

The Coronavirus Pandemic Effects on Children

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Abstract

The Coronavirus pandemic has affected and impacted everyone. Some people may simply not want to admit it; however, it has affected each person in a specific way [1]. Children had to stay home from school and learn virtually. Parents had the additional stress of going to work, during the pandemic, and finding safe ways to collaborate with others, in order for companies to remain open and provide their services to customers. This pandemic has affected all; however, one age group was affected the most. This age group [2] includes all children. Children have been affected, primarily, in two ways, physically, as well as mentally. This article has the purpose of analyzing the effects of the pandemic that were imposed on children and helping others gain full knowledge. Having the full knowledge of these effects will help individuals to decide for themselves, the extent to which this rapidly spreading virus affected the next generation.

Keywords

SARS-CoV-2, Acute Disseminated Encephalomyelitis, COVID-19

1. Introduction

On Tuesday, February 25, 2020, a telebriefing [3] was held by Dr. Messonnier. In this telebriefing, she stated some protective measures that would be put into effect, if the Coronavirus pandemic became unmanageable. The theory became reality, and many of the measures that were mentioned were put in place: masking, social distancing, proper hand hygiene, and the disinfection of commonly touched surfaces. Despite these measures, SARS-CoV-2 still managed to spread throughout communities. This quick dispersal might have been a result of the poor practice of guidelines, the incorrect interpretation of the severity of the virus, or a combination of both. It will be difficult to ascertain the true reason behind the spread; nevertheless, the results are evident. Even though the measures put into place did not fully stop the spread, they helped to mitigate it, and more strict enforce-

ment of these measures would have mitigated the spread by a greater percentage. Studies have shown that wearing a surgical mask is effective [4], it reduced the spread of COVID-19. If the correct masks were worn, and social distancing [5] was enforced, the spread would have been reduced [6] greatly.

One of the many subjects that Dr. Messonnier touched on was education. Education paves the way for the new generation and is crucial for all children. She had mentioned that school would be transferred to a video, conference call if the Coronavirus continued to spread.

The first case of SARS-CoV-2 was identified in the United States on January 20, 2020. Dr. Messonnier held her telebriefing on February 25, 2020. This evidence suggests that the Coronavirus had been spreading during a thirty-six-day period, and, on February 25, 2020, 57 cases of the Coronavirus were reported in the United States [7]. Social distancing and other protective measures were not put into place until the beginning of March, and the virus was allowed further time to rapidly spread among individuals [8]. Further cases were present, but not reported due to the lack of testing [9]. Individuals did not know if they contracted SARS-CoV-2 or had a different minuscule infection. In addition to this, many were afraid to go to hospitals because they feared that they would contract the virus. Individuals admitted to hospitals had a severe infection of the Coronavirus and needed immediate medical attention. The Coronavirus has had a great physical impact on children as well. This impact is directly related to SARS-CoV-2, and in rare cases, it has affected the brain and spinal cord, causing rare, life-threatening, diseases.

2. Methods

A study was carried out, in which specialists examined 38 children who had been infected with SARS-CoV-2. Neurosurgeons were seeking abnormalities in the brain and spinal cord. The 38 children who participated in the study were grouped into four categories, based on the severity of their case, as well as the findings: the first category included children with an acute COVID-19 infection, the second category included children who were asymptomatic or had a subacute COVID-19 infection, the third category included children with multisystem inflammatory syndrome, and the fourth category included children who were indeterminate.

3. Data

Within the first category, 50% of the patients were observed to be compatible with autoimmune disease. This is a disease in which the body's immune system attacks healthy, somatic cells. Within 33% of the patients in the first category, patchy T2 hyperintensity was observed in the white and gray matter, of the brain. This pattern is analogous to the pattern of acute disseminated encephalomyelitis. In another case, a young girl developed aggressive myelitis, and she is now quadriplegic.

Within the second category, 38% of the pediatric patients were diagnosed with acute disseminated encephalomyelitis-like abnormalities. 50% of the pediatric patients within this category had neuritis in the cranial or spinal nerves. Within this 50%, one of the patients also had acute disseminated encephalomyelitis-like abnormalities, and 13% of the patients had extensive superior sagittal sinus thrombosis.

Within the third category, 64% of the patients had splenial lesions. Another 64% of the patients had acute disseminate encephalomyelitis-like abnormalities, 9% had myelitis, 18% had cranial nerve enhancement, 9% had cauda equine enhancement, 9% had punctate foci, which were consistent with microthrombi, and 36% had myositis of the facial or neck musculature.

In the fourth category, 71% of the patients had neuritis, and 29% had acute disseminated encephalomyelitis-like abnormalities, of which one was also diagnosed with myelitis, and the other developed anti-myelin oligodendrocyte glycoproteins antibodies. 14% of the pediatric patients had cerebellitis, as well as neuritis, in the skull, and another 14% had vasculitis and a midbrain infarct [10].

4. Discussion

Acute disseminated encephalomyelitis-like abnormalities were commonly observed in pediatric patients with severe complications, due to a SARS-CoV-2 infection [11]. This disorder causes inflammation of the brain and spinal cord, as well as damage to the white matter of the brain. White matter is composed of neurons, which have extension-like arms that serve as connections between them. Axons are able to transfer information between neurons. They help neurons to communicate with each other, and have a protective coating called a myelin sheath. This myelin aids in the rapid the communication between neurons, and therefore the brain is able to function faster. Acute disseminated encephalomyelitis damages the myelin, which covers axons, thus contributing to communication issues between neurons. These communication issues may lead to negative effects on the memory, focus, and problem-solving abilities that individuals experienced.

It is not certain whether the patients surely had acute disseminated encephalomyelitis; however, the patterns they had were similar to this disease. In all four categories, most of the pediatric patients had favorable outcomes, except those with co-infections.

4.1. Oxygen Deficiency

SARS-CoV-2 has many symptoms, some of which include shortness of breath. This shortness of breath is the result of when the infection travels through the nose and the trachea, through the bronchi, and into the lungs. When the lungs become infected, the alveoli stiffen and fill with fluid, thus they are prevented from fully nourishing the blood with oxygen [12]. The blood collects oxygen through the alveoli and carries it to different organs in the body. The brain uses

about 20% of the oxygen that is inhaled, and thus when there is an oxygen deficiency, the brain is one of the organs that sees the greatest effects. Therefore, SARS-CoV-2 is thought to affect the brain through hypoxia [13], or a low oxygen supply in certain tissues. There have not been many studies conducted on this particular topic, and therefore it is not fully certain. However, a study was carried out with a set number of patients who had white matter abnormalities in the brain [14]. The study compared the brains of patients infected with SARS-CoV-2, with those of patients who have had white matter abnormalities after having hypoxia; however, they were not infected. The findings that researchers stated: the brains of the infected patients showed an N-acetyl-aspartate reduction, an elevation of choline, and a myo-inositol elevation. These same characteristics were found in patients that were not infected with the virus, however, had hypoxia. Researchers are still not sure whether the virus itself, is responsible for these white matter damages, or whether the oxygen deficiency, caused by the virus, is. More studies conducted in the future will lead to a definite explanation of the physical changes of the white matter.

In all of these cases, very rare complications of SARS-CoV-2 were visible. However, in many studies that have been conducted, most children who contracted SARS-CoV-2 were asymptomatic or had a very mild case, and few were hospitalized [15]. Nevertheless, there were some rare cases in which children were hospitalized, and similar complications can be seen as the ones above. Multisystem inflammatory syndrome was one of the most common, severe complications in children [16].

4.2. Introduction to Indirect Effects

SARS-CoV-2 is the virus that causes the Coronavirus disease. SARS-CoV-2 had direct or physical effects on children as well as indirect effects. The direct effects could be seen in children through magnetic resonance imaging. The SARS-CoV-2 infection caused many to contract the Coronavirus disease. This disease led to many indirect effects on children such as when schools were obligated to switch to remote learning.

Many schools started to transfer to remote learning at the beginning of March 2020. The first reaction that many children had was a positive one, as they were excited to get a break from school, and relax. However remote learning would continue for a year and a half, and it would have lasting impacts on students across the nation.

All children that are attending school are developing, especially those of younger ages. They have brains that are developing and growing, whether they are a baby or are already in their senior year of high school. It is crucial for children to participate in social interactions with others, as it helps them to develop [17]. In young children, social interactions aid in cognitive development as well as in setting emotional foundations. This cognitive development may be in acquiring new vocabulary, learning ways to form sentences, as well as acquiring polite manners,

and gaining new knowledge. In older children such as teenagers, social interactions help with the essential skills of voicing opinions, expressing emotions, and engaging in intelligent, polite, conversations. Remote learning has prevented children from experiencing these social interactions, which are of fundamental importance in the growth and development of a child. This decrease in social interactions has led to an increase in many neurological disorders such as social anxiety disorder.

Children were isolated and lived in a different society. They did not go to school, were not able to see friends and family, and rarely left the house to run an errand. Parents were worried, and they wanted to prevent their children from being infected with SARS-CoV-2. Many parents took the correct precautions and prevented their children from contracting the virus.

Remote learning also resulted in a learning loss, globally [18]. Many students are behind in their education because remote learning has imposed a great struggle on students, teachers, and parents. Students and teachers had to transition from in-person learning to remote learning. This transition took many weeks to complete, and after it was completed, students still struggled to focus and had trouble grasping new concepts. This learning loss was an indirect result of the Coronavirus pandemic, and it was influenced by the way that society changed. For example, social isolation had a major impact on the learning loss, which many students experienced.

Collaboration is a major skill to acquire when learning. It is acquired by learning, and it helps students to learn. The social isolation that occurred prevented students from experiencing the full benefit of collaborating with others, on certain projects, because they were learning remotely. Many careers depend on collaboration, and effective communication is the foundation upon which these careers are built. Each generation changes society, and the technological advancements that have been made in the past two decades, or so, show that the future is moving toward a society that depends on the internet. Even though society is changing, certain careers that are crucial to society will be the same. Healthcare professionals, lawyers, and many other careers depend on effective communication, and therefore collaboration is necessary. Collaboration provides individuals with the opportunity to learn to work with others and is the foundation upon which complex problems are solved.

Moreover, the transition back, to in-person learning also presents a difficult challenge. Many students were home for over a year and therefore are not used to the long hours at school. Online learning posed a difficult challenge, and children did not receive the full benefits that learning and collaboration have to offer. Their progression of development slowed, thus leading to a large gap in maturity.

The situation that children were exposed to was one that could not be imagined. Many children especially ones who were older, listened to the daily news and had knowledge of the pandemic and its early effects on society. Children of

this age group were put under high stress that may have even turned into toxic stress [19]. Older children may have had more responsibilities in the household, while still being expected to focus on schoolwork. Under the support of parents, children felt a continuous feeling of security, this, therefore, helped the body to return to a state of homeostasis. However, children who were not supported were not able to return to a state of homeostasis. Children who have this toxic stress, because of the lack of support, are impacted in the cardiovascular and neurological systems. This type of stress may lead to irreversible effects, as the child grows and develops into an adult. At the adult age, the consequences of toxic stress may still be apparent.

The isolation had many other substantial impacts on children as well [20]. Children were not able to see their friends in person, and thus many had trouble controlling and expressing their emotions. As being in an evolving and developmental state requires an environment in which interactions with other individuals and children occur. Teenagers need to have a person to talk with, so they can express how they feel. Without this type of support, many children fell into depression. A study has shown that depression rates in children have almost doubled, from the start of the pandemic [21]. Maturation in children can cause some stress because their body is changing, unbalanced levels of hormones are being produced, and new emotions are arising. The addition of depression definitively added to the stress that children had to bear. A solution to depression is seeking help and discussing it with friends and family. This was difficult, especially because of the results that the pandemic had, and the new way of living that was suggested. In this situation, the depression was most likely caused by the impairment from the stimulating environment. However, it could be solved with the unification of teenagers in this environment.

As children start to attend school, in person, there will be a drastic change for them. The emotional and cognitive development that they were not able to experience may result in usual behavior. It is crucial and pertinent for others to understand the way in which this pandemic has impacted children. They were not able to develop and mature, nevertheless, precious time passed by.

5. Conclusion

The Coronavirus has been a mysterious virus that has traveled and spread rapidly. Within a couple of months of the original case, a global pandemic was declared. Many have not lived through such a pandemic in their lives, and deciphering the correct course of action was one of the difficult challenges that many faced. Therefore, we learned to listen to the healthcare professionals who aimed to keep everyone safe. Many guidelines were instituted so that individuals would not contract the virus. Nevertheless, the virus managed to spread throughout communities, infecting many. We can definitively say that these past three years have been and the next couple of years will be a unique experience. Society has changed, rapidly in the last couple of years, however, there is one thing that

all have learned. It will be in a different format for all; however, each person has learned to overcome challenges. It might be in the form of problem-solving in difficult times with difficult measures or managing emotions. Nevertheless, all have learned to overcome challenges due to the pandemic and its lasting effects.

Author's Contribution

Oliver Miazga conducted research and wrote this article in its entirety.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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