Araştırma Makalesi
Research Article

COVID-19 Pandemic Effect of Non-Drug Interventions on Upper Respiratory Tract Infections in Children Admitted to University Hospital

ÜNİVERSİTE HASTANESİNE BAŞVURAN ÇOCUKLARDA COVID-19 PANDEMİSİ İLAÇ DIŞI MÜDAHALELERİN ÜST SOLUNUM YOLU ENFEKSİYONLARINA ETKİSİ

Fatma Merve ERDEM[1], Yekta COŞKUN[2], Pınar ERBAY DÜNDAR[1]

[1] Manisa Celal Bayar Üniversitesi Tıp Fakültesi Halk Sağlığı Anabilim Dalı, Manisa,Türkiye
[2] Manisa Celal Bayar Üniversitesi Tıp Fakültesi Halk Sağlığı Anabilim Dalı, Manisa,Türkiye

ABSTRACT

Aim: To determine effects of non-pharmaceutical COVID-19 precaution measures on the frequency of upper respiratory tract infection (URTI) in children aged 6-18.

Materials And Methods: The research is of cross-sectional type. The sample size was calculated as 316 people. The participation rate is 84.81% (n= 268). The dependent variable of the study is URTI in the last year; The independent variables are sociodemographic characteristics, characteristics related to URTI, and measures taken regarding the COVID-19 pandemic. The data were collected from the people who applied to the university hospital pediatrics polyclinic.

Results: The frequency of URTI in children in the study group in the last year is 36.6% and compared to the pre-pandemic period, the frequency of URTI has decreased by 71.3%. Previous history of hospitalization for any reason increases the status of having URTI in the last year by 1.9 times (95% CI 1.1-3.3); mask usage in the child being rarely/occasionally increases the status of having URTI in the last year by 2.7 times (95% CI 1.2-6.1), mask usage never increasing status of having URTI in last one year by 6 times (%95 CI 1.5-23.8) increase.

Conclusion: Compared to the pre-pandemic period, the frequancy of URTI in children decreased by 71.3% according to the data received from parents. In the study,it was determined that using only the masks from the public health measures applied during the COVID-19 pandemic was effective in reducing the frequency of upper respiratory tract infection and that the use of masks in the community, especially in children, should be encouraged. Children with a history of hospitalization should be provided with masks in public areas.

Keywords: COVID-19, Upper Respiratory Tract Infection, prevalence, Social Distancing, Mask

Öz

Amaç: 6-18 yaş grubu çocuklarda COVID-19 pandemisine karşı alınan farmakolojik olmayan önlemlerin üst solunum yolu enfeksiyonu (ÜSYE) sıklığına etkisini tespit etmektir.

Fatma Merve ERDEM
Manisa Celal Bayar Üniversitesi Tıp Fakültesi Halk Sağlığı Anabilim Dalı, Manisa, Türkiye
E-posta: merveerdem91@hotmail.com
https://orcid.org/0000-0001-5232-6588

DEU Tıp Derg 2023;37(1): 1-10
J DEU Med 2023;37(1): 1-10
doi: 10.18614/deutip.1179216

Gönderim tarihi / Submitted: 23.09.2022
Kabul tarihi / Accepted: 23.01.2023

Gereç ve Yöntem: Araştırma kesitsel tiptedir. Örnek büyüklüğü 316 kişi olarak hesaplanmıştır. Katılım oranı %84,81'dir (n= 268). Araştırmanın bağımlı değişkeni son bir yılda ÜSYE geçirme; bağımsız değişkenleri sosyodemografik özellikler, ÜSYE ile ilgili özellikler, COVID-19 pandemisi ile ilgili alınan önlemlerdir. Veriler üniversite hastanesi pediatri polikliniğine başvuran kişilerden toplandı.

Bulgular: Araştırma grubundaki çocuklarda son bir yılda ÜSYE geçirme sıklığı %36,6'dır ve pandemi öncesine göre ÜSYE görülme sıklığı %71,3 düzeyinde azalmıştır. Son bir yılda ÜSYE geçirme durumunu; çocuğun daha önce herhangi bir sebepten hastaneye yatış öyküsünün olması 1,9 kat (%95 GA 1,1- 3,3), çocukta maske kullanımı nadiren/ara sıra olması 2,7 kat (%95 GA 1,2-6,1), hiçbir zaman olması 6 kat (%95 GA 1,5-23,8) arttırmaktadır.

Sonuç: Pandemi öncesine göre çocuklarda ÜSYE görülme sıklığında ebeveynlerden alınan veriye göre %71,3 düzeyinde azalmıştır. Çalışmada, COVID-19 pandemisi döneminde uygulanan halk sağlığı önlemlerinden sadece maske kullanmanın ÜSYE sıklığındaki azalmada etkili olduğunu, çocuklarda maske kullanımının toplumda teşvik edilmesi gerektiğini belirlemiştir. Daha önce hastaneye yatış öyküsü bulunan çocuklar birinci basamak sağlık kuruluşları tarafından daha dikkatli takip edilmelidir. Hastaneye yatış öyküsü olan çocuklara ortak alanlarda maske verilmelidir.

Anahtar Kelimeler: COVID-19, Üst Solunum Yolu Enfeksiyonu, Prevalans, Sosyal Mesafe, Maske

The disease the World Health Organization named COVID-19 emerged in China and in a short period of three months it has taken the World under its influence (1). The COVID-19 outbreak, which was declared a pandemic by the World Health Organization as ofon March 11, 2020; continues to threaten the humanity of the world physically, mentally, and socially.

There is no fully effective treatment for COVID-19 yet. The most important measures to prevent the spread of the virus in society are hand hygiene, social distancing, and quarantine. Immediately after the official announcement of the first case on March 11, 2020, schools were closed on March 12, 2020, and then the transition to online-remote education are the measures taken in this context in Turkey. With the circulars issued, activities such as sports competitions and social events were postponed (2).

URTI is common in both children and adults. The cause is %90 of the time viral (3). Viral agents that cause URTI generally spread through the respiratory tract, which increases the rate of transmission both among children and from children to the society. Non-pharmaceutical measures implemented due to the COVID-19 pandemic are one of the factors that may have contributed to the seasonal characteristics of respiratory diseases (4). Prior to the COVID-19 pandemic, the impact of non-pharmaceutical measures on the spread of respiratory viruses was largely unknown. In a study by Hyunju et al. in Korea, it was determined that during the first wave of the pandemic, non-pharmaceutical considerations affect not only the spread of SARS-CoV-2, but also the influenza virus (5). Olsen et al., in their study in the Southern Hemisphere (Australia, Chile, South Africa), detected a significant decrease in influenza activity in the winter of 2020 and determined that pediatric hospitalizations due to non-COVID-19 respiratory diseases were significantly reduced (6). In the spring of 2020, global quarantines due to COVID-19 quickly halted the spread of RSV. RSV seasons seen each year have ended before they started in the Southern Hemisphere (Australia, Chile, South Africa) (7). Likewise, in the Northern Hemisphere (Finland and Alaska, USA), the ongoing RSV season quickly ended as restrictions were imposed (8). In the study conducted by Daniel et al. in Australia, in the first 13 weeks of 2020, before local COVID-19 restrictions, RSV and flu diagnoses were compared with the average of previous seasons, flu and RSV activity

decreased after the introduction of local COVID-19 restrictions at week 14, and It was determined to remain very low compared to previous seasons even after the successive relaxation of local COVID-19 restrictions.. Compared with the mean detections from week 14 to week 35 in the pre-pandemic years, patients diagnosed with RSV decreased by 98.0% and patients diagnosed with influenza decreased by 99.4% (9). In the study conducted by Yueling et al. at Zhejiang Children's Hospital, the prevalence of respiratory tract infection among 0-18 years old was 29.6% in April 2019, according to electronic health carehealthcare records, while this value was 6.9% in April 2020 (10). Although there is no community-level research on this subject in our country in the literature, Kızıl et al. in a study conducted a research on the factors of URTI cases admitted to the hospital in Eskişehir in 2022 with the pandemic; With measures such as the use of masks, restriction of social activities, closure of schools, they have detected a decrease in all viral factors, especially influenza, and with the relaxation of the measures taken, viral infections, especially respiratory syncytial virus, Rhinovirus and Bocavirus, have increased and they have seen an increase in respiratory tract infections similar to their pre-pandemic epidemiological features (11).

The aim of this study is to determine the effect of non-pharmaceutical measures against the COVID-19 pandemic on the frequency of URTI in children aged 6-18 years who applied to the Pediatrics Polyclinic of University Hospital between July and August 2021.

MATERIALS AND METHODS

Type of study:

The study is a cross-sectional study.

Place and time of the research:

The research was carried out in Manisa Celal Bayar University Hospital in between July-August 2021. Ethical approval was obtained from the local ethics committee with the date and number 01/12/2021/20.478.486/046

Research population and sampling method:

Children aged 6-18 years were included in the study. The population of the study consists of pediatric patients aged 6-18 years who applied to University Hospital for outpatient diagnosis and treatment. The sample size was calculated as 316 individuals using the sample size of the unknown population formula with 29.6% expected prevalence, %95 confidence limit, and %5 deviation (10). The persons to be included in the study were selected from the non-probability sampling types by using the quota sampling method. Parents of 316 children were reached, and the participation rate in the research was 84.81% (n=268). Persons who did not accept informed consent, were illiterate, and did not answer the questions completely were excluded from the research group.

The data were collected using a survey form created by the researchers with face-to-face interview technique. Except for exclusion criteria, all families with children aged 6-18 years who applied for outpatient diagnosis and treatment were included in the study. Informed consent was obtained from the families of the children aged 6-18 who applied for outpatient diagnosis and treatment, and a survey consisting of 43 questions was applied to those who agreed to participate in the study by a group of 9 interns.

Variables used in the research

Dependent Variables:

Having had an upper respiratory tract infection in the last year. The status of having an upper respiratory tract infection in the last year was questioned as July 2020 to July 2021, the period when pandemic measures were intensively applied.

Independent Variables:

As sociodemographic characteristics; parent's age, education level, employment status, family type, child's age, gender, the total number of children, ages, household income level, family health insurance, housing characteristics, caregiver, child's drug use, smoking at home, presence of pets The presence of chronic disease in the family was questioned. Regarding URTI; The number of URTIs that the child had in the last year, symptoms, medicine usage due to URTI, history of applying to a health institution, and the change in the frequency of URTIs compared to the pre-pandemic period were evaluated. To evaluate the COVID-19 pandemic non-pharmaceutical precautions; personal hygiene, frequency of presence in crowded/public areas, use of masks, compliance with the

social distance rule, the child's going out during the prohibition period, the status of going to school, the child's previous hospitalization history, the family's travel history in the last year, the child's growth and development status compared to their peers, the history of having COVID-19 in the household, the COVID-19 vaccination status of the family, the influenza vaccination status were questioned. For the definition of social class, the father's job was determined according to Korkut Boratav's urban social class diagram and was reduced to two categories as a lower and upper social class in the analysis (12). Personal hygiene, frequency of being in crowded/public spaces, use of masks, independent variables in the child's ability to go out during the prohibition period were categorized as three (never/rarely, occasionally, frequently/continuously) in order to see the linear change between them in the analysis. However, it is categorized into 2 (never/rare/occasional, frequent/continuous) as there is never anyone responding in the social distancing compliance variable.

Data were evaluated using the SPSS version 23.0 computer statistical package program, using descriptive statistics (number, percentage distribution, mean, standard deviation), chi-square test for categorical data, Student's t-test for univariate continuous data, and logistic regression analysis with Enter method for further analysis. Before further analysis, one of the variables that were found to be statistically significant in univariate analyzes and found to be collinear (changing together) was included in the model. For statistical analysis, $p<0.05$ was accepted as the level of significance.

RESULTS

The mean age of mothers participating in our study was 37.6±6.4 (57-24), fathers were 41.0±6.7 (27-60), and children were 10.5±3.4'(6-17) . (Table I)

Table I. Age distribution characteristics of the research group

Variables	Mean±SD (min-max)
Mother's age	37.6±6.5 (min:24 max:57)
Father's age	41.0±6.7 (min:27 max:60)
Child's age	10.5±3.4 (min:6 max:17)

5.2% of the mothers are uneducated, 29.9% are at primary school; 72.8% of fathers are in high school or higher education levelThe frequency of URTI in the last year is 36.6%. In the last one year, 57.1% of children with URTI had it once, and 42.9% had it twice or more. The frequency of URTI in children has decreased by 71.3% compared to the pre-pandemic period. (Table II)

Table II. Sociodemographic characteristics and upper respiratory tract ınfection (URTI) status of the research group.

Variables	Number	Percentage
Mother's educational status		
Uneducated	14	5.2
Primary education	80	29.9
High school and above	174	64.9
Father's educational status		
Uneducated	7	2.6
Primary education	66	24.6
High school and above	195	72.8
Smoker at home		
There is at least one smoker	174	64.9
No smoker at home	94	35.1
URTI in the last 1 year		
Yes	98	36.6
No	170	63.4
Amount of URTI in the last 1 year (n=98)		
1 Time	56	57.1
2 times or more	42	42.9
Prevelance of URTI compared to pre-pandemic		
Decreased	191	71.3
Same/Increased	77	28.7

URTI: Upper Respiratory Tract Infection

In the research group, those who were in the lower social class, whose father smoked, whose hand washing frequency was irregular before the pandemic, who used public space frequently or continuously before the pandemic, who paid attention to social distance frequently or constantly during the pandemic period, who never used a mask during the pandemic period and children with hospitalization history have had a higher frequencyof URTI in the last year and these statistics have been determined as significant according to the analysis. (Table III)

Table III. Upper respiratory tract infection (URTI) in the last 1 year of the participants in the study and related variables

Variables	*URTI in last year*				*P**
	No		*Yes*		
	Number	*Percentage*	*Number*	*Percentage*	
Social class					
Upper social class	68	71.6	27	28.4	0.046
Lower social class	101	58.7	71	41.3	
Father smoking					
Yes	88	58.3	63	41.7	0.047
No	82	70.1	35	29.9	
Handwashing frequency of the family compared to the pre-pandemic period					
Never/ rarely	9	56.2	7	43.8	0.045**
Occasionally	58	56.3	45	43.7	
Frequently/ continiously	103	69.1	46	30.9	
Family use of public areas compared to pre-pandemic					
Never	9	90.0	1	10.0	0.034**
Rarely / occasionally	112	65.5	59	34.5	
Frequently/ continiously	49	56.3	38	43.7	
Family adherence to social distancing rules during the pandemic					
Never/rarely/ occasionally	32	78.0	9	22.0	0.035
Frequently/ continiously	138	60.8	89	39.2	
Mask use in children during the pandemic period					
Never	3	23.1	10	76.9	<0.001**
Rarely/ occasionally	12	41.4	17	58.6	
Frequently/ continiously	155	68.6	71	31.4	
History of previous hospitalization of the child					
One or more hospitalization	46	51.7	43	48.3	0.005
Never	124	69.3	55	30.7	

URTI: Upper Respiratory Tract Infection
* Pearson's chi- squared test
**linear by linear association

According to the multivariate analysis, the status of having URTI in the last one year is; increased by 1.9 times (%95 CI 1.1- 3.3) with previous history of hospitalization for any reason; increased by 2.7 times (%95 CI 1.2-6.1) with mask usage in the child being rarely/occasionally and increased by 6 times (%95 CI 1.1-23.8) with children never using masks at all. (Table IV)

Table IV. Evaluation of variables related to the effect of COVID-19 pandemic non-pharmaceutical interventions on Upper Respiratory Tract Infection (URTI) according to the logistic regression reduced final model, Nagelkerke R2: 0,142

Variables	*URTI in last year***	
	P	***OR**** ***(%95 CI)***
History of previous hospitalization of the child		
Never	0.021*	1(Ref)
At least one hospitalization		1.9 (1.1- 3.3)
Mask use in children during the pandemic period		
Frequently/Continiously	0.003*	1(Ref.)
Rarely /occasionally		2.7 (1.2-6.1)
Never		6.0 (1.5-23.8)

URTI: Upper Respiratory Tract Infection

***Enter**

** ***Variables included in the model:*** Social class, father's smoking, child's hospitalization history, child's mask use status after the pandemic, family member with COVID-19

****Odds ratio***

DISCUSSION

In our study, in which we investigated the effects of COVID-19 pandemic non-pharmaceutical interventions on URTI in children aged 6-18 years who applied to the University Hospital for outpatient diagnosis, the frequencyof URTI in the last year was found to be 36.6%. Compared to the pre-pandemic period, the frequency of URTI symptoms decreased by 71.3%. This decrease, which occurred with the pandemic measures, is compatible with other studies in the literature. In the study conducted by Çınaroğlu et al. (13) in Sinop in 2014 before the start of the COVID-19 pandemic, the prevalence of URTI was found to be 43.3% in the last 1 year. In the study conducted by Chien-Fu Lin et al. (14) in Taiwan in December 2020 across the country, between January 2019 and January 2020, the rate of URTI in children increased from 45.5% to 48.3%, while pandemic measures were not yet taken between January 2019 and January 2020, pandemic measures between April 2019 and April 2020. It was found that when it started to be taken, it decreased from 40.1% to 32.2%. Yueling Zhu et al. (10), in their study conducted in April 2021 at the Children's Hospital of Zhejiang University Medical Faculty, China, found that the total number of pediatric patients with respiratory tract infections in the January-April 2020 period decreased by 65.7% and 59.0% from 2018 and 2019, respectively.

According to the further analyzes made in our study, it was found that the history of hospitalization of the child and the use of masks in the child was associated with having an URTI in the last year. However, the fact that the research could not be carried out in a sample representing the universe due to epidemic conditions and the widespread use of UTI protection measures in the community at the time the data were collected can be considered as one of the limitations of the established

model. Other individual factors (immune system, etc.) that were not questioned in the research for UTI development are also likely to affect the predictive success of the model. It has been observed that the frequencyof URTI in children aged 6-18 decreased with the measures taken against the COVID-19 epidemic, and the main factor in this decrease was the use of masks in children. During the COVID-19 Pandemic period, children with a mask usage frequency of frequently/continuously have a significantly higher frequencyof URTI compared to children who rarely use masks. According to the multivariate analyzes performed, the frequencyof URTI is 2.7 times (95% CI 1.2-6.1) in those who rarely/occasionally use it, and 6 times (95% CI 1.5-23.8) in those who never use it. Chien-Fu Lin et al.(14), their study in December 2020, also observed that, after implementing mask policies in response to the COVID-19 outbreak, nationwide pediatric emergency room visits related to URTI decreased by approximately 50% compared to the average in the last 3 years. Research by S. Sue Huang et al. (15) in New Zealand in February 2021 showed a reduction in the number of respiratory viruses detected before, during, and after pandemic measures in 2020 (compared to the reference period 2015-2019) and the proportional reduction for each virus. The striking reductions in influenza virus compared to the reference period are as follows: they showed a 67.7% reduction at the start of pandemic measures and a 99.9% reduction after pandemic measures. In the study of Djin-Yeoh et al. (16) in Germany in 2021, it was shown that for the first time in Germany's history, non-pharmaceutical measures applied so intensely – first of all these measures the frequent usage of masks- significantly reduced URTI compared to previous years. The decrease in the frequency of URTI is associated with the increase in mask use. However, we think that the reason for the decrease, even in those who never use masks, is due to other measures such as curfew and decreased use of public space.

The frequency of URTI in children with a previous history of hospitalization was 1.9 times (95% CI 1.1-3.3) higher than in children who had not been hospitalized before. According to the study conducted by S. Aldırmaz et al. (17) between January 1999 and October 2011; It has been shown that 90.5% of children with a history of hospitalization with a diagnosis of primary immunodeficiency have more than 8 URTIs in the last year. This result may be due to the fact that children with a previous history of hospitalization have a weaker immune system against other infections.

The strength of our research; In our research, questionnaires were applied to the people who applied to the hospital by face-to-face interview technique. Our study is a new and original study since there is no similar study done in Turkey before. With this feature, our work will be a guide for future studies and measures to be taken. Limitations of our research; Because of the limitation of field studies during the pandemic, our study was conducted only on patients who applied to the hospital for outpatient diagnosis and treatment and does not represent society. Therefore, causal relationships should be carefully evaluated. The change in the frequency of URTI was evaluated according to the ICD codes in the hospital records in other studies in the literature, and in our study, it was questioned at the individual level since our Ministry of Health did not share data.

Conclusion and Suggestions

In the study conducted at MCBU Hafsa Sultan Hospital, the frequency of URTI in the last year was 36.6% in children aged 6-18 years. Compared to the pre-pandemic period, the frequencyof URTI in children decreased by 71.3% according to data from parents. Status of having URTI in the last one year is increased by 1.9 times (%95 CI 1.1- 3.3) with previous history of hospitalization for any reason; increased by 2.7 times (%95 CI 1.2-6.1) with mask usage in the child being rarely/occasionally and increased by 6 times (%95 CI 1.1-23.8) with children never using masks at all.

In the study,it was determined that using only the masks from the public health measures applied during the COVID-19 pandemic was effective in reducing the frequency of upper respiratory tract infection and that the use of masks in the community, especially in children, should be encouraged. Children with a history of hospitalization should be more careful in the follow up of them for respiratory tract infections and it should be

recommended that people around these children use masks.

REFERENCES

1. Coronavirus disease 2019 (COVID-19): situation report, 52 [Internet]. [cited 2021 Dec 22]. Available from: https://apps.who.int/iris/handle/10665/331476
2. BALCI Y, ÇETİN G. COVID-19 PANDEMİ SÜRECİNİN TÜRKİYE'DE İSTİHDAMA ETKİLERİ VE KAMU AÇISINDAN ALINMASI GEREKEN TEDBİRLER. İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi [Internet]. 2020 Jun 27 [cited 2021 Dec 22];19(37):40–58. Available from: https://dergipark.org.tr/en/pub/iticusbe/752714
3. Butler CC, Robling M, Prout H, Hood K, Kinnersley P. Management of suspected acute viral upper respiratory tract infection in children with intranasal sodium cromoglicate: a randomised controlled trial. The Lancet. 2002 Jun 22;359(9324):2153–8. https://doi.org/10.1016/S0140-6736(02)09091-8
4. Gwaltney, J. M., Phillips, C. D., Miller, R. D., & Riker, D. K. (1994). Computed Tomographic Study of the Common Cold. New England Journal of Medicine, 330(1), 25–30. doi: 10.1056/NEJM199401063300105
5. Dehning J, Zierenberg J, Spitzner FP, Wibral M, Neto JP, Wilczek M, et al. Inferring change points in the COVID-19 spreading reveals the effectiveness of interventions. Science [Internet]. 2020 Apr 2 [cited 2021 Dec 22];369(6500). Available from: http://arxiv.org/abs/2004.01105 doi: 10.1126/science.abb9789
6. Lee H, Lee H, Song KH, Kim ES, Park JS, Jung J, et al. Impact of Public Health Interventions on Seasonal Influenza Activity During the COVID-19 Outbreak in Korea. Clinical Infectious Diseases [Internet]. 2021 Jul 1 [cited 2021 Dec 22];73(1):e132–40. Available from: https://academic.oup.com/cid/article/73/1/e132/5848838 doi: 10.1093/CID/CIAA672
7. Olsen SJ, Azziz-Baumgartner E, Budd AP, Brammer L, Sullivan S, Pineda RF, et al. Decreased influenza activity during the COVID-19 pandemic—United States, Australia, Chile, and South Africa, 2020. American Journal of Transplantation [Internet]. 2020 Dec 1 [cited 2021 Dec 22];20(12):3681–5. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/ajt.16381
8. Friedrich F, Ongaratto R, Scotta MC, Veras TN, Stein RT, Lumertz MS, et al. Early Impact of Social Distancing in Response to Coronavirus Disease 2019 on Hospitalizations for Acute Bronchiolitis in Infants in Brazil. Clinical Infectious Diseases [Internet]. 2021 Jun 15 [cited 2021 Dec 22];72(12):2071–5. Available from: https://academic.oup.com/cid/article/72/12/2071/5912563 doi: 10.1093/cid/ciaa1458
9. Yeoh DK, Foley DA, Minney-Smith CA, Martin AC, MacE AO, Sikazwe CT, et al. Impact of Coronavirus Disease 2019 Public Health Measures on Detections of Influenza and Respiratory Syncytial Virus in Children during the 2020 Australian Winter. Clinical Infectious Diseases. 2021 Jun 15;72(12):2199–202. doi:10.1093/cid/ciaa1475
10. Zhu Y, Li W, Yang B, Qian R, Wu F, He X, et al. Epidemiological and virological characteristics of respiratory tract infections in children during COVID-19 outbreak. BMC Pediatrics [Internet]. 2021 Dec 1 [cited 2021 Dec 22];21(1):1–8. Available from: https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-021-02654-8 doi: 10.1186/S12887-021-02654-8/FIGURES/2
11. KIZIL, MAHMUT C. Et Al. "Pandemi Öncesi ve Pandemi Dönemi, Retrospektif Nazofarengeal Viral PCR Sonuçlarının Değerlendirilmesi." 15.

Ulusal Çocuk Enfeksiyon Hastalıkları ve Bağışıklama Kongresi , Antalya, Turkey, pp.98, 2022

12. Boratav K. İstanbul ve Anadolu'dan Sınıf Profilleri - Korkut Boratav - 9789755334141 - Kitap | imge.com.tr [Internet]. 2020 [cited 2021 Dec 22].p.33–60. Available from: https://www.imge.com.tr/kitap/istanbul-ve-anadolu-dan-sinif-profilleri-korkut-boratav-9789755334141
13. Cinaroglu S. Prevalence of upper respiratory tract infections and associated factors among children in Turkey. Journal for Specialists in Pediatric Nursing [Internet]. 2020 Jan 1 [cited 2021 Dec 22];25(1):e12276. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/jspn.12276 doi: 10.1111/jspn.12276
14. Lin CF, Huang YH, Cheng CY, Wu KH, Tang KS, Chiu IM. Public Health Interventions for the COVID-19 Pandemic Reduce Respiratory Tract Infection-Related Visits at Pediatric Emergency Departments in Taiwan. Frontiers in Public Health [Internet]. 2020 Dec 16 [cited 2021 Dec 22];8:604089. Available from: /pmc/articles/PMC7772199/ doi: 10.3389/FPUBH.2020.604089
15. Huang QS, Wood T, Jelley L, Jennings T, Jefferies S, Daniells K, et al. Impact of the COVID-19 nonpharmaceutical interventions on influenza and other respiratory viral infections in New Zealand. Nature Communications 2021 12:1 [Internet]. 2021 Feb 12 [cited 2021 Dec 22];12(1):1–7. Available from: https://www.nature.com/articles/s41467-021-21157-9 doi: 10.1038/s41467-021-21157-9
16. Oh D-Y, Buda S, Biere B, Reiche J, Schlosser F, Duwe S, et al. Trends in respiratory virus circulation following COVID-19-targeted nonpharmaceutical interventions in Germany, January - September 2020: Analysis of national surveillance data. The Lancet Regional Health - Europe. 2021 Jul 1;6:100112. doi:10.1016/j.lanepe.2021.100112
17. Aldırmaz S, Yücel E, Kıykım A, Çokuğraş H, Akçakaya N, Camcioğlu Y. Profile of the patients who present to immunology outpatient clinics because of frequent infections. Turk Pediatri Arsivi. 2014 Sep 1;49(3):210–6. doi: 10.5152/tpa.2014.1810