

The Impact of post COVID-19 syndrome in adolescents: A pilot study.

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Abstract

Background: Post COVID-19 syndrome has emerged as a long-term complication in adults and children, its effect on adolescents' performance in school is not well studied. **Methods:** This is a survey of children in grades 10-12 looking into the physical/psychological impact of prolonged post COVID-19 symptoms on school performance. **Results:** 32/54 students with a mean age of 16 years old had COVID-19. Two were hospitalized, 10 had symptoms lasting more than 4 weeks. Commonly reported chronic symptoms were fatigue and cough. Seven students quit sports, 8 had decrease in their academic performance. Adolescents with a family history of long haulers and those being infected more than once were more likely to develop prolonged symptoms, quit sports and perform poorly in school. 3/14 (21%) reported not seeking help. **Conclusion:** Post COVID-19 syndrome is associated with decline in physical and mental performance in school yet only 79% of adolescents will talk about it.

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Introduction

Coronavirus disease 2019 (COVID-19), has been associated with significant worldwide morbidity and mortality (1). The understanding of the long-term effects of COVID-19 (post-acute COVID-19 syndrome) is still evolving. The residual effects of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection includes fatigue, dyspnea, chest pain, cognitive disturbances, and arthralgia (2). A study of 183 adults in the United States (3) showed that fatigue, dyspnea and psychological distress, were present in approximately 30%, 35 days post discharge. The severity of the acute illness was shown to be associated with persistence of symptoms (2). The definition of the post-acute COVID-19 has been suggested to include persistence of symptoms beyond 3 or 4 weeks from the initial infection (4). Until recently published data on the prolonged effect of COVID-19 in children has been limited to multisystem inflammatory syndrome (5). Persistence of post infectious symptoms beyond 4 weeks in children has been reported (6), however the impact on school performance was not. Our pilot study's main objective was to look at the physical/psychological impact of post-acute COVID-19 on children's school performance. Secondary objectives included looking for correlation between prolonged symptoms and age, race, blood type, SARS-Cov 2 variant, severity of initial infection, first or second infection and presence of a family history of prolonged symptoms.

Methodology and statistical analysis

This was a cross sectional pilot study at one high school. The protocol were approved by our Institutional Review Board (IRB). A web-based (fully anonymized) survey using Google Forms was used. The survey link was shared with the students with the help of their teachers over a period of 2 weeks (5/13/2022-5/30/2022). Participation was voluntary. The fully anonymized data was obtained from Google Forms was analyzed using SPSS software version 27.

Results

We surveyed 54 students, 15 to 18 years-old, 32 females, 45 White, 9 belonging to minority groups. 9 students were not fully vaccinated (no vaccination or only one dose of an mRNA vaccine). 32 (59.3%) reported having had COVID-19 and 7/32 (21.8%) were infected more than once. 21 had COVID-19 between December 2021 and May 2022 during the surge of the Omicron variant (BA1), and 12 between April 2020 and May 2021. Two (6.2%) students were hospitalized. 14 students had COVID-19 despite being fully vaccinated. Most common acute symptoms were fatigue, headaches and fever.

While many reported a short illness, 10 (31.3%) students reported symptoms for more than 4 weeks (2 students from 6 to 9 months). Of the 10 students with prolonged symptoms 60% were fully vaccinated and 60% had COVID-19 during the Omicron surge. The symptoms lasting more than 4 weeks included fatigue or cough in 30%, dyspnea or depression/anxiety in 20%, difficulty concentrating, headaches, loss of smell or

taste and myalgia/arthralgia in 10%. Half of the children with symptoms lasting more than 4 weeks (long haulers) had symptoms persist after the first COVID-19 while the other half had prolonged symptoms after subsequent infections. 6/38 (15.8%) students reported that one of their family member was a long hauler. 7/30 (23.3%) quit sports for the season. 8/30 (26.6%) had decrease in their academic performance with worsening grades following COVID-19. Factors found to be associated with prolonged symptoms included having a family member with prolonged symptoms and having had COVID-19 more than once. Long haulers were found to be more likely to quit sport and have a decline in school grades (Table1). Using a visual scale (from 1 to 10) to describe their health many students who had COVID-19 reported some form of deterioration of their perceived general health status (figure1).

Discussion

Our study is a pilot study based on a survey to reach a large number of students in a short period of time while maintaining anonymity. This study involves a specific age and setting that is understudied. In a previous survey by the world health organization, the study showed a significant impact of the COVID-19 pandemic on school aged children, their mental health and their performance in school in a general sense but not the impact of the infection itself and associated factors (7). In our study, 16 % of students were unvaccinated. While being unvaccinated was not statistically associated with developing prolonged symptoms that lasts more than 4 weeks, there was a trend toward significance (p 0.07). This is likely related to the small sample size of this study. Having COVID-19 more than once was significantly associated with prolonged symptoms. The underlying pathophysiology remains unclear. The association we found between having a long hauler family member and increased risk of developing prolonged symptoms may suggest a common underlying hereditary trait that may be shared among certain family members and triggered by COVID-19. Unlike the study by Raos et al that showed correlation between outcome and admission to the intensive care unit during the acute illness phase and post-acute COVID-19 (6), our study did not. Other studies also showed correlation between outcome and race (8) blood type (9) and infecting variant type (10) while ours did not and this is likely due to the small number of studied subjects.

Despite the fact that the COVID-19 pandemic affected the wellbeing of many children whether infected or not, the effect on those who develop prolonged symptoms seems to be far greater than the other groups. More kids in this group quit sports for the season and had a worse decline in their academic grades compared to their peers, which warrants special attention. Race or sex or smoking/vaping were not shown to have a significant effect in this age group. In this study 3/14 (21%) of participants have not sought medical attention which should not be taken lightly. The most common prolonged symptoms reported were fatigue, cough and central nervous system/mental disorder. Parents, teachers and health care providers should be aware of the significant impact of post-acute COVID-19 on children with prolonged symptoms, warranting an early screening and intervention in a timely manner to maintain their kids' wellbeing.

Conclusion

Having had recurrent COVID-19 infections or a family history of long haulers appears to be associated with post-acute COVID-19 syndrome. Adolescents whose symptoms last more than 4 weeks are most affected with an increased risk of decline in their academic and physical wellbeing.

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Table 1: Factors associated with prolonged symptoms

*NS: Non significant, **No vaccine or only one dose of either Moderna or Pfizer mRNA vaccine.

	Symptoms lasting >4 weeks	Symptoms lasting <4 weeks	P value
Sex (Female)	6/10	25/41	P 0.64(NS)
Race (White)	7/10	31/41	P 0.42 (NS)
Smoking/vaping	1/10	4/41	P 0.45 (NS)
Not fully vaccinated for SARS Cov2 **	4/10	5/41	P 0.078 (NS)
COVID19 more than once	5/10	2/22	P <0.001
Having a Family member who is a long Hauler	3/10	3/28	P 0.007
Quitting sport	5/10	2/23	P 0.001
Grades declined	4/10	4/23	P 0.006
SARS Cov2 Alpha variant	3/10	7/20	P 0.15 (NS)
Blood Type B or AB	3/10	7/38	P 0.63 (NS)

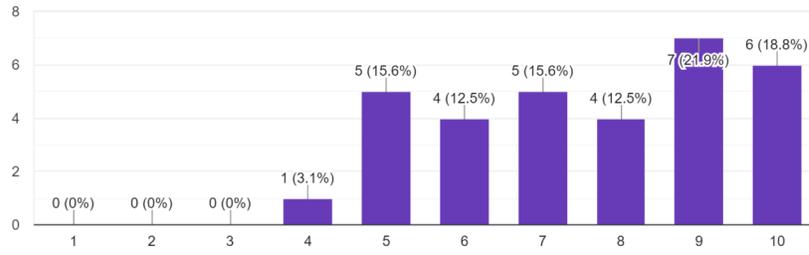
Figure legends

Figure 1

Self health assessment before and after COVID19 using a visual score from 1 to 10 with 10 being in best physical condition and 1 being in worst shape. The bar graph shows a decrease in post COVID19 health scores with an increase by almost 50% in scores 5 and 6 and 50% decrease in score of 10.

Figure 1

How do you describe your current health state AFTER developing COVID-19?
32 responses



How do you describe your health state BEFORE having COVID-19?
34 responses

