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Epidemiologic changes caused by the preventive measures for the coronavirus disease 2019 pandemic: An additional challenge for pediatricians

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After the World Health Organization declared pandemic status and implemented restrictive measures to counter the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), there was a reduction in major pediatric diseases caused by common seasonal viruses.[1,2] The typical increase in pediatric outpatient visits and workload in emergency departments and hospital wards that characterizes the winter season, usually dominated by respiratory syncytial virus (RSV) and influenza viruses, was not seen. Diseases such as bronchiolitis, asthma, and gastroenteritis, the protagonists of pediatric age, had drastically reduced or disappeared.

This commentary, prepared by the Social Pediatrics Working Group of the European Association of Pediatrics, Union of National Pediatric Societies and Associations, reports and briefly discusses data from the literature and the impact of preventive measures, established in various countries to contain the coronavirus disease 2019 (COVID-19) pandemic, on the seasonal epidemiology of various pediatric infectious diseases. The purpose of the article is to raise awareness of this anthropogenic epidemiologic phenomenon and to emphasize the importance of being adequately trained to properly address this new challenge in their practice.

Changes in the Seasonal Pattern of Pediatric Infectious Diseases Caused by COVID-19 Preventive Measures

Preventive measures taken to contain the COVID-19 pandemic have changed the spread of SARS-CoV-2 infection and also the predictable seasonal pattern of many endemic viral diseases in children.[2] Preventive measures have included the use of universal masks, school closures, travel restrictions, bans on mass gatherings, and other public health and physical removal measures to control COVID-19. Before 2020, outside tropical areas, RSV, and nonpandemic influenza viruses had their peak epidemic in winter in the Northern and Southern Hemispheres. In temperate climates, enteroviruses circulated from summer to fall, according to established cyclical and epidemiologic patterns.[3] The COVID-19 pandemic altered these patterns, and in many regions of the world, the usual circulation of these viruses was absent for more than a year only to reoccur unexpectedly.[2] An unprecedented low incidence of respiratory viral infections[4,5] was recorded in 2020. Notably, there was no typical winter increase in RSV-related pediatric hospitalizations.[4,6]

However, following the reduction in COVID-19 measures, an unseasonal increase in respiratory viral infections has been observed in many temperate areas of the world, such as in Europe and the United States, where climatic factors, including temperature, humidity, and ultraviolet radiation, may play a role in viral spread.[7] In many European countries, there was a complete absence of RSV cases during the Fall/Winter of 202020/21, and a resurgence of interseasonal cases was observed during May-June 2021, with epidemic spikes affecting several age groups, including young children, particularly those from neighborhoods with lower socioeconomic status.[4,8] After the collapse of global influenza circulation in early 2020, unseasonal outbreaks of influenza A occurred in the Spring-Summer of 2022 in the Northern Hemisphere, although strain B remained absent.[9] Enterovirus D68 infection, suspected of causing a polio-like illness called acute flaccid myelitis, did not occur in 2020; however, the virus reappeared in the fall of 2021 in Europe outside the expected 2-year cycles.[9]

Return patterns of these viral outbreaks have been heterogeneous among locations, populations, and among different pathogens, making any prediction difficult.[9] Although many infections, and associated morbidity and mortality, were prevented by measures taken to prevent COVID-19 infection, this resulted in reduced exposure to endemic viruses and created an immune gap in susceptible groups of individuals who avoided infection and subsequent response to protect

COVID-19	Coronavirus disease 2019
RSV	Respiratory syncytial virus
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2

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themselves from future infection.[10] The decline in childhood vaccination that has occurred in some settings may have contributed to this immune gap for vaccine-preventable diseases such as influenza, measles, chickenpox, and, in some countries, polio.[9,10] The cumulative effect of new susceptible birth cohorts decreasing immunity over time with reduced exposure to common endemic viruses and delayed vaccination rates in some settings widen this immunity gap and increase the potential for future outbreaks of endemic viruses.

Public Health Systems and Pediatricians Must Be Ready to Address Seasonal Changes in Immunity and Host Susceptibility to Infectious Diseases

The case of COVID-19 pandemic suggests that in the future, health services are likely to face unexpected nonseasonal epidemic outbreaks due to groups of more susceptible populations of children who are simultaneously exposed to multiple endemic viruses.[9] The size and timing of outbreaks of specific pathogens are difficult to predict because they depend on many dynamic factors, including the seasonality and transmissibility of individual pathogens and the duration of preventive measures for containment, as in the case of COVID-19 infection. The imposition of public health preventive measures could have a great impact on the magnitude of future epidemics of endemic viral diseases in children and generate seasonal changes in immunity and host susceptibility of various infectious diseases.[11] The unprecedented natural experiment that occurred during the COVID-19 pandemic may offer a unique research experience for understanding the dynamics of typical childhood viruses. The observed differences among pathogens could help elucidate the role of behavioral factors, climate, immunity, and, more generally, current lifestyle, in influencing the transmission of endemic infectious diseases among children.[12] Another likely effect of the delay in circulation and the resulting immune gap could be a temporary change in the age distribution of viral infections, as susceptible children may be exposed for the first time to some infectious pathogens at a later age than in the past.[12] In addition, decreased maternal exposure and immunity to common endemic viruses, resulting in a lack of transplacental antibodies transferred to the newborn, could make young children more vulnerable to infection.[9] In this regard, age-related differences in disease presentation are also likely to vary by pathogen. For example, the risk of severe RSV disease is greater in younger children, so delayed exposure might reduce the severity of disease in infants and even adults infected later in life,[12] although young children, unprotected by maternal antibodies, might be more likely to develop more severe disease.[11]

Conclusions

In view of the possibility of a re-emergence of SARS-CoV-2 infection or further unexpected pandemics in the next years, public health authorities should raise awareness among community health workers about the need to ensure access to services and continuity of vaccination programs. Pediatricians should be informed so that they can adapt their diagnostic and reporting algorithms accordingly. This should be an integral part of the overall delivery of health care to their patients during new infectious emergencies. Ensuring continuity of routine immunization and addressing gaps in previous immunization history is an essential element of public health support during new pandemics. Surveillance systems should be strengthened by increasing the awareness of health workers to ensure that vaccine-preventable and other communicable diseases are detected appropriately despite a possible change in their typical epidemiologic patterns.

Many infectious diseases that showed unusual seasonal patterns during the pandemic are likely to return to prepandemic endemic patterns. However, further studies are needed to determine the potential of synergistic and antagonistic interactions of the various pathogens with SARS-CoV-2, and their impact on the severity of clinical presentations or circulation patterns. This will enable to set up appropriate prevention programs by public health systems[9,13] and acquire appropriate skills from pediatricians to be able to adequately address possible future epidemiologic variations of even the most common infectious diseases. ■

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