

# Identifying Long COVID in Children and Adolescents

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## STORY AT-A-GLANCE

- › A recent study examined long COVID symptoms in children and adolescents, finding unique differences between age groups. In addition, about 6 million children are estimated to have long COVID
- › Common symptoms for both age groups include memory/focus issues, back/neck pain, headaches and lightheadedness
- › The study aims to clear misconceptions about long COVID in children and guide future research. However, diagnosis remains challenging and effective treatments are still being investigated
- › Strategies to manage long COVID symptoms include taking probiotics, optimizing NAD+ levels, boosting mitochondrial melatonin through sunlight exposure and following the I-RECOVER program by FLCCC
- › Reducing EMF exposure and minimizing linoleic acid intake (keeping it below 5 grams per day) will also help address long COVID symptoms by supporting mitochondrial health

According to the latest data from the U.S. Centers for Disease Control and Prevention (CDC), around 6.9% of adult Americans, which is around 17.6 million people, have long COVID.<sup>1</sup> Defined as a chronic condition that "can last weeks, months or even years after COVID-19 illness,"<sup>2</sup> long COVID severely impacts the quality of life for those affected.<sup>3</sup>

But what about the youth? A report<sup>4</sup> noted that around 6 million children are living with long COVID. However, not much is known about how to spot this condition among them,

which makes it difficult for health care providers to help their patients. Fortunately, a pioneering group of researchers aim to fill in the gaps in a newly published study.

## **Examining the Indicators of Long COVID Among the Youth**

"What prolonged symptoms experienced by youth are most associated with SARS-CoV-2 infection?" This was the central question that guided researchers in an August 2024 study published in JAMA.<sup>5</sup> The goal was to contribute knowledge to help pediatricians with children affected with long COVID. As noted by Dr. Rachel Gross, one of the study's co-authors:

*"Most of what we know about Long COVID, we know from studies of adults. This is one of the largest and first studies to try to characterize the prolonged symptoms that are experienced by children and to try to understand how they may differ between different age groups."*

To begin their research, the team sampled 5,367 participants aged 6 to 17 years from March 16, 2022, to December 16, 2023, from a prior cohort study. Next, they categorized the participants, creating two age brackets – 6 to 11 years old, and 12 to 17 years old. To collect data, caregivers of the children answered a comprehensive survey.

Note that the survey didn't ask whether the children received the shots or not.<sup>6</sup> The key focus were symptoms lasting more than four weeks that started or worsened after COVID infection.<sup>7</sup>

## **Symptoms of Long COVID in Children and Adolescents**

According to the researchers, children with long COVID developed symptoms that affected almost every organ system. Moreover, there was a definite difference in long COVID symptoms between children and adolescents, necessitating the creation of two age brackets.

After collating the findings through various analytical models, the researchers noted that 14 symptoms were shared between children and adolescents, and that four (children) and three (adolescent) symptoms were unique to each group.<sup>8</sup> Their findings are summarized in the table below:<sup>9</sup>

Ages 6 to 11 (Children)	Ages 12 to 17 (Adolescents)
Trouble with memory or focus	Change or loss of smell and/or taste
Back or neck pain	Body, muscle and joint pain
Stomach pain	Daytime sleepiness or low energy
Headaches	Fatigue after walking
Phobias	Back or neck pain
Refusal to go to school (which indicates larger issues)	Trouble with memory or focus
Itchy skin or rash	Headaches
Trouble sleeping	Lightheadedness or dizziness
Nausea or vomiting	
Lightheadedness or dizziness	

## Clearing Up Misconceptions About Long COVID Among the Youth

While the collated symptoms paint a picture of long COVID in children and adolescents, the researchers stress that they're not enough to officially diagnose long COVID. However, this is a step in the right direction, as the data can be used to help guide future

researchers and health care providers in estimating kids who probably have long COVID.<sup>10</sup> According to Gross:<sup>11</sup>

*"There have been many misperceptions about COVID and children, even since the beginning of the pandemic. There was a common misperception that children didn't get COVID infections, and we know that's not true. And now there's a common misperception that children don't develop long COVID, and we know from studies like this and others that that is not true, and that long COVID in children is not a rare condition."*

Co-author Tanayott Thaweethai, Ph.D., a biostatistician at Massachusetts General Hospital, chimes in, saying that most research pertaining to long COVID have focused on adults.<sup>12</sup> But now, the featured study aims to clear up misconceptions and help get children the help they need. According to TIME:<sup>13</sup>

*"As of now, even a correct long COVID diagnosis doesn't mean a child will get adequate treatment. Researchers are looking for therapies, but there is not yet any test or treatment specifically approved and shown to be effective against long COVID."*

## **Could the Shots Also Cause Long COVID?**

Many COVID jab recipients also experience long COVID-like symptoms. In an article<sup>14</sup> by Science magazine, reporters noted that "In rare cases, coronavirus vaccines may cause long COVID-like symptoms," which include (but are not limited to) brain fog, memory problems, headaches, blurred vision and nerve pain, as well as fluctuating blood pressure and heart rate. Muscle weakness was also reported, which is described as "debilitating internal electric shocks."

If that's the case, could the shots give children long COVID, too? Since the JAMA study didn't specify the vaccination status of the participants, it's logical to believe that at least some of the children did get the shots.

In a study<sup>15</sup> published in the Annals of Medicine, 50.1% of children below 18 years old have already received a dose by November 2022. From that population, 43.9% aged 5 to 11 years and 63.3% aged 12 to 17 years have already completed an entire schedule of shots. To add, from the two subsets with a completed schedule, 39.1% and 55.3% have received a booster, respectively.

Now, what kind of treatments are available for long COVID in children? While the JAMA study doesn't mention any treatment, I believe that improving mitochondrial function will help children and adolescents boost their odds of reversing the damage caused by contracting the virus or getting the jab.

## **Probiotics Help with Long COVID, Research Shows**

Increasing probiotic intake among children and adolescents will help address symptoms of long COVID. As noted in a Swedish study<sup>16</sup> published in Medicines, researchers found that symptoms alleviated after 14 days of boosting the intake of probiotics. Specifically, researchers wanted to evaluate how effective probiotics might be in alleviating two of the symptoms of long COVID – muscle soreness and brain fog.

Researchers selected 200 participants who had post-COVID fatigue. The test group, comprising 100 participants, took ProbioSEB CDC3 (5 billion CFU per capsule) and ImmunoSEB (500 milligrams per capsule) for 14 days. Meanwhile, the control group received a placebo. Throughout the test, all participants were tested at different time points from day one to day 14. Data was gathered via an 11-item self-report assessment given to the participants.

Results showed that 91% of the participants in the test group resolved their muscle fatigue by the 14th day. The remaining 9% weren't considered fatigue-free, but they still had better scores compared to when the study began. Interestingly, benefits were experienced as early as the fourth day of the study. Mental fatigue was also reduced.<sup>17</sup>

How do probiotics help manage symptoms? According to ABC15 Health Insider Dr. Shad Marvasti, the benefits of probiotics are related to its ability to boost the immune

system:<sup>18</sup>

*"There's a number of studies that have shown that kids who take probiotics, especially multiple strains, during cold and flu season actually have lower incidents of colds and flus and decreased numbers of school absentee days."*

If you decide to take a probiotic supplement, Marvasti recommends a product with at least 10 strains for maximum effectiveness.<sup>19</sup> In addition, I recommend nourishing your gut microbiome with probiotic-rich foods, such as:

Raw, grass fed  
yogurt

Sauerkraut and  
other fermented  
vegetables

Kimchi

Pickles

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Natto

Kefir

Miso soup

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## Boost Your NAD+ Levels for Optimal Mitochondrial Function

I believe that boosting your NAD+ (nicotinamide adenine dinucleotide) is another crucial aspect in managing long COVID, as well as shot-related injuries. NAD+ is a signaling molecule that plays an important role in mitochondrial function, longevity and gene expression. Moreover, altered NAD+ levels have been linked to metabolic disorders and even neurodegenerative conditions.<sup>20</sup>

To learn more about the role of NAD+ in health, see my article "[Even More Health Benefits of Niacinamide](#)." There, I explain several ways NAD+ impacts your overall health. Regarding strategies to boost your NAD+ levels, consider the following:

- **Time-restricted eating (TRE)** – Research<sup>21</sup> shows that fasting boosts NAD+ levels, which help against COVID-19. To do this, compress all your meals (also known as eating window) between six and eight hours, then fast for the remaining hours.

Once you regain your metabolic flexibility and are no longer insulin-resistant, which takes a few weeks to a few months, you will need to increase your eating window

again. The reason for this is because extended fasting will raise your cortisol levels, contributing to inflammation and cellular damage.

Make sure that most of your energy source comes from glucose as well, which is your body's preferred fuel. Depriving your body of glucose will elevate cortisol levels, which your liver will use to create the glucose your body needs to function.

- **Low-dose niacinamide (not niacin) to boost NAD+** — Boosting NAD+ upregulates PARP (Poly ADP-ribose polymerase) activity. According to a study<sup>22</sup> published in the Journal of Biological Chemistry, PARP contains antiviral properties, but the activity is limited by the availability of NAD+. Therefore, boosting NAD+ helps boost your innate immunity to coronaviruses.

## Melatonin Plays a Role in Mitochondrial Function

Melatonin is commonly thought to be something that's only produced in the pineal gland in response to darkness. Moreover, this method only accounts for 5% of the melatonin produced. In reality, 95% of your melatonin is produced in your mitochondria. This revelation came from [my interview with Russel Reiter, Ph.D.](#), a world-class expert on melatonin.

In Reiter's research, he noted that melatonin is produced in your mitochondria in response to near-infrared light, which comes from the sun and near-infrared bulbs in saunas. Now, how does melatonin relate to optimal mitochondrial function?

Aside from having antioxidant effects that target the mitochondria,<sup>23</sup> melatonin stimulates glutathione synthesis<sup>24</sup> and other important antioxidants like superoxide dismutase and catalase.<sup>25</sup>

Since melatonin combats oxidative damage, it makes sense that 95% of it is made in your mitochondria — that's precisely where most of the oxidative damage occurs, which is in the mitochondrial electron transport chain. The key to this benefit is exposure to near-infrared light.

To harness the benefits of near-infrared light, you need to expose your skin to sunlight. However, there are caveats to this approach, especially if you've been eating a diet high in LA. When sunlight hits your skin, the LA embedded in it breaks down, leading to inflammation. If you've just started detoxing LA from your body, limit your sun exposure to early morning or late in the evening for six months.

Once you're confident enough that LA has been purged from your system, it's time to change your schedule. The best time to take a walk is around 12 noon or 1 p.m. if it's Daylight Saving Time. This is when the beneficial ultraviolet and near-infrared light are at their peak, which is what your body needs to produce vitamin D and mitochondrial melatonin.

## **Additional Strategies to Help Address Long COVID**

If you know a loved one whose child is suffering from long COVID or adverse effects from the shot, there are other helpful resources. I recommend the I-RECOVER program by the Front Line COVID-19 Critical Care Alliance (FLCCC). It extensively covers two important topics – treating long COVID<sup>26</sup> and post-vaccine treatment.<sup>27</sup> Since both versions are constantly updated as more research comes to light, be sure to check back regularly.

Consider reducing electromagnetic field (EMF) exposure in your home, too. Research has shown that manmade sources of EMFs, such as Wi-Fi and 5G, "can disturb the homeostasis of free radicals leading to dysfunctions such as the 'cellular stress response.'" Your fat intake also matters, as your mitochondria contain cardiolipin, which play a role in mitophagy and overall mitochondrial quality control.<sup>28</sup>

The dietary fat that promotes healthy cardiolipin is omega-3. Omega-6, on the other hand, is highly susceptible to oxidation, which promotes proinflammatory effects.<sup>29</sup> Therefore, minimizing your linoleic acid (LA) intake is crucial. Keep it below 5 grams per day, but if you can keep it below 2 grams, that would be better. To monitor your intake, enter your daily meals into an online nutrient calculator like Cronometer.



The most common sources of LA include seed oils used in restaurants, processed foods and fast foods. Condiments, salad dressings and most olive and avocado oils (as they're mostly adulterated) are also loaded with seed oils. Animals raised on grains such as conventionally raised chicken and pork are high in LA as well.

## Sources and References

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- <sup>2</sup> [CDC, "Long COVID Basics"](#)
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- <sup>5</sup> [JAMA. 2024 Aug 21:e2412747, Key Points](#)
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- <sup>7</sup> [JAMA. 2024 Aug 21:e2412747, Methods](#)
- <sup>8</sup> [News-Medical.net, August 26, 2024](#)
- <sup>9, 10, 13</sup> [TIME, August 21, 2024](#)
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- <sup>15</sup> [Ann Med. 2023; 55\(1\): 2232818, Abstract](#)
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