A Comparison of the Clinical and Laboratory Characteristics of Influenza A and B Infections in Children

Çocuklarda İnfluenza A ve B Enfeksiyonlarının Klinik ve Laboratuvar Özelliklerinin Karşılaştırılması

Abstract

Aim: In this study, we aimed to compare the clinical and laboratory findings of Influenza A and Influenza B infections in children.

Methods: The study included 1826 pediatric patients (aged <16 years) who were diagnosed with Influenza A (n=1400) and B (n=426) infections between 1 October 2019 and 30 April 2020. The patients were also divided into age groups: the age groups of 0–2 years, 3–9 years, and 10–16 years. The characteristic clinical and laboratory findings were compared.

Results: Influenza A infection was significantly more common in patients aged <2 years and was significantly less common in patients aged 3–9 years. Body temperature was significantly higher in all age groups with Influenza A infection than in children with Influenza B infection. While leukocytosis and lymphopenia were significantly more common in the Influenza A group, leukopenia and neutropenia were significantly more common in the Influenza B group. While acute otitis media was more common in Influenza A infection, myositis was more common in Influenza B infection. No significant difference was found between the Influenza A and B groups in terms of hospitalization rates. Of all patients, 98.3% were treated with oseltamivir.

Conclusion: Our findings indicate that Influenza A and B infections are, in general, very similar in terms of symptoms. However, Influenza A infection is more common in very young children. It progresses with higher fever and is more frequently associated with pharyngeal hyperemia and acute otitis media, while leukopenia, neutropenia, conjunctivitis, nasal discharge, and myositis were found to be more common in Influenza B infection.

Keywords: children; Influenza A; Influenza B

Öz

Amaç: Bu çalışmada, çocuklarda İnfluenza A ve İnfluenza B enfeksiyonlarının klinik ve laboratuvar bulgularını karşılaştırmak amaçlanmıştır.

Yöntem: Çalışma 1 Ekim 2019 ile 30 Nisan 2020 tarihleri arasında İnfluenza A (n=1400) ve B (n=426) enfeksiyonu tanısı almış 16 yaş altı 1826 çocuk hasta içerdi. Hastalar aynı zamanda yaş gruplarına ayrıldı: 0–2 (yıl) yaş grubu, 3–9 yaş grubu, ve 10–16 yaş grubu. Karakteristik klinik bulgular ve laboratuvar bulguları karşılaştırıldı.

Bulgular: İnfluenza A enfeksiyonu <2 yaşındaki hastalarda anlamlı biçimde daha yaygın, 3–9 yaşındaki hastalarda anlamlı biçimde daha enderdi. Vücut sıcaklığı İnfluenza A enfeksiyonlu tüm yaş gruplarında İnfluenza B enfeksiyonlu çocuklara göre anlamlı biçimde daha yüksekti. İnfluenza A grubunda lökositoz ve lenfopeni anlamlı biçimde daha yaygınken, İnfluenza B grubunda lökopeni ve nötropeni anlamlı biçimde daha yaygındı. Akut orta kulak iltihabı İnfluenza A enfeksiyonunda daha yaygınken, miyozit İnfluenza B enfeksiyonunda daha yaygındı. Hastaneye yatış oranı açısından ise İnfluenza A ve B grupları arasında anlamlı fark bulunmadı. Tüm hastaların %98,3'ü oseltamivir ile tedavi edildi.

Sonuç: Bulgularımız İnfluenza A ve B enfeksiyonlarının semptomlar açısından genel olarak çok benzer olduğuna işaret etmektedir. Bununla birlikte, İnfluenza A enfeksiyonu çok küçük çocuklarda daha yaygındır. Daha yüksek ateşle ilerler ve farengeal hiperemi ve akut orta kulak iltihabı daha sık görülür. Lökopeni, nötropeni, konjonktivit, burun akıntısı ve miyozitin ise İnfluenza B enfeksiyonunda daha yaygın olduğu tespit edilmiştir.

Anahtar Sözcükler: çocuklar; İnfluenza A; İnfluenza B

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Received/*Geliş* : 05.12.2020
Accepted/*Kabul*: 06.01.2021

DOI: 10.21673/anadoluklin.836285

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INTRODUCTION

Influenza, caused by Influenza A and Influenza B viruses, is an acute respiratory tract infection with fever. It is highly contagious, with seasonal and non-seasonal outbreaks resulting in 2 to 5 million cases and 250 to 500 thousand deaths worldwide annually (1–3).

Genetic variations of the influenza virus (i.e., antigenic drift mutations) lead to changes in the surface glycoproteins. Because of these structural changes, the human immune system encounters a new virus every year, and influenza vaccination, established as the most effective protection against the virus, has to be repeated annually (2–5).

Influenza can be seen at any age and is common in the pediatric population. The frequency and severity may increase in very young children, with complications and hospitalization (3). Although influenza has a similar clinical course in most pediatric cases, there are several factors that cause variations in the general clinical picture. Previous studies comparing Influenza A and Influenza B infections have shown various differences between the two entities (2,5). Further investigation could be beneficial to better understand such differences in the course and outcome of the disease. Accordingly, in this study we aimed to analyze and compare data obtained from pediatric patients diagnosed with Influenza A and B infections during the 2019–2020 winter season.

MATERIALS AND METHODS

Rapid antigen tests were performed for the patients who were brought to the pediatric clinic of the Medipol Mega Hospital Complex between 1 October 2019 and 30 April 2020. Of these patients, 70 with a concurrent Group A streptococcal infection, 24 co-infected with Influenza A and B viruses, and 3 with a concurrent urinary tract infection were excluded from the study. As a result, a total of 1826 patients under the age of 16 years who were diagnosed with influenza were included.

Clinical and laboratory findings obtained from patient medical records were reviewed retrospectively. Data on symptoms of presentation, complete blood count, radiological imaging, history of medical treatment including drug use, complication development, and indication for hospitalization were acquired from the hospital records. The data obtained were grouped and compared according to infection type (Influenza A or B) and patient age. For comparisons by age, the patients were divided into age groups as described in previous studies: the age groups of 0–2 years, 3–9 years, and 10–16 years (6).

The diagnosis of influenza was made by rapid antigen tests (STANDARD F Influenza A/B FIA; SD Biosensor) using nasopharyngeal samples in all patients.

Definitions

Leukopenia was defined as a white blood cell count <4000/mm^3; thrombocytopenia, a thrombocyte count <150.000/mm^3; lymphocytosis, a lymphocyte count >4000/mm^3; lymphopenia, a lymphocyte count <1500/mm^3; and neutropenia, an absolute neutrophil count <1500/mm^3 (7,8). Observation status: patients not hospitalized but kept under observation for 4–6 hours. Febrile convulsion: febrile seizures in children who have not been diagnosed with epilepsy.

The diagnosis of pneumonia was confirmed by pediatric radiologists who had no information about the clinical presentation of the patients.

Statistical analysis

All statistical analyses were performed using the SPSS 25.0 software (IBM SPSS, Chicago, IL, USA). Descriptive data were expressed as numbers and percentages. Comparisons of categorical variables between the groups were performed using Pearson's chi-square test and Fisher's exact test. Normal distribution of continuous variables was confirmed by the Kolmogorov–Smirnov test. Differences between the groups in terms of continuous variables were analyzed using Student's t-test, and comparison of mean values between multiple groups was done by variance analysis. The relationship between continuous variables was evaluated by Spearman's correlation analysis. The results were evaluated with a confidence interval of 95% and a significance level of <0.05. Bonferroni correction was made where appropriate.

Study ethics

The retrospective study protocol was reviewed and approved by the ethics committee of the Istanbul Medipol University Faculty of Medicine (approval no. 10840098-772.02-E.43570).

Table 1. The age and sex distribution of the Influenza A and B groups

		Influenza A group (n=1400)		Influenza B group (n=426)		Total (n=1826)		p
		n	%	n	%	n	%	
Male		747	53.4	215	50.5	962	52.7	0.296
Age group (year)	0–1	174	12.4	38	8.9	212	11.6	***0.048***
	0–2	585	41.8	127	29.8	712	39.0	***0.001***
	3–9	742	53.0	266	62.5	1008	55.2	***0.001***
	10–16	73	5.2	33	7.7	106	5.8	0.05

RESULTS

There were 1400 patients diagnosed with Influenza A infection and 426 patients diagnosed with Influenza B infection. Of all patients, 962 (52.7%) were boys and 864 (47.3%) were girls. The mean age for patients with Influenza A and B infections was 3.61±2.81 years and 4.79±3.11 years, respectively. Of all patients, 94.2% were children aged ≤10 years. Influenza A infection was significantly more common in the age groups of 0–1 year (12.4% vs. 8.9%) and 0–2 years (41.8% vs. 29.8%). Influenza B infection was significantly more common in the age group of 3–9 years (Table 1). Correlation analysis showed that increase in age was associated with increased rates of Influenza B infection ($p<0.001$; $r=0.161$).

Body temperature was found to be significantly higher in all age groups with Influenza A infection than in children with Influenza B infection. Fever and very high fever were seen more in patients with Influenza A infection than in patients with Influenza B infection, especially in the age group of 3–9 years. No statistically significant difference was found between the Influenza A and B groups in terms of symptoms other than fever. (Table 2).

Pharyngeal hyperemia as a physical examination finding was significantly more common in Influenza A infection than in Influenza B infection, especially in the age groups of 0–2 years and 10–16 years. Conjunctivitis was significantly more common in Influenza B infection than in Influenza A infection. The difference was observed to be significantly greater in the age group of 3–9 years. Nasal discharge was more common in patients with Influenza B infection than in Influenza A infection, especially in the age groups of 3–9 years and 10–16 years. No significant difference was found between the Influenza A and B groups in terms of other physical examination findings (Table 2).

Laboratory analysis revealed leukocytosis in 14.1%, leukopenia in 4.2%, neutropenia in 4.2%, lymphopenia in 19.9%, and lymphocytosis in 7.6%. No patient had anemia while 3.7% had thrombocytopenia. Leukocytosis and lymphopenia were significantly more common in patients with Influenza A infection while leukopenia and neutropenia were significantly more common in Influenza B infection. While the rate of thrombocytopenia was higher in patients with influenza A infection, the difference was not statistically significant. The hematological and C-reactive protein (CRP) values are shown in Table 3.

The distribution of complications was as follows: pneumonia in 2.57%, acute otitis media in 4.76%, febrile convulsions in 0.54%, myositis in 0.87%, and croup in 0.27%. Acute otitis media and myositis were significantly more common in patients with Influenza A and B infection, respectively. These differences were detected only in the age group of 3–9 years. There was no significant difference between the Influenza A and B groups in terms of pneumonia, febrile convulsions, and croup (Table 2).

The number of patients kept under observation were higher in the Influenza A group than in the Influenza B group, especially in the age group of 3–9 years. The hospitalization rate did not significantly differ between the Influenza A and B groups. Of all patients, 98.3% were treated with oseltamivir. Antibiotic treatment, in addition to the oseltamivir treatment, was more frequently used in the Influenza A group, especially in the age group of 0–2 years (Table 2).

Table 2. Comparison of variables between Influenza A and B infections according to age groups

		General			0–2 years old			3–9 years old			10–16 years old		
		Influenza A n=1400	Influenza B (n=426)	*p*	Influenza A (n=585)	Influenza B (n=127)	*p*	Influenza A (n=742)	Influenza B (n=266)	*p*	Influenza A (n=73)	Influenza B (n=33)	*p*
Signs and symptoms, n (%)	Fever	1304 (93.1)	387 (90.8)	0.113	542 (92.6)	117 (92.1)	0.839	695 (93.7)	244 (91.7)	0.283	67 (91.8)	26 (78.8)	0.059
	Sore throat	87 (6.2)	30 (7)	0.541	16 (2.7)	1 (0.8)	0.193	62 (8.4)	21 (7.9)	0.814	9 (12.3)	8 (24.2)	0.122
	Cough	829 (59.2)	253 (59.4)	0.949	330 (56.4)	70 (55.1)	0.790	451 (60.8)	161 (60.5)	0.942	48 (65.8)	22 (66.7)	0.927
	Nasal discharge	483 (34.5)	134 (31.5)	0.245	205 (35)	37 (29.1)	0.203	250 (33.7)	81 (30.5)	0.334	28 (38.4)	16 (48.5)	0.327
	Fatigue	219 (15.6)	72 (16.9)	0.534	94 (16.1)	20 (15.7)	0.929	109 (14.7)	45 (16.9)	0.386	16 (21.9)	7 (21.2)	0.935
	Vomiting	91 (6.5)	20 (4.7)	0.172	35 (6)	3 (2.4)	0.100	52 (7)	16 (6)	0.580	4 (5.5)	1 (3)	0.582
	Red eye	13 (0.9)	3 (0.7)	0.664	2 (0.3)	0 (0)	1.000	10 (1.3)	2 (0.8)	0.442	1 (1.4)	1 (3)	0.528
	Diarrhea	30 (2.1)	4 (0.9)	0.108	15 (2.6)	1 (0.8)	0.221	15 (2)	3 (1.1)	0.345	0 (0)	0 (0)	-
	Myalgia	14 (1)	8 (1.9)	0.146	-	-	-	12 (1.6)	7 (2.6)	0.297	2 (2.7)	1 (3)	1.000
	Abdominal pain	25 (1.8)	14 (3.3)	0.061	5 (0.9)	0 (0)	0.296	18 (2.4)	14 (5.3)	***0.024***	2 (2.7)	0 (0)	1.000
	Hyperemic pharynx	1220 (87.1)	350 (82.2)	***0.009***	502 (85.8)	99 (78)	***0.027***	649 (87.5)	224 (84.2)	0.181	69 (94.5)	27 (81.8)	***0.038***
	Rhinitis	292 (20.9)	108 (25.4)	0.05	150 (25.6)	27 (21.3)	0.300	131 (17.7)	69 (25.9)	***0.004***	11 (15.1)	12 (36.4)	***0.014***
	Conjunctivitis	19 (1.4)	14 (3.3)	***0.009***	9 (1.5)	4 (3.1)	0.219	10 (1.3)	10 (3.8)	***0.016***	0 (0)	0 (0)	-
Complications, n (%)	Pneumonia	35 (2.5)	12 (2.8)	0.718	11 (1.9)	1 (0.8)	0.386	21 (2.8)	8 (3.0)	0.882	3 (4.1)	3 (9.1)	0.373
	Otitis media	76 (5.4)	11 (2.6)	***0.016***	34 (5.8)	4 (3.1)	0.226	42 (5.7)	7 (2.6)	***0.049***	0 (0)	0 (0)	-
	Febrile convulsion	6 (0.4)	4 (0.9)	0.211	4 (0.7)	3 (2.4)	0.082	2 (0.3)	1 (0.4)	0.785	0 (0)	0 (0)	-
	Myositis	6 (0.4)	10 (2.3)	***0.002***	2 (0.3)	0 (0)	-	4 (0.5)	8 (3.0)	***0.002***	0 (0)	1 (3.0)	-
	Croup	2 (0.1)	3 (0.7)	0.052	0 (0)	3 (2.4)	-	2 (0.3)	0 (0)	-	0 (0)	0 (0)	-
Body temperature (°C), (mean±SD)		38.3±0.9	37.9±1	***0.001***	38.2±0.9	37.9±1	***0.014***	38.3±0.9	37.9±1	***0.001***	38.5±0.7	38±0.8	***0.018***
Severity of fever, n (%)	Mild (36.5–38.0)	191 (24.1)	71 (28)	0.22	80 (23)	18 (23.1)	0.987	101 (25.1)	46 (29.5)	0.294	10 (24.4)	7 (35)	***0.006***
	High (>38.0)	561 (70.8)	149 (58.6)	***0.001***	242 (69.5)	47 (60.3)	0.113	288 (71.5)	89 (57.1)	***0.001***	31 (75.6)	13 (65)	0.386
	Very high (>39.0)	98 (12.4)	13 (5.1)	***0.001***	41 (11.8)	4 (5.1)	0.084	50 (12.4)	7 (4.5)	***0.006***	7 (17.1)	2 (10)	0.465
Treatment, n (%)	Oseltamivir	1374(98.1)	414 (97.2)	0.224	573 (97.9)	125 (98.4)	0.726	728 (98.1)	258 (97)	0.283	73 (100)	31 (93.9)	0.095
	Additional antibiotics	249 (17.8)	58 (13.6)	***0.044***	95 (16.2)	9 (7.1)	***0.008***	139 (18.7)	44 (16.5)	0.426	15 (20.5)	5 (15.2)	0.511
	Observation status	310 (22.1)	65 (15.3)	***0.002***	124 (21.2)	18 (14.2)	0.073	161 (21.7)	39 (14.7)	***0.014***	25 (34.2)	8 (24.2)	0.303
	Hospitalization	55 (3.9)	15 (3.5)	0.692	31 (5.3)	5 (3.9)	0.525	24 (3.2)	8 (3)	0.846	0 (0)	2 (6.1)	0.097

SD: standard deviation

DISCUSSION AND CONCLUSION

Influenza is reported to be more common and severe in very young children. Previous studies suggest that differentiating between the types of influenza may be beneficial since the clinical picture can differ between children with Influenza A and Influenza B infections (4,6–12). In our study, we compared the clinical and laboratory findings of the two entities. Patients with other respiratory tract infections and those co-infected with Influenza A and B viruses were excluded from the study in order to avoid data bias. Also, since the clinical picture seen in outbreaks of respiratory tract infections can differ seasonally, we studied the 2019–2020 winter season only.

Previous studies show that very young children are more commonly diagnosed with Influenza A infection (2,13). Peltola et al. found that mean patient was age significantly lower in children with Influenza A infection than in Influenza B infection (13). Tran et al. reported that the average age of children hospitalized for Influenza A infection was significantly low, and that a significant number of children aged <2 years were diagnosed with Influenza A infection (10). Daley et al. found that the hospitalization rate for children aged <1 year was significantly higher in Influenza A than in Influenza B infection (4). Also, Mattila et al. reported that in the age group of 0–2 years hospitalization was significantly more common in Influenza A than in Influenza B infection, and that the mean age of hospitalized children was significantly lower in the Influenza A group (6). In our study, there were significantly more patients diagnosed with Influenza A infection in the age groups of 0–1 year and 0–2 years, although there were significantly less patients with Influenza A infection in the age group of 3–9 years. The mean age was significantly lower in the Influenza A group than in the Influenza B group. Correlation analysis showed

Table 3. Comparison of laboratory findings between Influenza A and B infections according to age groups

mean±SD	General		*p*	0–2 years old		*p*	3–9 years old		*p*	10–16 years old		*p*
	Influenza A	Influenza B		Influenza A	Influenza B		Influenza A	Influenza B		Influenza A	Influenza B	
Hb (g/dL)	12±1.2	12.3±1.2	***0.001***	11.6±1.3	11.6±0.7	0.994	12.1±1.1	12.5±1.2	***0.004***	13.2±1	13.2±1.4	0.822
Leukocyte (10^3/mL)	8.5±3.6	7.3±2.8	***0.001***	8.8±3.7	8.2±3	0.248	8.4±3.5	7±2.6	***0.001***	6.9±2.5	5.7±1.9	***0.048***
Neutrophil (10^9/L)	5.1±2.9	4.1±2.3	***0.001***	4.4±2.6	3.7±2.2	***0.034***	5.7±3.1	4.3±2.4	***0.001***	4.9±2.4	3.4±1.5	***0.007***
Lymphocyte (10^9/L)	2.4±1.8	2.4±1.5	0.805	3.2±2.2	3.4±2	0.471	1.8±1.2	2±1	0.196	1.2±0.6	1.5±0.6	0.046
Monocyte (10^9/L)	0.9±0.4	0.8±0.4	***0.001***	1±0.5	1±0.4	0.740	0.8±0.4	0.7±0.3	***0.002***	0.8±0.3	0.8±0.4	0.827
Thrombocyte(10^9/L)	252.5±80.4	244.4±76	0.173	265.8±91.2	268.3±71.7	0.833	244.8±71.4	237.6±79.2	0.314	225.4±52.2	216.5±44.6	0.485
Neutropenia	51 (6.5)	26 (11.4)	***0.014***	28 (8.3)	9 (13.6)	0.168	21 (5.3)	16 (11.3)	***0.014***	2 (3.8)	1 (4.5)	0.889
Leukopenia	49 (6.2)	29 (12.7)	***0.001***	16 (4.7)	4 (6.1)	0.649	29 (7.3)	21 (14.9)	***0.007***	4 (7.7)	4 (18.2)	0.184
Leukocytosis	223 (28.3)	35 (15.3)	***0.001***	108 (32)	16 (24.2)	0.214	110 (27.6)	18 (12.8)	***0.004***	5 (9.6)	1 (4.5)	0.465
Lymphopenia	299 (37.9)	66 (28.8)	***0.018***	69 (20.4)	9 (13.6)	0.202	189 (47.4)	47 (33.3)	***0.004***	41 (78.8)	10 (45.5)	***0.005***
Lymphocytosis	113 (14.3)	26 (11.4)	0.25	94 (27.8)	21 (31.8)	0.509	19 (4.8)	5 (3.5)	0.547	0 (0)	0 (0)	-
Thrombocytopenia	56 (7.1)	13 (5.7)	0.452	22 (6.5)	2 (3)	0.274	29 (7.3)	8 (5.7)	0.52	5 (9.6)	3 (13.6)	0.611
CRP (mg/L)	12.3±15.7	10.3±14.5	0.094	11±16.4	8.3±12	0.214	12.6±14.7	11.8±16.2	0.594	17.7±18.2	6.5±6.6	***0.009***

CRP: C-reactive protein; Hb: hemoglobin; MCH: mean corpuscular hemoglobin; MCV: mean corpuscular volume; MPV: mean platelet volume; PDW: platelet distribution width; SD: standard deviation

that the incidence of Influenza B infection increased with age. These findings show that very young children are more likely to be diagnosed with Influenza A than with Influenza B infection, and that Influenza A infection is much more common in children aged <2 years.

Previous studies show that Influenza A and Influenza B infections generally have similar clinical symptoms (2–4,10). Daley et al. observed similar signs and symptoms in the two groups of patients (4). Tran et al. reported that headache, abdominal pain, and myalgia were more common in Influenza B than in Influenza A infection (10). In our study, we found similar rates of symptoms in Influenza A and B infections, and the rates of all symptoms were still similar in the Influenza A and B groups when analyzed for the age groups. These similarities show that it is difficult to differentiate the two infections based on symptoms only.

Studies suggest that the degree of fever might differ between cases of Influenza A and Influenza B infections (11,12). Hong et al. found that the rate of very high fever (>39°C) was significantly higher in children with Influenza B than with Influenza A infection (11). Also, Mancinelli et al. found significantly higher rates of fever (<38°C, range: 37–37.9°C) in children with Influenza B infection (12). In our study, the rates of fever and very high fever were found to be significantly higher in Influenza A infection. The degree of fever, on average, was found to be significantly high in all age groups with Influenza A infection. These findings suggest that Influenza A infection generally progresses with higher fever in children, and that fever above 38°C and 39°C is more common in children with Influenza A infection, with the difference being particularly significant in the age group of 3–9 years.

Daley et al. and Machado et al. found that the incidence of clinical findings were similar in children with Influenza A and Influenza B infections (4,9). Mattila et al. also reported that the two influenza groups were similar in terms of physical examination findings (6). However, unlike most other studies, our study found a number of notable differences between the two groups of patients. In our study, patients with Influenza A infection who were aged <2 years and >10 years showed higher rates of pharyngeal hyperemia, while patients with Influenza B infection who were aged <2 years had higher rates of conjunctivitis and nasal discharge. Similar to previous studies, we observed no other significant difference between the two groups in terms of physical examination findings.

Laboratory findings in influenza are generally very similar to those in many other viral respiratory tract infections. However, there may be differences among cases of influenza (2–4,9). Daley et al. reported similar rates of abnormal laboratory findings in children di-

agnosed with Influenza A and Influenza B infections (4). Machado et al. also reported similar rates of mean lymphocyte counts, leukocytosis, and lymphopenia in the two types of influenza (9). Zhong et al., however, found that the mean leukocyte count and leukocytosis rate were both significantly higher in patients diagnosed with Influenza A infection (14). In our study, significantly higher rates of leukocytosis and lymphopenia were seen in patients with Influenza A infection, while significantly higher rates of leukopenia and neutropenia were seen in patients with Influenza B infection. While the mean neutrophil and leukocyte counts were found to be significantly low, the mean hemoglobin values were found to be significantly high in patients with Influenza B infection. Though not statistically significant, thrombocytopenia was found to be more common in Influenza A infection. The rate of leukopenia was significantly high in Influenza B infection in the age group of 3–9 years, while the rate of lymphopenia was significantly high in Influenza A infection in the age groups of 3–9 years and 10–16 years. According to all these findings, laboratory values do not seem to differ greatly between the two influenza groups; however, it should be noted that leukocytosis and lymphopenia are more likely in Influenza A infection while leukopenia and neutropenia are more likely in Influenza B infection.

In children with underlying chronic conditions, influenza can be complicated by lower respiratory tract infection, acute otitis media, rhino sinusitis, febrile convulsions, dehydration, and encephalopathy (15). Though not statistically significant, Mattila et al. reported a higher rate of otitis media in cases of Influenza A infection, and also stated that complication rates were similar in Influenza A and B infections (6). The most common complication in the present study was acute otitis media, and it was significantly more common in patients with Influenza A infection.

Influenza can lead to pneumonia in some pediatric patients (11,12). Hong et al. and Mancinelli et al. found a similar rate of pneumonia development in the two influenza groups (11,12). In our study, the rate of pneumonia (2.57%) did not significantly differ between the Influenza A and B groups or between the age groups. These findings suggest a similar rate of pneumonia in patients with Influenza A and B infections.

Influenza-associated myositis is another complication (16,17). In their meta-analysis, Agyeman et al. reported that influenza-associated myositis was significantly more likely in school-aged children and after infection with Influenza B virus (17). Hu et al. also reported a higher association of myositis with Influenza B (18). Similar to previous studies, we found that influenza-associated myositis was significantly more common in Influenza B infection in the age group of 3–9 years. These findings indicate that children diagnosed with Influenza B should be monitored for the development of myositis.

Though very rarely, children diagnosed with influenza can develop febrile convulsions (6,10). Mattila et al. reported a febrile convulsion rate of 5–10% in hospitalized patients and no significant difference between Influenza A and Influenza B infections (6). Tran et al. also stated that the febrile convulsion rate was similar in the two types of influenza (10), which was also the case in our study. The rate was generally <1%, but it fluctuated around 1% in the age group of 0–2 years. These findings suggest that children with influenza generally have a similar risk of febrile convulsions.

Oseltamivir is an antiviral drug used in the treatment and prevention of influenza, and is often used in severe cases or in individuals with risk factors (15). Daley et al. reported similar patterns of treatment in children diagnosed with Influenza A and Influenza B infections (4). Also, Mattila et al. found similar rates of oseltamivir and antibiotic use in children with Influenza A and B infections (6). Hong et al. reported similar rates of oseltamivir use in the two groups, and showed that children with Influenza B infection were significantly more often hospitalized and treated with additional antibiotics (11). In our study, oseltamivir was used in a similar manner in all age groups with Influenza A and Influenza B infections. The rate of additional antibiotic use was significantly higher in Influenza A infection in the age group of 0–2 years; the rate of patients placed in observation status was significantly higher in Influenza A infection in the age group of 3–9 years; and the hospitalization rates were found to be similar in all age groups. Although these findings suggest that there is no significant difference between the two influenza groups in terms of hospi-

talization rates, the need for treatment with additional antibiotics in children aged <2 years and the need for further observation in children aged 3–9 years should be noted in the case of Influenza A infection.

Finally, the present study has several limitations. First, a mortality comparison between the Influenza A and B groups was not feasible as no patient was lost. Second, complications that could develop in the long term were not taken into consideration as the study was designed as a cross-sectional analysis. Lastly, we could not obtain data on whether the patients included in the study were vaccinated against the influenza virus.

In conclusion, the present study was one of the largest studies to compare Influenza A and B infections in the pediatric population. Our findings indicate that in general the two entities are symptomatologically similar, though with some individual differences. Influenza A infection is more common in younger children, progresses with higher fever, and is associated with higher rates of pharyngeal hyperemia, acute otitis media, leukocytosis, and lymphopenia. Influenza B infection is more common in older age groups, and is associated with higher rates of nasal discharge, conjunctivitis, myositis, leukopenia, and neutropenia. In both types of infection, some patients may require hospitalization. In any case, the use of vaccination and other preventive measures against influenza is strongly recommended.

Conflict-of-Interest and Financial Disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

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