








RESEARCH PAPER



Immunization rates of pneumococcal, influenza and tetanus vaccines and knowledge and attitudes of adult patients who receive inpatient treatment at hospital: Point prevalence study

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ABSTRACT

The safety of vaccines, access to health care, the level of community's knowledge and the attention of physicians play a critical role in the rate of adult vaccination. This study aims to determine the immunization rate of pneumococcal, influenza and tetanus vaccines among the patients and their knowledge and attitudes in the hospital. The study is a cross-sectional point prevalence survey. The patients who agreed to participate in the study were interviewed using a questionnaire. Patients' gender, occupation, educational status, income level and risk factors (immunosuppressed and over 65 years old) were compared with the knowledge and attitudes about vaccinations. Of the 251 participants, 51.4% were female and 48.6% were male. The self-reported vaccination rate was 3.5% for pneumococcal, 8.6% for influenza and 26.6% for tetanus. Most of the patients have knowledge about influenza vaccination (90.3%). Patients with the high education level have significantly higher knowledge about tetanus vaccination and higher rate of tetanus vaccine compared to those with low education level ($p = 0.04$; $p = 0.006$). It was found that those with higher income levels had the more pneumococcal vaccination, more knowledge on tetanus vaccination, and more attitude that tetanus vaccine is necessary compared to those with lower income level ($p < 0.05$). Patients without risk factors have a higher rate of tetanus vaccination compared to those with risk factors ($p < 0.001$). It was inferred that the high level of education and income have a positive effect on the patients vaccination rates and their knowledge and attitude.

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Introduction

Immunization is the most important step in preventive health care. Adult immunization is generally recommended for people with chronic diseases and immunosuppression. It is also recommended for people with occupational risks such as health workers and travelers.¹ In the adult population, vaccination coverage is often low.² Among the reasons for low vaccination rates in adults the concerns about vaccination safety and efficacy and ignorance of community vaccination are the important factors.^{3,4}

To protect against invasive pneumococcal infection, 23-valent pneumococcal polysaccharide vaccine (PPV23) and 13-valent pneumococcal conjugate vaccine (PCV13) are recommended for elderly and immunosuppressed individuals.⁵ Influenza virus infection is seen with significant complications in individuals with chronic disease and over 65 years of age. Also, seasonal influenza vaccination is particularly cost-effective in the elderly population.⁶ In adults, there is a significant reduction in immune response to tetanus-diphtheria-pertussis (Tdap) vaccines.³ For this reason, in many countries booster doses of Tdap vaccine is recommended for adults once every 10 years.^{7,8}

In this study, our aim is to describe the self-reported immunization status of pneumococcal, influenza and tetanus vaccines and the level of knowledge and attitudes of adult patients toward vaccination who are receiving inpatient treatment at the hospital.

Results

Total of 251 out of 332 patients who were admitted to the hospital agreed to participate in the study. Nine of the patients refused to report the level of income, and three others refused to explain the education level. Among the study population, 19.8% (49) were illiterate while 75% (186) had a low education level. Monthly income level in 70.1% of patients was < 2000 TL and in 21.4% of patients were < 1000 TL. We found that 75.9% of female patients were housewives. Table 1 shows the demographic and clinical findings of the patients.

For the pneumococcal vaccine, 108 (46.4%) patients declared that vaccination was necessary, but nine patients (3.6%) were vaccinated. For the influenza vaccine, this number

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Table 1. Demographic and clinical characteristics of patients.

| Patient characteristics (n = 251) | | | |
|-----------------------------------|-----------------------------|------------|------|
| Age Ort.±SD | | 5.5 ± 18.5 | |
| | | n | % |
| Gender | Female | 129 | 51.4 |
| | Male | 122 | 48.6 |
| Education status | Low | 186 | 75.0 |
| | High | 62 | 25.0 |
| Occupation | Housewife | 98 | 39.7 |
| | Other | 149 | 60.3 |
| Income level | Low | 171 | 70.1 |
| | High | 71 | 29.3 |
| Chronic disease | COPD* | 19 | 7.6 |
| | Chronic renal failure | 31 | 12.4 |
| | Diyabetes mellitus | 65 | 25.9 |
| | Malignancy | 49 | 19.5 |
| | HIV/AIDS | 4 | 1.6 |
| | Coronary artery disease | 58 | 23.1 |
| Drugs | Corticosteroids | 20 | 8.0 |
| | Immunosuppressive treatment | 16 | 6.4 |
| Habits | Active smoker | 65 | 26.1 |
| | Alcohol | 36 | 14.5 |
| Risk group | With risk factor** | 177 | 70.5 |
| | Without risk factor | 74 | 29.5 |

*COPD: chronic obstructive pulmonary disease.

**Risk factors: immunosuppressed conditions and patient over 65 years old.

was 128 (53.6%) and 21 (8.6%) whereas for the tetanus vaccine it was 193 (83.2%) and 64 (26.6%). The study participants rated friends and relatives, media, and family doctor as a source of information about the vaccinations respectively. **Table 2** shows the detailed results of patients for self-reported vaccination, knowledge about the vaccine, information sources, and attitude that vaccination is necessary.

Knowledge about influenza vaccination via media was significantly higher in women (46.9%) compared to the men (33.6%) ($p = 0.04$). Also, the study shows that media is the main source of information for influenza vaccine among those with high-income level ($p = 0.03$). The self-reported vaccination coverage on the pneumococcal vaccine is higher in those with high-income levels than in those with low-income levels ($p = 0.02$). Also, knowledge about tetanus vaccine and attitude that tetanus vaccine is necessary are higher among patients with high-income level compared to those with low-income level ($p = 0.01$, $p = 0.01$). The family physician was largely known as the source of information for tetanus vaccination among females (35.2%) compared to the males (17.2%) ($p = 0.003$). **Table 3** shows the detailed results comparing sex, education, occupation, and income level.

Patients with risk factors were more likely to have a lower educational status and lower income level compared to those without risk factors ($p < 0.05$). Patients without risk factors largely responded self-reported vaccination of tetanus vaccine compared to patients with risk factors ($p < 0.05$). **Table 4** shows a comparison of cases according to risk factors.

Among all patients, the proportion of active smokers is 65 (26.1%). Total of 30 (12%) patients were active smokers without additional risk factors. Of these patients, one (3.3%) patient reported pneumococcal vaccination, 13 (43.3%) had knowledge about pneumococcal vaccination and nine (31.0%) declared the necessity of this vaccination. There was no significant

Table 2. Immunization rate of patients and knowledge and attitude towards vaccination.

| Patient characteristics (n = 251) | n | % |
|--|-----|------|
| Knowledge of pneumococcal vaccine | 108 | 43.5 |
| Pneumococcal vaccine knowledge source | | |
| - Media | 33 | 30.0 |
| - Family doctor | 30 | 27.5 |
| - Friends and relatives | 56 | 51.4 |
| Declaration of the necessity of pneumococcal vaccination | 108 | 46.4 |
| Knowledge of influenza vaccine | 224 | 90.3 |
| Influenza vaccine knowledge source | | |
| - Media | 90 | 40.4 |
| - Family doctor | 67 | 30.0 |
| - Friends and relatives | 101 | 45.3 |
| Declaration of the necessity of Influenza vaccination | 128 | 53.6 |
| Knowledge of tetanus vaccine | 205 | 83.0 |
| Tetanus vaccine knowledge source | | |
| - Media | 44 | 21.5 |
| - Family doctor | 54 | 26.5 |
| - Friends and relatives | 127 | 62.3 |
| Declaration of the necessity of tetanus vaccination | 193 | 83.2 |
| Vaccinated with pneumococcal vaccine | 9 | 3.6 |
| Vaccinated with influenza vaccine | 21 | 8.6 |
| Vaccinated with tetanus vaccine | 64 | 26.6 |
| The reason for the tetanus vaccination | | |
| - Prophylaxis after injury | 54 | 73.0 |
| - Pregnancy | 8 | 11.3 |
| - Family doctor's recommendation | 2 | 2.8 |

difference evaluated in the knowledge, attitude and self-reported pneumococcal immunization rate of active smokers without additional risk factors and those with risk factors ($p = 0.760$, $p = 0.516$, $p = 0.076$).

We analyzed factors influencing the knowledge, attitude and vaccination rate about the three vaccines. For this purpose; we performed Binary-logistic regression analysis on the model consisting of gender, education level, occupation, income level, risk factor, and smoking. No confounding factor detected. For tetanus vaccination, education status identified as the decisive factor. Being a primary school, secondary school and high school graduate was a significant factor compared to illiterates (**Table 5**). There was no significant relationship between variables and other vaccines.

Discussion

In our study, vaccination rates for pneumococcal and influenza were 3.5% and 8.6%, respectively while this rate for tetanus was 26.6%. The National Health Interview Survey in the USA reported the rate of vaccination for influenza, pneumococcal and tetanus respectively 44.8%, 23.0% and 23.1% among the individuals over 19 years old.² In a study conducted in Germany, pneumococcal, influenza and tetanus immunization rates were 11.5%, 51.4% and 56.3% in patients over 60 years of age, respectively.⁹ It is noteworthy that the self-reported vaccination among our study population is so low, although 70.5% of the patients are in the risk group. Whereas these vaccinations are free for elderly and patients with co-morbid diseases in Turkey. There was no difference between patients with and without risk factors in relation to self-reported pneumococcal and influenza vaccination coverage. The difference is significantly higher among patients without risk factors in tetanus vaccination compared to patients with risk factors ($p < 0.001$). That difference could be due to prophylaxis after injury.

Table 3. Knowledge and attitudes about vaccination and vaccination rate according to gender, occupation, income level and educational status.

| Vaccine knowledge and attitude | Gender (%) | | | Occupation (%) | | | Educational status (%) | | | Income level (%) | | |
|--|------------|------|--------|----------------|-------|------|------------------------|------|--------|------------------|------|-------|
| | Female | Male | p | Housewife | Other | p | Low | High | P | Low | High | p |
| Knowledge of pneumococcal vaccine | 41.9 | 45.4 | 0.58 | 39.8 | 46.3 | 0.31 | 42.3 | 45.2 | 0.70 | 41.4 | 46.7 | 0.43 |
| Knowledge source | | | | | | | | | | | | |
| - Media | 25.9 | 33.9 | 0.36 | 23.1 | 33.8 | 0.24 | 12.2 | 16.1 | 0.42 | 12.1 | 15.6 | 0.45 |
| - Family doctor | 31.5 | 23.6 | 0.36 | 35.9 | 22.9 | 0.14 | 11.6 | 12.9 | 0.79 | 12.1 | 11.7 | 0.93 |
| - Friends and relatives | 53.7 | 49.1 | 0.63 | 51.3 | 51.4 | 0.99 | 21.7 | 12.2 | 0.68 | 21.3 | 24.7 | 0.55 |
| Declaration of the necessity of pneumococcal vaccination | 45.9 | 46.8 | 0.88 | 45.7 | 46.8 | 0.88 | 43.4 | 41.9 | 0.84 | 43.1 | 42.8 | 0.97 |
| Vaccinated with pneumococcal vaccine | 2.3 | 4.9 | 0.27 | 3.1 | 6.1 | 0.69 | 3.2 | 4.8 | 0.54 | 1.7 | 7.8 | 0.02* |
| Knowledge of influenza vaccine | 89.1 | 91.6 | 0.51 | 86.7 | 93.3 | 0.08 | 87.8 | 93.5 | 0.21 | 86.8 | 94.8 | 0.06 |
| Knowledge source | | | | | | | | | | | | |
| - Media | 46.9 | 33.6 | 0.04* | 41.7 | 39.6 | 0.76 | 34.9 | 38.7 | 0.59 | 31.6 | 45.4 | 0.03* |
| - Family doctor | 31.0 | 29.1 | 0.76 | 34.5 | 27.3 | 0.26 | 26.5 | 27.4 | 0.88 | 18.4 | 28.6 | 0.07 |
| - Friends and relatives | 44.2 | 46.4 | 0.75 | 41.7 | 47.5 | 0.39 | 38.1 | 46.8 | 0.23 | 39.1 | 42.8 | 0.52 |
| Declaration of the necessity of influenza vaccination | 52.8 | 54.4 | 0.81 | 57.9 | 50.7 | 0.27 | 50.3 | 53.2 | 0.69 | 51.7 | 49.3 | 0.73 |
| Vaccinated with influenza vaccine | 8.7 | 8.5 | 0.96 | 8.2 | 8.8 | 0.87 | 9.0 | 6.4 | 0.53 | 6.9 | 11.7 | 0.21 |
| Knowledge of tetanus vaccine | 83.7 | 82.2 | 0.75 | 81.6 | 84.5 | 0.56 | 78.8 | 90.3 | 0.04* | 77.6 | 90.9 | 0.01* |
| Knowledge source | | | | | | | | | | | | |
| - Media | 21.0 | 22.0 | 0.85 | 15.2 | 25.4 | 0.08 | 16.4 | 21.0 | 0.41 | 13.8 | 26.1 | 0.20 |
| - Family doctor | 35.2 | 17.2 | 0.003* | 32.9 | 22.4 | 0.10 | 19.0 | 29.0 | 0.10 | 18.4 | 28.6 | 0.07 |
| - Friends and relatives | 58.1 | 66.7 | 0.21 | 63.3 | 61.6 | 0.80 | 59.8 | 53.2 | 0.36 | 47.7 | 57.1 | 0.17 |
| Declaration of the necessity of tetanus vaccination | 84.2 | 82.1 | 0.68 | 81.3 | 84.4 | 0.54 | 74.1 | 85.5 | 0.06 | 72.4 | 87.0 | 0.01* |
| Vaccinated with tetanus vaccine | 21.8 | 31.6 | 0.08 | 21.3 | 30.1 | 0.13 | 21.2 | 38.7 | 0.006* | 22.4 | 32.5 | 0.09 |

*All indicators with asterisks show the significant level.

70% of the patients have low education status, 70.1% have the low-income level, that might be affected vaccination coverage among our study population. Also, it indicates that knowledge about pneumococcal, influenza and tetanus

Table 4. Comparison of cases according to risk situation.

| Patient characteristics | With risk factor (n = 177) % | Without risk factor (n = 74) % | p value |
|--|------------------------------------|--------------------------------------|---------|
| Female | 53.1 | 47.3 | 0.40 |
| Male | 46.9 | 52.7 | |
| Low level of education | 81.3 | 54.5 | <0.001* |
| Low level of income | 76.3 | 46.7 | <0.001* |
| Housewife | 46.2 | 24.3 | 0.001* |
| Other occupation | 53.8 | 75.7 | <0.001* |
| Active smoker | 18.3 | 44.6 | <0.001* |
| Vaccinated with pneumococcal vaccine | 4.5 | 1.4 | 0.23 |
| Vaccinated with influenza vaccine | 8.7 | 8.2 | 1.00 |
| Vaccinated with tetanus vaccine | 18.5 | 45.2 | <0.001* |
| Knowledge of pneumococcal vaccine | 44.8 | 40.5 | 0.53 |
| Pneumococcal vaccine knowledge source | | | |
| - Media | 28.8 | 33.3 | 0.64 |
| - Family doctor | 31.6 | 16.7 | 0.12 |
| - Friends and relatives | 46.8 | 63.3 | 0.12 |
| Declaration of the necessity of pneumococcal vaccination | 46.0 | 47.2 | 0.86 |
| Knowledge of influenza vaccine | 90.2 | 90.5 | 0.94 |
| Influenza vaccine knowledge source | | | |
| - Media | 41.9 | 36.8 | 0.47 |
| - Family doctor | 32.3 | 25.0 | 0.28 |
| - Friends and relatives | 41.3 | 54.4 | 0.07 |
| Declaration of the necessity of Influenza vaccination | 54.5 | 51.4 | 0.66 |
| Knowledge of tetanus vaccine | 81.5 | 86.5 | 0.34 |
| Tetanus vaccine knowledge source | | | |
| - Media | 22.7 | 18.8 | 0.52 |
| - Family doctor | 21.4 | 37.5 | 0.02* |
| - Friends and relatives | 63.6 | 59.4 | 0.57 |
| Declaration of the necessity of tetanus vaccination | 83.3 | 81.9 | 0.73 |

*All indicators with asterisks show the significant level.

**Risk factors: immunosuppressed conditions and patient over 65 years old.

vaccines were 43.5%, 90.3%, and 83.0% and attitude that vaccination is necessary were evaluated 46.4%, %53.6 and %83.2 respectively among the study population. The inability of individuals to access health care due to limited economic opportunities and the lack of information on health-related issues negatively affect vaccination rates.⁴ A study among patients with malignancy shows that the vaccination rate was 17% and 4.2% for influenza and pneumococcal vaccination respectively. Low knowledge about the indication of vaccines (33.5%) indicated the most important cause of not getting the vaccination.¹⁰ Although in our study the knowledge and attitudes of the patients about the vaccines were relatively good, the study yields a lower self-reported vaccination. The low education status and low-income level were thought to be the reason that patients could not reach health care services. Unlike our study, another study in our country found that 59.3% of participants did not receive influenza vaccination, 3% did not know the vaccine, and 22% did not believe in the preventive role of the vaccine.¹¹ In our study, knowledge about tetanus vaccination and tetanus immunization rate were significantly higher among the group with high education level ($p = 0.04$; $p = 0.006$). We did not find any significant difference between education status and pneumococcal and influenza vaccination knowledge and coverage. The self-reported pneumococcal and tetanus vaccination and attitude that tetanus vaccination is necessary were found to be significantly higher in the high-income group.

Table 5. Relationship between educational status and tetanus vaccination.

| Education status | n | B | p | OR | CI 95% | |
|------------------------|-----|--------|-------|-------|--------|--------|
| Reference: illiterates | 49 | 10,301 | | | | |
| Primary school | 110 | 0,832 | 0,04 | 2,298 | 1,04 | 5,076 |
| Secondary school | 27 | 1,737 | 0,029 | 5,682 | 1,189 | 27,154 |
| High school | 41 | 1,436 | 0,019 | 4,205 | 1,268 | 13,94 |
| University | 21 | 1,463 | 0,070 | 4,318 | 0,89 | 20,958 |

Klett-Tammen et al. indicated that the vaccination coverage depends on economic status, behavior, attitude and knowledge level besides other factors.⁹

Our study shows that family physicians were recognized by a few of patients as a source of knowledge for tetanus, influenza and pneumococcal vaccines (respectively 26.25%, 30.0% and 27.5%). In a study by Satman et al. indicated that physicians' awareness is important for increasing influenza and pneumococcal vaccination coverage in diabetic patients.¹² We found that most of our patients are aware of influenza vaccination. While knowledge of vaccinations was not different between genders, the study shows that women and high-income individuals mainly received information from the media about influenza vaccination. We inferred that because 75.9% of female patients were housewives, they have easy access to media devices. Thus, our study shows that the media is important for increasing the coverage of vaccination. Similarly another study shows that informative campaigns before winter season are effective for increasing influenza and pneumococcal vaccination coverage.¹³

Cigarette smoking has been shown to be an independent risk factor for invasive pneumococcal infections in adults with normal immune systems and aged 18–64 years.¹⁴ Our study shows that 12% of patients were active smokers without additional risk factors. We did not find any significant difference between the patients with risk factors and active smokers without additional risk factors in relation to knowledge, attitude and self-reported immunization rate of pneumococcal vaccine.

Analysis of the variables did not show any confounding factor but determined that the educational status was significantly a decisive factor for the tetanus vaccination. According to illiterates, there was a tendency to have about 6 times more tetanus vaccinations in secondary school graduates (OR:5.682, CI 95%: 1.189-27.154, $p = 0.029$).

Self-reported vaccination is a limitation of the study in which the vaccination rate was recorded based on patient recall not hospital record, vaccination card or antibody result. We thought that elderly patients might not remember exactly their vaccination status. The recalled information might reduce the accuracy of the obtained data. Another limitation of the study is that a validated questionnaire measuring the level of knowledge, attitudes, and behaviors of patients on immunization was not used. The questionnaire consists of only nine questions do not give a quantitative value that reduces the chance of an objective analysis. Also, the study population is a limitation of the study as these data are not generalizable as the whole population. There are no specific cases of hospitalization among the study population that might influence vaccine, knowledge, attitude, and vaccine receipt.

As a result, it is considerable that the self-reported vaccination rate is strikingly low in all three vaccines. Prophylactic applications after injury appeared to affect the tetanus vaccination rates. High-levels of education and high-incomes were thought to have a positive impact on the vaccination, knowledge, and attitudes of the patients that vaccination is necessary. Also, the study yields that influenza vaccination was known mostly among the participants and the media was the influential factor. Our results point the value of the family physicians and the media in increasing knowledge about immunization.

Raising public awareness about the importance of adult vaccines, through improving implementation of awareness-raising projects will increase immunization rates and reduce mortality and morbidity. In addition, the study recommends the policy level at the county to focus on the population with the low education and low-income for adult vaccination. Also, it recommends that current family physicians might need refresher training on adult vaccination and subsequent advice vaccination among the target population.

Materials and methods

We included in the study those adult patients (> 18 years) who were hospitalized in a Training and Research Hospital in Turkey. Subsequently, we interviewed them to determine the self-reported immunization rate of pneumococcal, influenza and tetanus vaccines. Also, we filled a questionnaire about the participant's knowledge and attitudes about these vaccines. We excluded from the study all patients who were hospitalized in the pediatric, psychiatric services, the intensive care unit, delivery ward and patients with not enough consciousness to answer the questionnaire.

We filled an informed consent form from all patients who agreed to participate in the study. We recorded the demographic characteristics of the patients (age, gender, education, occupation, income level, habits) and clinical characteristics (admission reason, a treatment used, chronic diseases) from the follow-up form. Illiterate, primary and secondary school graduates classified as lower education, those with high school and university degrees classified as higher education. A self-reported vaccination coverage recorded as the vaccination rate. For the pneumococcal vaccine, those vaccinated with one or both PPV23 and PCV13 vaccines in the last five years were evaluated as vaccinated. Those who received influenza vaccine in the previous year and tetanus vaccine in the last 10 years have been considered immunized. We collected information about the knowledge, attitude, and source of information about the vaccines. We defined women who did not have any specific occupational outside home as the housewife. The total amount of Turkish Lira that earned by a household on monthly basis defined as income level. Those with the income level of less than 2000 TL (500 €) were classified as low income and those with the income level of more than 2000 TL (500 €) were defined as high income. Those who did not quit smoking until the survey were defined as active smokers. We did not consider the number of cigarettes as an active smoking. Chronic disease (chronic renal failure, coronary artery disease, diabetes mellitus, chronic obstructive pulmonary disease, malignancy, HIV / AIDS), corticosteroids or immunosuppressive treatment and those aged 65 years or older were recognized as the risk factor among the participants. Chronic conditions that suppress immunity and older age also increase the susceptibility to related infections, such as decreased effectiveness of previous vaccines.^{3, 6, 15} For this reason, these factors were identified as common risk factors for all three diseases. Participants who did not have any of the risk factors other than active smoking and who were younger than 65 years were identified as a group without the risk factor.

Statistical analysis

For the statistical analysis, we used Statistical Package for the Social Sciences (SPSS Inc.; Chicago, IL, USA) 15.0 Windows program. Descriptive statistics include number and percentage for the categorical variable, mean, standard deviation, minimum, maximum for the numerical variable. Comparisons of ratios in independent groups were performed with Chi-Square analysis. Monte Carlo simulation was applied when conditions were not met. A statistical significance level of alpha was accepted as $p < 0.05$.

Disclosure of potential conflicts of interest

The authors report no potential conflicts of interest.

Ethics approval

The study was initiated after the approval of Sisli Hamidiye Etfal Education and Research Hospital Clinical Trials Ethics Committee (Registration number: 1357; Date: 27.12.2016).

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