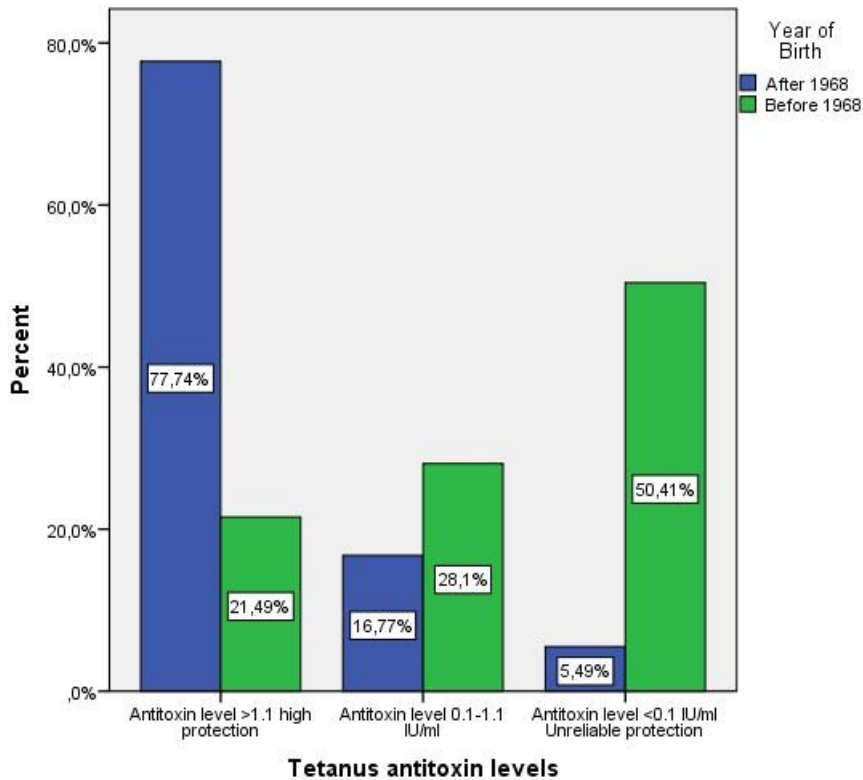

Figure 2. Distribution of tetanus antibody levels in the individuals born before and after 1968.

While examining the vaccination in the last pregnancy, 41.6% (n=193) of 464 women who have been pregnancy story had tetanus vaccine, 28.2% of

them (n=131) were not vaccinated and 30.2% of them (n=140) didn't remember if they were vaccinated or not. When the genders and protective

antibody values were compared in our study, no significant difference was found between the groups (p=0,225). When the marital status and protective antibody values of the participants were compared, the antibody values of the single individuals were significantly higher than the married (**p<0.001).** Sociodemographic features and protective tetanus antibody was shown in Table 2.

Table 2. Sociodemographic features and protective tetanus antibody

Variables	Protective tetanus antibody (+) n (%)		Protective tetanus antibody (-) n (%)		Total (n)	*p value*
Age (Year)						
18-27	303	(97.7)	7	(2.3)	310	
28-37	229	(94.2)	14	(5.8)	243	**<0.001**
38-47	119	(82.1)	26	(17.9)	145	
48-57	65	(57.5)	48	(42.5)	113	
≥ 58	40	(38.1)	65	(61.9)	105	
Gender						
Female	511	(81.5)	116	(18.5)	627	0.225
Male	245	(84.8)	44	(15.2)	289	
History of vaccination						
Positive	449	(93.7)	30	(6.3)	479	
Negative	88	(66.2)	45	(33.8)	133	**<0.001**
Unknown	219	(72.0)	85	(28.0)	304	
Working Status						
Employed	259	(90.2)	28	(9.8)	287	**<0.001**
Unemployed	497	(79.0)	132	(21.0)	629	
Marital status						
Married	512	(79.4)	133	(20.6)	645	**<0.001**
Single	244	(90.0)	27	(10.0)	271	
Education						
< Primary school graduated	276	(70.3)	113	(29.7)	380	**<0.001**
≥Secondary school graduated	489	(91.2)	47	(8.8)	536	
Monthly income						
<1500 TL	279	(75.0)	93	(25.0)	372	**<0.001**
≥ 1500 TL	477	(87.7)	67	(12.3)	544	

Tetanus antibody levels were compared in terms of some variables, except for non-pregnant women and men who did not do military service in Table 3. Of 221 men who did military service, 25.8% (n=57) stated that they were vaccinated in the military; 19.4% (n=43) of them said they did not have vaccine and 54.8% (n=121) of them did not remember if they were vaccinated or not.

Table 3. Comparison of tetanus antibody levels in gender in terms of some variables.

Variables	FEMALE			MALE		
	Titers of antibody (IU/mL)			Titers of antibody (IU/mL)		
	≥1.1 n (%)	0.1-1.1 n(%)	<0.1 n(%)	≥1.1 n(%)	0.1-1.1 n(%)	<0.1 n(%)
Age (Year)						
18-27	189(85.1)	28(12.6)	5(2.3)	84(95.5)	3(3.4)	1(1.1)
28-37	128(72.7)	37(21.0)	11(6.3)	55(82.1)	9(13.4)	3(4.5)
38-47	45(51.1)	26(29.5)	17(19.4)	32(56.1)	16(28.1)	9(15.8)
48-57	14(17.5)	27(33.8)	39(48.7)	14(42.4)	10(30.3)	9(27.3)
≥ 58	6(9.8)	12(19.7)	43(70.5)	9(20.5)	13(29.5)	22(50.0)
	(p<0.001)			(p<0.001)		
Did you have an accident?						
No	312(61.1)	101(19.8)	98(19.1)	99(65.1)	27(17.8)	26(17.1)
Yes	70(60.3)	29(25.0)	17(14.7)	95(69.3)	24(17.5)	18(13.2)
	(p=0.315)			(p=0.624)		
***Vaccination in the pregnancy (n=464)**						
No	53(40.5)	34(26.0)	44(33.5)			
Yes	150(77.7)	34(17.6)	9(4.7)		------	
Unknown	51(36.4)	37(26.4)	52(37.2)			
	(p<0.001)					
****Vaccination in military service (n=221)**						
No				22(51.2)	9(20.9)	12(27.9)
Yes		-------		44(77.2)	10(17.5)	3(5.3)
Unknown				67(55.4)	27(22.3)	27(22.3)
				(p=0.007)		
*****Year of birth**						
Before 1968	25(16.2)	44(28.6)	85(55.2)	27(30.7)	24(27.3)	37(42.0)
After 1968	357(75.5)	86(18.2)	30(6.3)	167(83.1)	27(13.4)	7(3.5)
	(p<0.001)			(p<0.001)		

* Women who were not pregnant were not evaluated.
** Men who did not do military service were not evaluated.
****In Turkey, immunization against diphtheria, tetanus and pertussis has been applied since 1968.

When comparing accident situations and the genders of the participants, it was seen that those who have not had accidents consist of 77.1% (n=511) women and 22.9% (n=152) men. There was a statistically significant difference between them (χ^2=82.669, **p<0.001**).

The participants were divided into three groups according to their vaccination situations: those who had vaccines 52.3% (n=479), those who didn't vaccines 14.5% (n=133) and those who didn't remember being vaccinated 33.2% (n=304). When comparing the participants'vaccination situations and their genders, the ratio of both vaccination and not remembering being vaccinated was higher in women than men. A statistically significant difference was found between them (χ^2=13.229, **p<0.001**).

The participants' reasons for vaccination were divided into three groups as pregnancy 40.5% (n=194), trauma/cuts 26.5% (n=127) and protection 33.0% (n=158). When comparing the reasons of vaccinating and the genders of the participants, a statistically significant difference was found between them (χ^2=229.421, **p<0.001**). A majority of those who were vaccinated due to trauma/cuts consisted of men (Table 4).

Table 4. Relationship between gender and accident/vaccination status

PARAMETERS	Gender						χ^2	p
	Female		Male		Total			
	n	%	n	%	n	%		
Did she/he have an accident?								
No	511	77.1	152	22.9	663	100.0		
Yes	116	45.8	137	54.2	253	100.0	82.669	**<0.001**
Vaccination Status								
No	109	82.0	24	18.0	133	100.0		
Yes	315	65.8	164	34.2	479	100.0	13.229	**0.001**
I do not remember	203	66.8	101	33.2	304	100.0		
Reason of being a vaccine								
Pregnancy	194	100.0	-	-	194	100.0		
Trauma / injury	49	38.9	78	66.1	127	100.0	229.421	**<0.001**
To be protected	72	45.6	86	54.4	158	100.0		

The protective antibody values of the women vaccinated in their last pregnancy were significantly higher than of those who did not have vaccine **(p<0.001).**

When the vaccination situation and the protective antibody levels of the participants were compared, the protective antibody values of those who were vaccinated were significantly higher than of those who did not have vaccine **(p<0.001).** When examining the correlation between age and serum tetanus IgG values, it was found out that there was a powerful relationship in negative direction between them (r= -0.521, **p<0.001**). 27.1% of the decrease in the tetanus antibody level was attributed to advanced age (R^2=0.271, **p<0.001**) Linear regression analysis between age and tetanus antibody levels was shown in Figure 3.
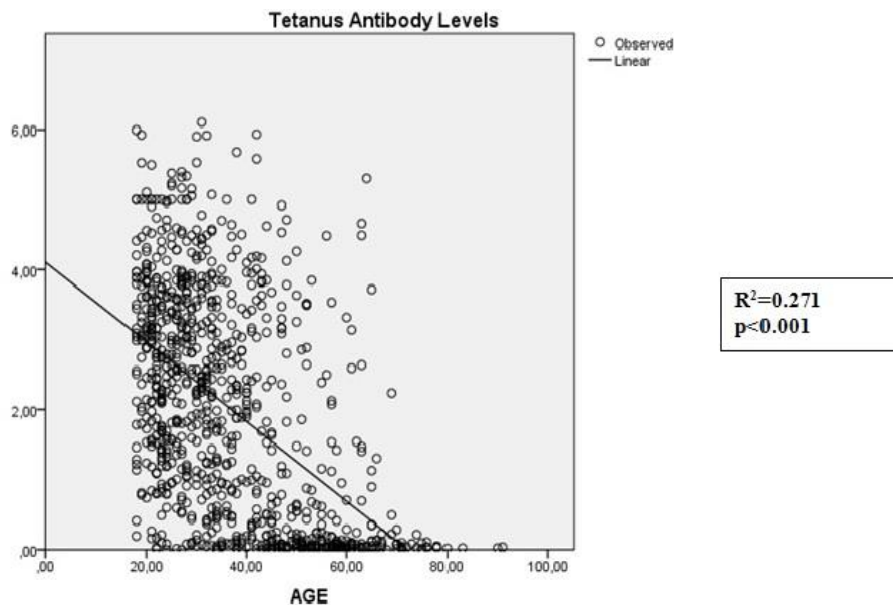

Figure-3. Linear regression analysis between age and tetanus antibody levels

DISCUSSION

Tetanus is a fatal disease that can be prevented with vaccine and that has high mortality rates. It continues to be an important health problem in the world. For this reason, it is vitally important to conduct vaccination programs (1-3). The protectiveness rate against tetanus varies by the development level and vaccination programs of the countries. There are many researches about this matter in the literature (1-10). In the presented study, the frequency of protectiveness against tetanus in Konya city center was determined to be 82.5% in adults at the age of 18 and over. In a study performed on 255 people in India, showed that 47.0% of the participants were unprotected against to tetanus (11). Domínguez et al. (12) performed a study on 1296 people in Spain and they stated that the protectiveness rate was 68.3%. In a study performed on 295 people in Edirne, Tansel et al. (13) determined that the protectiveness rate of the participants was 98.6%.

In this study, the relationship between tetanus antibody level and sociodemographic features was searched. The tetanus antibody levels of those with secondary and higher education were found significantly higher than of those with primary and pre-primary education. In some several studies, it was shown that the protective antibody levels of well educated participants were higher. In a study performed in the U.S.A., McQuillan et al. reported that as the educational status increases, the protectiveness rate against tetanus increases as well (5). In a study carried out in Edirne, Tansel et al. (13) determined that the protectiveness rate of those with primary and pre-primary education was lower than of those who had secondary and higher education. As it is understood from this study, the knowledge obtained through education shows us how important vaccination is to prevent a deadly disease such as tetanus.

It was determined that tetanus IgG values had decreased significantly with increasing age. In the studies performed in Germany by Aue et al. (2003); in Greece by Symeonidis et al. (2003); in Australia by Gidding et al. (2005); it was found out that the protective antibody level against tetanus was significantly lower with increasing age (14-16). The reason why tetanus antibody levels are lower in advanced age may be because the necessary booster dose vaccine is not applied decennialy and immune response decreases with increasing age.

Tetanus IgG values of the participants with high income were found significantly higher. As the level of income increased, their antibody levels increased as well. Likewise, in a study performed in the U.S.A., McQuillan et al. (5) stated that when level of income goes up, the protectiveness level against tetanus rises, too. In a different study performed on 10618 people by Gergen et al. in the U.S.A., it was reported that protectiveness rate against tetanus went up with increasing level of income (3). The fact that the individuals with high income can get better medical services and their vaccination rates are higher may be effective on having higher protective antibody levels against tetanus in U.S.A. Differently from this, Dundar et al. could not find a significant relationship between socioeconomic status and immunity in a study they performed in Kocaeli (17). This may be due to the fact that tetanus vaccine is free of charge in all health institutions in our country.

In this study, the significant difference was not found in tetanus IgG values between male and female gender. Similar to our study, Wu et al. (2009) stated in a study performed in Taiwan that there was not a significant difference between men and women in terms of protective antibody levels (10). In a study performed in Spain, Domínguez et al. (12) and in the Netherlands, Melker et al. (18), it was shown that the antibody levels were higher in men. In a study performed by Afzali et al. (19), they stated that there was no statistically significant difference in the tetanus antibody levels between both sexes. Tetanus vaccination due to the military service in men and due to pregnancy in women is an opportunity for adult vaccine. The fact that a majority of the participants leave pregnancy and military service behind may affect their protectiveness rates against tetanus positively.

Tetanus IgG values of the employed individuals were found significantly higher than of the unemployed. In a study in the U.S.A. Hayney et al. determined that the antibody levels of the farmers were higher than the ones who were not farmers (20). In a study performed in Kocaeli, Dundar et al. (17) showed that the antibody levels of the employed were significantly higher than of the unemployed. Ozturk et al. stated in a study they performed in Kayseri that the occupations did not create a significant difference in protective antibody levels (21). The employees have more risk to get injured and they are vaccinated due to the injuries, so this may be related to the high tetanus antibody levels. Besides, the fact that the educational status of the employed is higher than the unemployed may cause higher vaccination percentage and tetanus antibody levels.

In this study, tetanus IgG values of those who were vaccinated were found significantly higher than of those who were not. In a study performed in Canada, Yuan et al. (22) determined that the tetanus antibody values of those who did not remember whether they were vaccinated or not were significantly lower. In a study carried out in Kocaeli, Dundar et al. stated that the tetanus antibody levels of those with vaccination history were significantly higher. The studies show the importance of vaccination to have high tetanus antibody level (17).

Tetanus antibody levels of those who were vaccinated more recently were found significantly

higher than of those who were vaccinated a long time ago. Coplu et al. (23) researched the effects of the length of vaccination on tetanus antibody levels in the studies they carried out in Antalya, Samsun and Diyarbakır. They stated that the protectiveness rates start to decrease as the time passes after the last vaccination. The studies reveal that vaccination should be performed regularly every 10 years in order to maintain adequate antibody values against tetanus.

Tetanus antibody values of single people were found significantly higher than of the married. The reason why the antibody levels of the single are higher may be because they are younger than the others. In our study, the relationship between having accident and tetanus IgG values was searched. There was not a significant difference in tetanus antibody values between the ones who had accidents and those who didn't. In their study conducted in Kocaeli, Dundar et al. stated that they could not find a relationship between immunization and injury history (17). This may be due to the fact that the the participants did not show the sensitivity required for tetanus vaccination although they have accidents. It was determined that while the history of the vaccination and the injury was being questioned, most of the individuals had difficulty in remembering it or they were indecisive about it. Memory was an important factor in their statements and failure rate on remembering was quite high, so this was an important limit in our study.

In this presented study, tetanus antibody levels were significantly higher in those who were vaccinated in the military than those who were not vaccinated. Similar to this study, McQuillan et al. (5) found that the protective antibody levels of those vaccinated in the military were significantly higher than those who were not vaccinated in the USA. In a study performed in Kocaeli by Dundar et al, the significant difference was not found in tetanus antibody levels between those who did their military service and those who did not (17). The fact that the participants can't remember being vaccinated in the military or that they remember it wrong can clarify this situation.

In this study, the relationship between vaccination in the last pregnancy and tetanus IgG values was studied. Tetanus IgG values of those who were vaccinated in their last pregnancy were found significantly higher than of those who were not vaccinated. In a study performed in Ankara, Maral et al. (24) examined the immunity of 493 pregnant women against tetanus and they found that the protectiveness rate of those who had two doses of vaccine was 95.6%. In women who had single dose of vaccine it was 93.5% and for those who never had vaccine this rate was 46.4%. In a study performed by Aboud et al. (2002) in Tanzania, it was determined that the protectiveness level against tetanus was 94.5% in pregnants (25).

In conclusion, in this study conducted in Konya city center on 916 people at the age of 18 and more, seropositivity of serum tetanus IgG was determined as 82.5%. It was determined that tetanus IgG values decreased significantly with increasing age. There was a strong relationship between age and tetanus IgG in a negative direction. 27.1% of the decrease in antibody level was attributed to increasing age. Tetanus IgG values were found significantly higher in people with high income, those with secondary and higher educated, the single and working group. Tetanus IgG values of those who were vaccinated were found significantly higher than of those who were not vaccinated. No significant difference was found between men and women in tetanus IgG values.

Although tetanus is a disease with high mortality rates and it can be prevented by vaccine, it still appears. The primary objectives of health policies are the existence of a healthy community with healthy individuals. To maintain long-term protective immunity against tetanus, booster immunization is essential for adolescents and adults. After routine vaccination in childhood, during military service for men, and pregnant women during pregnancy, booster dose is recommended in Turkey. Tetanus vaccine has been recommended to be administered once every 10 years, especially to people aged 20 and over. It may be beneficial that society must be informed about tetanus disease and the individuals unvaccinated or with incomplete vaccined must be vaccinated.

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