



# Evaluation of Attitudes and Knowledge of Influenza Diagnosis, Treatment and Vaccination Among Pediatric Residents

Pediatric Asistanlarının Çocuklarda İnfluenza Tanı, Tedavi ve Bağışıklaması Hakkındaki Bilgi Düzeyleri, Algı, Tutum ve Davranışları

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## Abstract

**Objective:** Influenza virus is common in children, especially in winter, causing hospitalization, admission to the intensive care unit, or even death. There are few studies on the attitudes or knowledge of influenza diagnosis, treatment, and vaccination among pediatricians. This study was planned to determine pediatric residents' attitudes and behaviors about recognizing the influenza virus, making treatment decisions, prophylaxis, and immunization.

**Material and Methods:** This descriptive cross-sectional study was performed from 31 July-1 December 2019 among pediatric residents working in six different hospitals in the Aegean Region by an online survey. Twenty-seven questions were asked regarding participant's demographic characteristics, recognition of the influenza symptoms, treatment, prophylaxis, and immunization.

## Öz

**Giriş:** İnfluenza virüsü özellikle kış aylarında çocuklarda sık görülen, bazen hastane ve yoğun bakım yatışlarına hatta ölüme sebebiyet verebilen bir virüstür. Pediatristlerin influenza tanısı, tedavisi ve bağışıklaması ile ilgili bilgi düzeylerini ve yaklaşımlarını araştırarak son derece kısıtlı yayın bulunmaktadır. Bu nedenle bu çalışmada pediatri asistanlarının influenza virüsünü tanıma, tedavi kararını verme, profilaksi yaklaşımı ve bağışıklaması hakkındaki tutum ve davranışlarının saptanması planlandı.

**Gereç ve Yöntemler:** Bu tanımlayıcı kesitsel araştırma; 31 Temmuz- 1 Aralık 2019 tarihleri arasında; Ege Bölgesi'nde altı merkezde çalışan pediatri asistanlarına internet üzerinden (Google formları) anket yapılarak gerçekleştirildi. Katılımcılara demografik özellikleri, influenza semptomlarını tanıması, tedavisi, profilaksi ve bağışıklaması ile ilgili 27 soru soruldu.

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**Results:** Two hundred and four (58.5%) of 349 pediatric residents were included in the study, who answered the questionnaire. Among the participants, 72.5% were females, and their mean age was  $27.9 \pm 2.1$  years, and 59.3% worked as a pediatric residents for less than two years. When the symptoms of influenza were evaluated, the most known symptoms were fever (94.1%), myalgia (81.9%), tiredness (77.0%), headache (70.1%), and cough (68.6%). When oseltamivir treatment indications were questioned, most pediatric residents (82.2%) answered the questions. It was observed that 21.1% of the pediatric residents had the flu vaccine in the current season. According to the state of having chronic diseases, the rate of vaccination in participants was not statistically significant ( $p=0.136$ ).

**Conclusion:** In this study, it was determined that pediatric residents' knowledge about influenza awareness, treatment, and immunization was insufficient. It may be beneficial to train pediatric residents about the influenza virus and vaccine before each influenza season.

**Keywords:** Pediatric residents, influenza, attitudes, knowledge, vaccination

## Introduction

Influenza virion is an enveloped RNA virus of the Orthomyxoviridae family, which is investigated under three main family groups as per the matrix protein. Influenza A and B viruses are subgroups that commonly cause epidemics; whereas group C leads to milder clinical pictures like runny nose and malaise (1). Clinical onset is mainly sudden increase in temperature and is usually accompanied by symptoms such as malaise, prevalent muscle pain, cough (non-productive), and sore throat. More rarely, abdominal pain, nausea, vomiting, and diarrhea can be seen. Even though symptoms mostly regress within a week, severe disease can be seen in some patients despite no underlying diseases (2).

Until the present day, influenza has caused the death of approximately 40 million people with the "1918-Spanish flu", of approximately 4 million people with the "1957-Asia flu", and of approximately 1 million people with the "1968-Hong-Kong flu" (3-6). According to the data of Centers for Disease Control and Prevention (CDC), 29 million people got infected with influenza last year, 23 million of these people presented to hospital, and 16 thousand people lost their lives due to this virus. Its incidence in healthy children varies between 10% and 40% (2). Every season, 10 in every 1000 children are infected with influenza, and antibiotic prescription rates, correspondingly, increase at a rate of 10-30%. It is important for physicians to recognize an infection seen as commonly as this one and determine treatment and prophylaxis indications correctly. Additionally, influenza immunization of physicians and other healthcare workers considered at high risk for influenza remains low (7). In this study, it was aimed to determine the knowledge level, perception, attitude, and behavior of pediatric residents who frequently see influenza cases on the recognition of the disease and detection of treatment and prophylaxis indication.

**Bulgular:** Çalışmaya dahil edilen 6 merkezde çalışan 349 pediatri asistanının 204'ü (%58.5) anket sorularına yanıt verdi. Katılımcıların %72.5'i kadındı, yaş ortalamaları  $27.9 \pm 2.1$ 'di; %59.3'ü iki yıldan daha kısa süredir asistanlık yapıyordu. İnfluenza tanısını düşündüren semptomlar sorgulandığında katılımcıların %94.1'i ateş, %81.9'u kas ağrısı, %77'si yorgunluk, %70.1'i baş ağrısı ve %68.6'sı öksürük olarak doğru yanıtladı. Oseltamivir tedavi endikasyonları sorgulandığında 166 (%82.2) katılımcı doğru olarak yanıt verdi. Asistan hekimlerin %21.1'inin mevcut sezonda grip aşısı yaptırdığı görüldü. Kronik hastalığı olan ve olmayan asistanlar arasında grip aşısı yapılma sıklıkları açısından istatistiksel anlamlı bir fark saptanmadı ( $p=0.136$ ).

**Sonuç:** Araştırmada; pediatri asistanlarının influenza farkındalığı, tedavisi ve bağışıklaması hakkında bilgi düzeylerinin ve bağışıklama oranlarının düşük olduğu saptanmıştır. Her influenza sezonu öncesinde pediatri asistanlarına influenza virüsü ve aşısı hakkında hatırlatıcı eğitimler verilmesinin faydalı olabileceği düşünülmüştür.

**Anahtar Kelimeler:** İnfluenza, tanı, tedavi, aşılama, bilgi düzeyi, yaklaşım

## Materials and Methods

The study was carried out with pediatric residents working in of Izmir SBU Tepecik Training and Research Hospital, Izmir SBÜ Behçet Uz Pediatric Health and Diseases Hospital, Dokuz Eylül University Medical Faculty Hospital, Ege University Medical Faculty Hospital, Adnan Menderes University Medical Faculty Hospital, and Celal Bayar University Medical Faculty Hospital between July 31<sup>st</sup> and December 1<sup>st</sup> 2019. In the study designed as a descriptive research, the questions were forwarded to the participants online (through Google Forms), and prior to the study, online consent was obtained. In the survey, demographic characteristics and duration of employment of the participants, whether or not they got the influenza vaccine in the previous season, the reason for not getting the vaccine, and their chronic diseases were questioned. In questions regarding diagnosis, a list of symptoms were given to the participants, and they were asked to mark the ones seen in influenza. Modes of transmission and treatment indication of influenza were asked with multiple-choice questions. In order to question treatment doses, weight groups and treatment doses were given to the participants, and they were expected to match them correctly. The treatment duration of oseltamivir and the most commonly observed side effect of the treatment in uncomplicated cases and in those without any chronic diseases were asked with multiple choice questions. In questions related to protection, the risk group in terms of complications recommended to get the vaccination was asked with open-ended questions. Correct and incorrect propositions were prepared to question the risk groups recommended to get the vaccine and immunization schemes, and the participants were asked to respond to these propositions. Drugs used in secondary prophylaxis were asked with open-ended questions. In order to question chemoprophylaxis indications, the conditions necessitating chemoprophylaxis were specified, and the participants were asked in which con-

ditions they were required to give chemoprophylaxis. A total of 27 questions were asked, of which 5 were related to the recognition of influenza findings, 4 were related to treatment, 10 were related to vaccination, and 3 were related to secondary protection. For the correct answers to the questions, the guideline "Recommendations to Prevent and Control Influenza in Children" of the American Pediatric Academy was used (3).

Those working for over than 2 years as residents were categorized as senior residents. For the study, approval was received from the Non-interventional Clinical Research Ethics Board of SBU Izmir Tepecik Training and Research Hospital on July 25th, 2019 with the decision no.2019/12-22.

### Statistical Analysis

SPSS 24.0 (SPSS IBM., Corp, Amonk IL, NY) was used for statistical analyses of the data. Mean±standart deviation was used for continuous data compatible with normal distribution, median (minimum-maximum) was used when they did not fit the normal distribution, and categorical data were expressed as number (n) and percentage (%). The results were presented with one-dimensional and two-dimensional charts. Categorical comparisons were made using Chi-square test.  $P < 0.05$  was set as the significance level.

### Results

The participation of all pediatric residents working in the designated centers (n= 349) was expected; however 204 residents (58.5%) agreed to participate in the study. Of the participants, 72.5% were females (n= 148), 27.5% were males (n= 56) with a mean age of  $28 \pm 2.1$  years.

When symptoms seen in influenza were evaluated, while the most frequently and correctly known symptoms were fever (94.6%), muscle pain (84.3%), fatigue (78.4%), headache (71.1%), and cough (68.6%), the less known symptoms were diarrhea (18.1%), complicated febrile convulsion (19.6%), and abdominal pain (20.1%) (Table 1). When statistical differences of the correct answers between senior and non-senior residents were evaluated, muscle pain and complicated febrile convulsion were more frequently answered correctly by senior residents ( $p = 0.04$ ,  $p < 0.01$  respectively). A statistical difference was not observed between the two groups in clasifying other symptoms. There were only 2 participants (1%) defining all symptoms correctly.

When modes of transmission of influenza were questioned, the most frequently and correctly known mode of transmission was spread through droplets and was correctly answered by 90.7% of the participants (n= 185). This was followed by aerosole with 59.8% (n= 122), contact with 38.2% (n= 78), and autoinoculation with 10.8% (n= 22). While a statistically significant difference was not detected between senior and non-senior residents for droplet, contact and autoinoculation modes

**Table 1.** Recognition of influenza symptoms by residents

Clinical finding	n (%)
Fever	193 (94.6)
Muscle pain	172 (84.3)
Fatigue	160 (78.4)
Headache	145 (71.1)
Cough	140 (68.6)
Sudden onset	120 (58.8)
Sore thoat	115 (56.4)
Abdominal pain	41 (20.1)
Complicated febrile convulsion	40 (19.6)
Diarrhea	37 (18.1)
Afebrile seizure	9 (4.4)

of transmission, aerosole transmission was more commonly and correctly responded by non-senior residents ( $p = 0.01$ ). Moreover, there were 7 participants (3.4%) who described all modes of transmission correctly.

When treatment indications of oseltamivir were questioned, 82.2% of the participants (n= 166) responded correctly to the fact that it should be started in the first 48 hours in cases suspected of influenza and foreseen to clinically worsen, 75.4% of the participants (n= 154) responded correctly to the fact that it should be started in cases with influenza symptoms included in the risk group regardless of their vaccination status, and 51.9% of the participants (n= 106) responded correctly to the fact that it should be started in cases hospitalized and followed with a preliminary diagnosis of influenza. When treatment responses were evaluated, a statistical difference was not detected between senior and non-senior residents. Table 2 shows the responses the participants gave to the propositions prepared for treatment indications in the survey. When the duration of oseltamivir treatment was questioned in previously healthy cases and in those not developing complications, 87.3% of the participants (n= 178) responded correctly as five days.

It was detected that 90.1% of the participants (n=184) responded correctly to the treatment dose of oseltamivir. When the most common side effects of oseltamivir were questioned, 73% of the participants (n= 149) responded with nausea-vomiting, and the frequency of responding correctly was statistically significantly higher in senior residents ( $p = 0.041$ ).

American Pediatrics Academy recommends influenza vaccination to all individuals aged older than 6 months and strongly recommend annual influenza vaccination to individuals in high-risk populations, individuals living in the same house and to those providing care (3). When age range of the children in high risk group recommended to get the influen-

**Table 2.** Distribution of responses given to oseltamivir treatment

Proposition	n (%)
It should be given in the first 48 hours in cases foreseen to worsen clinically and in those suspected of influenza.	166 (82.2)
Regardless of the vaccination status, it should be given to high-risk children suspected of influenza.	154 (75.4)
It should be given to all children with positive rapid antigen test in the influenza season.	77 (37.1)
It should be given to all hospitalized children suspected of influenza.	106 (51.9)
It should be given to all children with URTI symptoms during the influenza season.	175 (85.6)

**Table 3.** Correct response rates of the participants in terms of influenza vaccine indications in children

Indications	n (%)
Children with chronic pulmonary disease	198 (97.1)
Children with chronic cardiac disease	173 (84.8)
Immunosuppressive children with diagnosis	158 (77.5)
Children with Chronic kidney disease	138 (67.6)
Children with anomaly increasing aspiration risk	136 (66.7)
Children with metabolic diseases	133 (65.2)
Children with sickle-cell anemia	108 (52.9)
Children requiring constant salicylate treatment	108 (52.9)

za vaccination was asked to the participants, there were only 16 individuals (7.8%) responding with 6 months-5 years. Table 3 shows the responses given to propositions prepared for the risk groups recommended to get the vaccine. The most commonly reported risk groups were chronic pulmonary disease (97.1%), chronic heart disease (84.8%), and immunosuppressed patients (77.5%).

According to the responses given to case samples for age-appropriate dose applications of the influenza vaccine, the frequency of those knowing that one dose of the vaccine would be sufficient for those aged 9 years and over was 83.3%, and the frequency of those knowing that two doses with an interval of 4 weeks are required in individuals aged 6 months and 8 years in the event of first implementation of the vaccine was found as 51.7%.

When influenza vaccine recommendation was asked in pregnant women and breastfeeding mothers, 65.1% of the participants (n=133) indicated that both groups needed vaccination. However, 20.6% of the participants stated that influenza vaccine should be applied to breastfeeding mothers but was contraindicated in pregnant women, and 11.3% stated that influenza vaccine should be applied to pregnant women but was contraindicated in breastfeeding mothers. Of the

participants, 2.9% reported that it was contraindicated in both groups. A statistically significant difference was not detected between senior and non-senior residents in terms of correct answer frequency (p= 0.070).

When drugs used is prophylaxis were questioned (as open-ended), 65.2% of the participants (n= 133) responded correctly as oseltamivir. When the duration and dose of oseltamivir in influenza prophylaxis were questioned, while only 46.3% of the participants responded correctly as the same dose with treatment but as a single dose daily, 15.3% responded that it should be half the treatment dose but continued throughout the influenza season, and 13.2% responded that it should be the same dose given at treatment with two doses daily continued for three days.

Of the participants, 11.8% (n= 24) had a chronic disease, and 21.1% (n= 44) had the influenza vaccination in the present season. The frequency of getting the influenza vaccine was similar in those with and without a chronic disease (p= 0.136). When the reason for not getting the influenza vaccine was questioned, 39.2% stated that they considered the vaccine unnecessary, 14.1% stated that they did not have the time, and 9.8% stated that they forgot to get the vaccine.

### Discussion

Influenza virus is a virus that has affected humans for decades, causing acute respiratory tract infections and severe pneumonia, and even death. Its morbidity and mortality are high especially in risk groups. Therefore, the recognition of its symptoms by clinicians, knowing risk groups, and starting treatment when necessary are of vital importance. Knowing that the groups recommended to have the influenza vaccine, which is the most effective method in protecting from the disease, and that healthcare workers are at the risk group in terms of influenza complications, and evaluating approaches to influenza immunization have a significant role in recommending the patients.

Previous studies on this matter have shown that immunization rates of healthcare workers, despite being in the risk group, are generally low (but different from country to country) (8-10). In a large, cohort study evaluating influenza immunization of healthcare workers in Sweden between 2007 and 2019, it has been reported that vaccination rates varied between 14% and 31% as per years (8). In a study conducted with 1450 healthcare workers in Vietnam in 2017, it was found that the rate of getting vaccinated for influenza at that season was 45.5% (9). In a study by Bal et al. conducted with 179 individuals in Turkey in 2015, vaccination frequency was reported as 18.4% (10). In our study, only 44 (21.1%) of the 204 participants had the influenza vaccine in the previous season. In light of all of these studies, it is possible to express that immunization rate of healthcare workers, despite being in the risk group in

terms of influenza, is quite low. When studies investigating the reason for low rates of vaccination among healthcare workers were investigated, it was detected in a study carried out after the H1N1 influenza epidemic in 2009 that the most frequent reason for not getting the vaccine was the fear of side effects (11). The most frequent reason of the physicians, nurses, and other healthcare personnel for not getting the vaccine in the study by Bal et al. has been indicated as not frequently suffering from the flu (53.4%) (10). In our study, the most frequent reasons of the residents for not getting the vaccine were the belief that the vaccine was unnecessary, not finding time and forgetting (Respectively; %39.2, %14.1 and %9.8).

Although the presence of chronic disease is considered a risk group for influenza, only 33.3% of the participants with a chronic disease had their flu vaccine in the current season. Even though it is foreseen that cases with chronic diseases would get the vaccine to be more cautious against influenza complications, a statistically significant result was not obtained when the relation between vaccination status and the presence of chronic disease was investigated.

When symptoms seen in influenza were evaluated, the number of participants knowing that rare symptoms like diarrhea, abdominal pain, and febrile convulsion could be encountered in influenza was found quite low. This condition leads to the consideration of other diagnoses in cases presenting with symptoms other than cough and muscle pain, skipping influenza diagnosis, the prescription of unnecessary antibiotics, and implementation of unnecessary medical interventions.

Even though the most commonly known mode of transmission in influenza is through droplets, influenza can be transmitted by aerosole, contact and autoinoculation (2). In our study, while most of the participants knew that influenza is transmitted by droplets, the frequency of those knowing the modes of aerosole, contact, and autoinoculation were was found less. When it is considered that the number of participants knowing all modes of transmission correctly was 7 in the study, it is also important not to forget hand hygiene, not to get in close contact and to remember using mask.

The most commonly used drug in influenza treatment today is oseltamivir; however, there are studies in increasing numbers suggesting that oseltamivir resistance is developing in influenza viruses (2, 12-14). In a study performed with 1155 participants in the United States of America in 2009, oseltamivir-resistant viruses were reported to be seen more frequently in younger age groups (13). Therefore, recognizing treatment indications and regulating treatment in appropriate doses and length of time in patients followed with a diagnosis of influenza are crucial. In our study, most of the residents responded correctly by stating that treatment should be initiated in cases in risk groups with influenza symptoms regardless of their vac-

ination status. However, approximately half of the residents did not respond correctly to the fact that treatment should be started in cases hospitalized with a preliminary diagnosis of influenza. The decision to initiate influenza treatment may be affected by the poor general condition of the patient, considering a bacterial agent or the presence of secondary infections. When hospitalization rates in the influenza season are considered, awareness on this matter must be increased. More than half of the participants in our study considered that treatment should be started in all cases with positive rapid antigen test, and a few of the participants considered that treatment should be started in all children showing influenza symptoms during the influenza season. These results made us consider that the place of laboratory tests in influenza diagnosis and treatment and indications for influenza treatment were not fully understood by the participants.

Influenza viruses results in high morbidity and mortality especially in risk groups every year and in all around the world (15-18). When case questions prepared for influenza immunization in risk groups were scrutinized, vaccine recommendation to those with chronic pulmonary disease was the most commonly correct application. Other most frequently and correctly known risk groups were those with chronic heart disease, immunosuppressive patients with diagnosis, and those with chronic kidney disease. When the participants were asked about the age range of children in high risk group in whom influenza vaccination is strongly recommended, a very few of them responded to the question correctly. Recognition of risk groups in terms of hospitalization and complications by pediatricians is important in terms of treatment and follow-up.

There are many studies putting forth that influenza vaccination during pregnancy protects the mother from influenza complications and that the vaccine is safe to be used during pregnancy and breastfeeding (19-21). In 2010, it was shown that vaccination in pregnancy lowered hospitalizations in infancy (19-21). Similarly, it can be considered that breastfeeding mothers can protect their babies from influenza and its complications by getting vaccinated. Of the pediatric residents participating in our study, 65.2% stated that influenza immunization must be carried out in pregnant women and breastfeeding mothers.

There are some limitations to our study. The questions to the participants were asked online, and the survey was not conducted face-to-face. The responses were received on the internet using cell phones or computers, which may have affected the attention of the participants. Moreover, study results may have been affected by the conditions the participants responded to the questions. The aim in our study was to reach all pediatric residents; however, a small part of the residents declined participating in the study, and participation rate remained at 58.5%. Low participation percentage may

have caused the study results to not reflect the knowledge and approach of all physicians in the centers.

### Deductions

Results obtained in this study detected that the knowledge level of pediatric residents who frequently see influenza cases in clinical practice is lacking. Therefore, insufficient and different recommendations attracted attention in attitude and approaches. Moreover, this lack of knowledge was independent of employment duration, suggesting that residents must be regularly informed on influenza independent of experience. Therefore, it is considered that informing the residents before every influenza season on the diagnosis, treatment, and immunization of influenza will be beneficial.

**Ethics Committee Approval:** For the study, approval was received from the Non-interventional Clinical Research Ethics Board of SBU Izmir Tepecik Training and Research Hospital on July 25th, 2019 with the decision no.2019/12-22.

**Informed Consent:** Patient consent was obtained.

**Peer-review:** Externally peer-reviewed.

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