Descriptive Study of COVID-19 Clinical Characteristics among Allergic Children: Implications for Nursing Care in Egypt

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Abstract

Background: The global prevalence of allergic diseases in children is steadily rising, including asthma, allergic rhinitis, atopic eczema, conjunctivitis, food allergies, insect allergies, and anaphylaxis. These disorders can enhance children's vulnerability to COVID-19 due to immune system abnormalities and chronic drug use. Understanding the clinical features of COVID-19 among allergic children is critical for personalizing nursing treatment and prevention interventions. **Aim:** The purpose of this study was to describe the clinical characteristics of COVID-19 in allergic children and highlight implications for nursing care. **Method:** A descriptive cross-sectional design was used. Data were acquired using an online self-administered questionnaire delivered via Google Forms to parents of allergic children. attending the University Hospital in Menoufia Governorate, Egypt. A purposive sample of 100 parents participated. Two tools were used: (1) COVID-19 symptoms and complications questionnaire, and (2) laboratory investigations and chest X-ray findings. **Results:** High fever was reported in 75% of children, dry cough in 65.6%, sneezing in 43.8%, and difficulty breathing in 18.8%. Most children (90.6%) fully recovered, while 9.4% remained symptomatic during data collection. A significant correlation was observed between COVID-19 infection and allergic status. **Conclusion and recommendations:** Allergic children exhibited moderate COVID-19 symptoms, with no cases requiring ICU admission or isolation. These findings underscore the importance of nursing interventions, including continuous monitoring, early detection of complications, and parental education to optimize outcomes for allergic children during viral outbreaks.

Keywords: Allergic children, COVID-19, Clinical characteristics, Nursing care, Descriptive study

Introduction

The COVID-19 outbreak, caused by SARS-CoV-2, started in Wuhan, China. In March 2020, the World Health Organization (WHO) proclaimed COVID-19 a global pandemic (Tanno et al., 2021). COVID-19 causes a large number of people to grow ill and die. COVID-19 primarily targets the nose and lungs, resulting in ailments including the common cold, bronchitis, and pneumonia. (Chatziparasidis et al., 2021). The US Center for Disease Control and Prevention (CDC) has revealed laboratory-approved paediatric COVID-19 cases, revealing that 2572 of 149,082 (1.7%) known cases were under the age of 18. Furthermore, the COVID-19 epidemic presented a unique threat to the world. In addition, knowledge in the field has been developing tremendously, and the major allergy societies have developed guidance documents

for improved management of allergic patients over this period (Centres for Disease Control and Prevention, 2020).

Allergies are immune-mediated responses. The child is reacting to a particular drug or allergy. The child's immune system responds to the allergen by producing histamine and other substances that might cause symptoms in the nose, lungs, throat, sinuses, ears, eyes, skin, and stomach lining. Some children's allergies can cause asthma symptoms. Controlling allergies is critical since a lack of therapy might make them worse (MacPhail, 2023). This allergic reaction can impact many sections of the body, resulting in diseases or symptoms such as anaphylaxis, asthma, contact dermatitis, eczema, food allergy, hay fever, hives, insect bite allergy, and drug allergy (Mullins et al., 2022)

Allergic children infected with COVID 19 require continuous monitoring and evaluation. A study conducted by Tanno et al., (2021) at an Indian hospital found that allergic children were not at risk of contracting COVID-19 (53.4%) or developing severe symptoms such as severe acute respiratory syndrome (SARS) (46.1%). Two hundred twenty-nine (36.1%) participants agreed that asthmatics are at risk of developing SARS. Severe COVID-19 instances reveal a rise in the level of many cytokines that can promote inflammation of the bronchial tracts, aggravating asthma attacks (Tanno et al., 2021) Allergic reactions produce airway inflammation, which worsens asthma and impairs lung function(Savin et al., (2023). Consequently, this inflammation can be risk factors for hospitalization in children because of COVID-19(Chatziparasidis et al., 2021]. Moreover, Asthmatic children with severe COVID-19 symptoms are at high risk and may require supportive intensive care. To treat shock or hypoxaemia, the kid should receive oxygen promptly (Srijit et al., 2021).

The recent study by Brough et al.,(2020). There was no evidence that commonly used asthma and allergy treatments, such as antihistamines, corticosteroids, and bronchodilators, increased the risk of severe disease from COVID-19. In addition, a new study conducted by [CDC, 2019] showed that a nationwide case series of 2143 paediatric patients with COVID-19 reported to the Chinese Center for Disease Control and Prevention from January 16 to February 8, 2020, provided important information regarding the epidemiology and transmission patterns of the disease in children, accounted for 94.1% of all cases in 43 allergic children with COVID-19, allergic rhinitis (83.7%) was the main disease, followed by drug allergy. In other hand, Du et al.,(2021). There was no significant difference in demographics or clinical features between allergic and nonallergenic children. Allergic children had lower increases in acute phase reactants, procalcitonin, D-dimer, and aspartate aminotransferase levels than other children. Patients with a history of diabetes, severe asthma, or heart disease are more likely to be affected by COVID-19. Children with allergies and concurrent COVID-19 infection require comprehensive nursing care, which includes ongoing monitoring, symptom management, family education, and collaboration with multidisciplinary healthcare teams. Nurses have an important role in determining disease severity, providing family-centered education, and implementing preventative actions to limit transmission and consequences.

Though it is believed that people with chronic asthma who have been infected with the virus may have a worse prognosis, there is no evidence to substantiate this association. Despite the growing number of studies in recent months, few have addressed children's allergic sickness symptoms and problems during the COVID-19 outbreak. So, in order to provide reliable data on children's allergies and COVID-19, the purpose of this study was to evaluate the clinical characteristics and consequences of COVID-19 among allergic children and analyze their implications for nursing treatment.

Purpose of the Study: This study intended to characterize the clinical features and consequences of COVID. -19 among allergic children and determine their implications for nursing care.

Research Questions:

What are the clinical features and consequences of COVID-19 in allergic children? Is there a link between the intensity of COVID-19 symptoms and the existence of allergy disorders in children?

Research Design: A descriptive cross-sectional research design was adopted to achieve the study objectives.

Setting: This study conducted using online self-administered questionnaire through using Google Form to parents of allergic children in university hospital in Menoufia governorate, Egypt.

Subjects: A purposive sample of 100 parents of allergic children. Who fit the inclusion criteria; children who are aged from 0 to 18 years, male, and female gender, having any type of allergy.

The instruments of Data Collection

Instrument 1: Covid-19 symptom and complication questionnaire. This instrument consists of two parts. **Section 1**: contains information about children's socio-demographic factors such as age, gender, and residency.

Section 2: Covid-19 symptoms and complication questionnaire. This instrument was developed by the researchers based on [6] to evaluate clinical feature of allergic children while infected with corona virus, (fever, cough, dyspnea, muscle pain, diarrhea, fatigue, and congestion throat, running nose, conjunctivitis, loss of sense of smell and chest pain, complications after using the treatment, hospital admission, the need for ICU care during the period of COVID 19 disease. Each domain consisted of a collection of questions that were answered yes or no and scored (0&1), respectively. The overall score for each domain was calculated and divided into three categories: low reporting (<50%), moderate reporting (50-75%), and high reporting (>75%) of adverse effects. The validity of this questionnaire was assessed by a panel of five professors from various nursing disciplines, and they all agreed that it was valid. The reliability of this questionnaire was assessed, and Cronbach's alpha was ($\alpha = 0.84$).

Instrument 2: Laboratory investigation and X ray: to confirm COVID 19 infection such as chest X ray, CT scan, PCR test, Complete Blood Count (CBC) and C-reactive protein (CRP) ect **….**

Ethical consideration: The ethics committee approval about research was obtained from the local institutional board. The cover page of the questionnaire also included a brief overview of the study's purpose, the voluntary nature of participation, declarations of anonymity and confidentiality, notes for filling out the questionnaire, and the link and quick response (QR) code for the online questionnaire. Participants who agreed to actively engage in the study would click the 'Continue' option and be prompted to fill out the self-administered questionnaire.

Data Collection: Five academics (three professors of internal medicine and two professors of community health nursing) evaluated the measures' content validity after they were developed. The improvements were made to ensure their application and comprehensiveness. A pilot study was conducted on 10 parents to test the clearness of the questionnaires. The parents from the pilot study were excluded from the entire sample. During the third wave of covid-19, data was collected from March 1 to June 30, 2021. An online survey portal, Google Form, was built, and participants were requested to fill out and submit the form. Participants could examine the questions by clicking on the link, answer them, and send them back to the researcher via email.

Statistical analysis

The data was collected, arranged, and analysed using IBM compatible computer and SPSS (statistical Package for Social Science) version 20 (SPSS Inc., Chicago, IL, USA). The qualitative data was described as frequency and percentage while, quantitative data was described as mean, standard deviation and range. Microsoft excel will be used to fill, organize, and manage participant data. Microsoft electronic calculator used to calculate the sample size and the following value was choosing acceptable margin of error (5%), confidence level (95%), Different statistical tests will be used to manage collected data to compare between them. P- value was considered significant at a value (≤ 0.05).

Results

This study was conducted on parents of allergic children in university hospital in Menoufia governorate, Egypt. Their mean age

of children was 7.4±4.9 and ranged from 5 – 20 years, regarding the sex (58.2) were males, (20.9 %) age from 5 - 7, (20.0%) age range from 3 – 5 and (43.9%) age range from 3 – 5. (15.5%) age range from 3 – 5. The majority of sample (70%) from rural area.

Table 2 Showed number and percentage distribution of child types of allergies, symptoms, and medication use. This table revealed that chest allergy was more common type of child allergy (20.9%), skin allergy (10.9%), food allergy (10.0%), but drug allergy was less common (1.8%). Also, period the child had allergy was >1-2 (44.5%), (44.5%) had moderate severity of symptoms associated with the child allergy, and about half of children (50.9%) used prays, drops or ointments as medical treatment of allergy.

Table 3 Showed number and percentage distribution of COVID 19 infection, symptoms, and complication in child with allergic diseases. This table revealed that (29.1 %) the child been infected with Covid-19. (43.8%) the parents of child do not know the Source of 43.8 infection and (40.6%) the child infected by family member. All children infected one times with COVID 19. (75.0%) of children the main symptoms were high temperature, (65.6%) had dry cough, (43.8%) complaint of sneezing, and less common symptoms (18.8%) were difficulty breathing. (65.6%) had moderate severity of Covid- 19 symptoms, (93.8%) the condition of child not required ICU admission or isolation.

Table 4 Showed number and percentage distributions of diagnostic tests for Covid- 19 child had done. This table revealed that (28.1%) diagnosed by CBC and (15.6%) diagnosed by CT. (34.4%) of children infected with Covid-19 treated with antibiotic and Vitamins.

Table 5: Showed number and percentage distributions of child complication post Covid-19. This table revealed that the majority of studied sample (84.4%) had no complication post Covid-19, (9.4%) of children had complication post Covid- 19. (90.6 %) of children had complete recovery but (9.4%) was still sick.

Table 6: Showed the correlation between covid -19 infections and Child allergy. This table showed significant correlation between covid -19 infection and child allergy which (p value = >0.05).

Table 1: Distribution of Socio-demographic Characteristics of Participants (N=100).

Socio demographic characters		No.	%
1. Age of child	Mean ±SD	7.4±4.9	
	Median	6.5	
	Range	0.5-20	
	0-1 years	6	5.5
	1-3	17	15.5
	3-5	22	20.0
	5-7	23	20.9
	7-10	14	12.7
	10-12	12	10.9
	12-18	13	11.8
	above 18	3	2.7
2. Sex of child	Male	64	58.2
	Female	46	41.8
3. Residence	Urban	30	30
	Rural	70	70

Table 2: Percentage Distributions of child types of allergies, symptoms, and medication use (N=100).

Variables		No.	%
Does the child have any kind of allergies?	no	28	25.5
	may be	11	10.0
	yes	71	64.5
Types of child allergy	Nose allergy	18	16.4
	chest allergy	23	20.9
	skin allergy	12	10.9
	eye allergy	4	3.6
	Dust allergy	3	2.7
	food allergy	11	10.0
	animals' allergy	2	1.8
	drugs allergy	2	1.8
	Seasonal allergy	7	6.4
Period the child had allergy	0-1 year	33	30.0
	>1-2	49	44.5
The severity of the symptoms associated with the child allergy?	mild	30	27.3
	moderate	49	44.5
	severe	2	1.8
Type of medication the child use?	Sprays, tablets or drinking drugs.	23	20.9
	Sprays, drops or ointments.	56	50.9
	Nothing	3	2.7

Table 3: Percentage Distributions of Covid -19 infection, symptoms, and complication in child with allergy (N=100).

Variables		No.	%
1. **Has the child been infected with Covid- 19?**	no	78	70.9
	yes	32	29.1
2. Source of infection	family	13	40.6
	School or nursery	5	15.6
	don't know	14	43.8
3. Numbers the child infected with Covid- 19	Only one	32	100.0
4. Symptoms the child have after Covid- 19 infection	high temperature	24	75.0
	dry cough	21	65.6
	general fatigue	9	28.1
	smell and taste loss	12	37.5
	Colic and Diarrhea	10	31.3
	Difficulty breathing	6	18.8
	sneeze	14	43.8
	Sore throat	12	37.5
5. Severity of Covid- 19 symptoms in the child?	mild	11	34.4
	moderate	21	65.6
6. The condition of the child required ICU admission.	no	30	93.8
	yes	2	6.3
7. The condition of the child required isolation at the hospital?	no	30	93.8
	yes	2	6.3

Table 4: Percentage Distributions of Diagnostic tests for Covid 19 child had done and medication taken (N=100).

Variables		No.	%
Diagnostic x-rays or tests done	no	19	59.4
	Yes	13	40.6
Diagnosed by	X-ray	4	12.5
	CBC	9	28.1
	CRP	4	12.5
	CT	5	15.6
What are the drugs?	Antibiotics	11	34.4
	Analgesic and antipyretic	9	28.1
	vitamins	11	34.4
	Cortisone	2	6.3

Table 5: Percentage Distributions allergic child complication post Covid 19 (N=100).

Variables		No.	%
Complications	no	27	84.4
	May be.	2	6.3
	Yes	3	9.4
Types of complications	Fever, chest pain and diarrhoea	2	6.2
	Increased sensitivity in the skin and skin allergic rash	1	3.1
Prognosis	Complete recovery	29	90.6
	still sick	3	9.4

Table 6: The correlation Covid- 19 infected and Child allergy (N=100).

		The child had been infected with Covid-19				X^2	p. value
		no		Yes			
The child has any kind of allergies	**No**	22	28.2%	6	18.8%	1.2	0.548 >0.05
	may be	7	9.0%	4	12.5%		
	Yes	49	62.8%	22	68.8%		

Discussion

Allergic reactions produce airway inflammation, which worsens asthma and impairs lung function (Savin et al., 2023) Consequently, this inflammation can be risk factors for hospitalization in children because of COVID-19(Chatziparasidis et al., 2021). Furthermore, Asthmatic children with severe COVID-19 symptoms are particularly vulnerable and may require supportive intensive care. To treat shock or hypoxaemia, the kid should give oxygen immediately (Srijit et al., 2021).

The current study aimed to assess the prevalence of COVID-19 on allergic children.

In relation to symptoms, and medication use of allergic children. Regarding allergic children's symptoms and medication use. The current study's findings revealed that chest allergy was

the most prevalent type of child allergy (20.9%), followed by skin allergy (10.9%) and food allergy (10.0%), but drug allergy was the least common (1.8%), which is consistent with a study on Allergies in Children (Golding et al., 2022). The later study concluded that the food allergies are most common in young children, especially children with atopic dermatitis; relatively few foods are responsible for the massive allergic reactions. Furthermore**,** the systemic review of Nomula et al., (2022). concluded that the food allergy in children and young people were most common followed by drug allergy and anaphylaxis. In addition, Siddiqui et al., (2022) concluded that in Bangladesh the Food allergies are more common in infants and typically resolve as people age. Even though some food allergies are dangerous, many only produce itchy rash, stuffy nose, and diarrhoea.

On the other hand, these study results are incongruent with Dayasiri et al., (2021) who reported allergic rhinitis which is the most common paediatric allergic disorder has a significant negative effect on quality of life in affected children. The differences might be related to difference in the sample size.

The current study showed that COVID 19 symptoms, and complication in child with allergic diseases. (29 %) the child been infected with Covid- 19. (40.6%) the children infected by family member. All children infected one times with COVID 19. (75.0%) of children the main symptoms were high temperature, (65.6%) had dry cough, (43.8%) complaint of sneezing, and less common symptoms (18.8%) were difficulty breathing. (65.6%) had moderate severity of Covid 19 symptoms, (93.8%) the condition of child not required ICU admission or isolation. This may explain the Covid 19 infection had moderate effect on allergic children.

In congruent with the current study were about management of allergic diseases during COVID-19 outbreak, (Domínguez et al., 2021)who observed that there was a strong association between allergic children and the probability of unfavourable clinical outcomes from COVID-19 as well as the intensity of presentation. Similarly, Feng et al., (2020) observed that children with allergic conditions were more susceptible to SARS-CoV-2 due to immune system problems and long-term use of specific medicines.

On the other hand, Brindisi et al., (2021) contradicted these results and concluded that the allergic children have mild symptom of covid 19 and regarding the prognosis the majority of asthmatic children showed improvement in their symptoms. Similarly, the majority of those with allergic rhinitis reported improved clinical symptoms. In terms of treatment, we noticed an overall decline in the use of on-demand therapies (salbutamol, nasal corticosteroid, and antihistamine) for both diseases. Concerning allergic child complications with Covid 19, the current study showed the majority of studied sample (84.4%) had no complication post Covid 19, (9.4%) of allergic children had complication post Covid 19. Accordingly, Wandalsen et al., (2021) the majority of children had no complication post Covid 19. And complication occurs in mild level. While Shekerdemian et al., (2020) who assessed "characteristics and outcomes of children with coronavirus disease 2019 in US and Canadian paediatric intensive care units". They reported 35 (73%) presented with respiratory symptoms and 18 (38%) required invasive ventilation. Eleven child (23%) had failure of 2 or more organ systems.

Furthermore, the current study found that significant correlation between covid 19, infection and child allergy which (p value = >0.05). These results agree with the results carried out by Guvey, (2021) about how does allergy impact the severity of COVID-19 and reported that there was significant correlation between Covid 19, infection and child allergy which (p value = >0.05). This result was in the same line with Boechat et al., (2021) who indicated that allergy in the paediatric population consider as a risk for severe SARS-CoV-2 infection, and found that highly significant correlation between covid 19, infection and child allergy which (p value = >0.001). This may be explained as Inflammation occurs in the airway owing to systemic allergic response, which may lead to aggravation of asthma and reduces the functioning of the lungs, hence increasing the severity of COVID-19 symptoms.

On other hand, Du et al., (2021) contradicted these results and concluded that there was no difference in disease incidence, clinical

characteristics, laboratory and immunological results between COVID-19 children who were allergic and those who were not. It was also shown that allergy was not a risk factor for the development or severity of SARS-CoV-2 infection, and had little influence on the illness course of COVID-19 in children. The disparities in the current study could be attributed to changes in data collection time, sample size, and allergy-specific care for children.

Conclusion:

Based on the results of the current study it can be concluded that allergic children had moderate severity of Covid 19 symptoms, and condition of child not required ICU admission or isolation. Also, this descriptive study highlighted that allergic children infected with COVID-19 commonly exhibited moderate symptoms such as high fever, dry cough, and sneezing, with fewer cases reporting difficulty breathing. Most children achieved complete recovery without requiring intensive care or isolation. A significant association was found between allergic status and the severity of COVID-19 symptoms.

These findings emphasize the critical role of nursing care in monitoring allergic children during viral outbreaks, providing early detection of complications, and delivering continuous parental education on symptom management and preventive measures. Implementing nursing-led interventions tailored to this vulnerable group can enhance outcomes and reduce the risk of severe complications.

Study implications:

The findings of this study underscore the importance of proper management of allergic diseases in children and the need to minimize exposure to aggravating allergens, particularly during viral outbreaks such as COVID-19. Special attention should be directed toward allergic children diagnosed with COVID-19, as they may present with moderate symptoms that require vigilant monitoring and early nursing interventions to prevent complications.

Further research is needed to determine the long-term effects of COVID-19 on allergic children, as well as to investigate any disparities in clinical results among public and private healthcare institutions. Such studies would provide broader insights and guide evidence-based nursing practices for managing this vulnerable population.

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References

1. Tanno L, Demoly P, Martine B, & Berstein J. (2021). Allergy and coronavirus disease (COVID-19) international survey: Real-life data from the allergy community during the pandemic. World Allergy Organization Journal, 14:100515. http://doi.org/10.1016/j.waojou.2021.100515
2. Chatziparasidis G, & Kantar A. (2021). COVID-19 in Children with Asthma. Lung 199:7–12. https://doi.org/10.1007/s00408-021-00419-9
3. Centres for Disease Control and Prevention. People at increased risk: and other people who need to take extra precautions. Available at: https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/index.html, accessed September 3, 2020.
4. MacPhail T. Allergic: how our immune system reacts to a changing world. Random House; 2023 May 25, 3rd ed, Ch. 2, pp. 19-32.
5. Mullins RJ, Dear KB, Tang ML. Changes in Australian food anaphylaxis admission rates following introduction of updated allergy prevention guidelines. Journal of Allergy and Clinical Immunology. 2022 Jul 1;150(1):140-5. https://doi.org/10.1016/j.jaci.2021.12.795
6. Savin IA, Zenkova MA, Sen'kova AV. Bronchial asthma, airway remodeling and lung fibrosis as successive steps of one process. International journal of molecular

sciences. 2023 Nov 7;24(22):16042. https://doi.org/10.3390/ijms242216042

7. Srijit G, Das S, Mondal, Abdullah S, Sultana S, Singh S, Sehgal A, & Behl T. (2021). A review on the effect of COVID-19 in type 2 asthma and its management. International Immunopharmacology (91) 107309.
8. Brough H, Kalayci O, Sediva A, Untersmayr E, & Philippe A. (2020). Managing childhood allergies and immunodeficiencies during respiratory virus epidemics – The 2020 COVID-19 pandemic: A statement from the EAACI-section on pediatrics, Eigenmann. Pediatr Allergy Immunol, 31:442–448.
9. CDC. Corona virus disease 2019 (COVID 19). Cent Dis Control Prev. 2020. Available at https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/asthma.html . Accessed April 2, 2020.
10. Du H, Dong X, Zhang J, Cao Y, Akdis M, Huang, Chen H, & Li Y. (2021). Clinical characteristics of 182 pediatric COVID-19 patients with different severities and allergic status. Allergy. 76:510–532. Clinical characteristics of 182 pediatric COVID-19 patients with different severities and allergic status (wiley.com).
11. Golding MA, Batac AL, Gunnarsson NV, Ahlstedt S, Middelveld R, Protudjer JL. The burden of food allergy on children and teens: a systematic review. Pediatric Allergy and Immunology. 2022 Mar;33(3):e13743. https://onlinelibrary.wiley.com/doi/10.1111/pai.13742 .
12. Nomula K, Liburd K, Ge X, Sun J, Chang C. A brief history of allergy and immunology. InAllergic and Immunologic Diseases Academic Press. 2022;(1):17-42 https://doi.org/10.1016/B978-0-323-95061-9.00002-3
13. Siddiqui ZA, Walker A, Pirwani MM, Tahiri M, Syed I. Allergic rhinitis: diagnosis and management. British journal of hospital medicine. 2022 Feb 2;83(2):1-9. https://doi.org/10.12968/hmed.2021.0570
14. Dayasiri K, and Thadchanamoorthy V. (2021). Diagnosis and Management of Allergic Rhinitis in Children. April 2021International Journal of Human and Health Sciences (IJHHS) 05(2):159-162. DOI:10.31344/ijhhs. v5i2.253
15. Domínguez A, & Rojas M, & Alobid I. (2021). Management of Allergic Diseases During COVID-19 Outbreak Current Allergy and Asthma Reports 21: 8 https://doi.org/10.1007/s11882-021-00989-x
16. Feng L, Xuefeng X, Ping W, Kai G, & Lu M. (2020). Pediatric Allergy, Immunology and Rheumatology Branch, Asia Pacific Association of Medicine and Bio-Immunology (PAIRB-APAMBI), China. J Clin Mol Med, Volume 3: 1-2 DOI: 10.15761/JCMM.1000134
17. Brindisi G, Vittori V, Nola R, Elia P, Anania C, Castro G, Cinicola B, Gori A, Cicinelli E and Zicari A. (2021). Updates on Children with Allergic Rhinitis and Asthma during the COVID-19 Outbreak. J. Clin. Med. 10, 2278. https://doi.org/10.3390/jcm10112278
18. Wandalsen F, Kuschnir F Boechat J, and Delgado L. (2021). COVID-19 and Pediatric Asthma: Clinical and Management Challenges. Int. J. Environ. Res. Public Health, 18, 1093. https://doi.org/10.3390/ijerph18031093 .
19. Shekerdemian, L, Mahmood R, MD; Katie K. Wolfe, MD; Becky J. Riggs, MD; Catherine E. Ross, MD; Christine and A. McKiernan. Characteristics and Outcomes of Children with Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units. AMA Pediatrics September 2020 Volume 174, Number 9 8.
20. Guvey A, (2021). How does allergic rhinitis impact the severity of COVID-19: a case–control study. European Archives of Oto-Rhino-Laryngology. https://link.springer.com/content/pdf/10.1007/s00405-021-06836-z.pdf
21. Boechat L, Wandalsen G, Kuschnir F and Delgado L, (2021). COVID-19 and

Pediatric Asthma: Clinical and Management Challenges. Int. J. Environ. Res. Public Health 2021, 18, 1093. https://doi.org/10.3390/ijerph18031093

22. Du H, Dong X, Zhang J, Cao Y, Akdis M, Huang P, Chen w, Li Y, Liu G, Akdis C., and Lu X, (2021). Clinical characteristics of 182 pediatric COVID-19 patients with different severities and allergic status. Allergy; 76:510–532 https://onlinelibrary.wiley.com/doi/10.1111/all.14452