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Post-COVID Syndrome in Pediatric Patients: Clinical Manifestations, Diagnosis, and Management Strategies

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Abstract

This article presents analysis of the clinical manifestations, diagnostic approaches, and management strategies for pediatric post-COVID syndrome based on current international cohort studies and the experience of specialized long COVID clinics. The research adopts an interdisciplinary perspective that integrates insights from pediatrics, neuropsychology, epidemiology, and educational medicine. Particular attention is given to the structuring of symptoms by age group, analysis of validated diagnostic tools (PedsQL, RCADS, SDSC, Chalder Fatigue Scale), and the comparison between post-COVID syndrome (PCS) and myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). Based on the Delphi definition of long COVID, a stratification of complaints and description of clinical-behavioral phenotypes is proposed. The article includes three tables summarizing symptom frequency, diagnostic instruments, and distinctions between PCS and other post-viral conditions. Diagnostic challenges are highlighted, including the lack of visible correlates, low specificity of laboratory findings, and insufficient awareness among primary care providers. Modern management tactics used in the UK and Italy are discussed: multidisciplinary teams, psychoeducation, school support, telemedicine, and online programs for adolescents. Limitations of the current system are also examined, particularly long waiting times and the lack of unified clinical pathways. This article will be of interest to pediatricians, neurologists, general practitioners, school health specialists, educational managers, and researchers involved in developing clinical and behavioral protocols for pediatric post-COVID rehabilitation.

Keywords: *Post-COVID Syndrome, Long COVID, Children, Pediatrics, Diagnosis, Rehabilitation.*

INTRODUCTION

Post-COVID syndrome (PCS) in children represents one of the most debated yet under-researched issues in modern pediatrics. Unlike the adult population—where the clinical sequelae of SARS-CoV-2 infection have already been extensively documented in the international literature—the pediatric aspects of long COVID remain insufficiently defined, complicating timely diagnosis and selection of effective management strategies. Reported prevalence rates of PCS in children vary widely—from 1.6% to 70% across different countries and assessment methodologies—reflecting both the heterogeneity of clinical presentations and the absence of a universally accepted diagnostic approach [1], [2].

The clinical picture of long COVID in childhood is characterized by a combination of asthenic-neurotic, somatoform, and cognitive disturbances, often without clear laboratory or imaging correlates. Families and clinicians may therefore struggle to interpret these symptoms, which can be mistakenly regarded as functional or transient, delaying the initiation of appropriate therapy and social reintegration. In this context, the role of primary health-care providers and specialized long COVID clinics becomes especially important: these settings perform systematic analyses of patient complaints, employ quality-of-life scales, and develop individualized management plans [10].

The challenge of pediatric PCS extends beyond medical diagnostics to encompass educational and psychosocial dimensions: missed school days, declining academic performance, heightened anxiety, social isolation from peers, and the risk of stigmatization. Experience from pediatric centers in the UK, USA, and Italy demonstrates that effective support is possible only through a multidisciplinary approach involving pediatricians, psychologists, school professionals, and social services [4].

Current guidelines rely on the so-called Delphi definition of pediatric PCS proposed by Stephenson et al. [8]. This definition has served as a foundation for epidemiological studies and for structuring clinical care—informing symptom

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stratification, recommended follow-up duration, and criteria for recovery. Nonetheless, despite these reference points, much of the existing guidance remains empirical, underscoring the need for further analysis of available data and the development of practical algorithms for managing children with long COVID.

The aim of this study is to synthesize existing clinical information on post-COVID syndrome in children, describe its most common manifestations, diagnostic approaches, and management strategies—drawing on key domestic and international sources, including data from specialized long COVID clinics and thematic cohort studies.

MATERIALS AND METHODS

This study employs a narrative-analytic approach to synthesize data on the clinical manifestations, diagnosis, and management strategies of pediatric post-COVID syndrome (PCS). English-language publications were included, encompassing cohort studies, thematic interviews, and clinical case series from specialized pediatric long COVID clinics. We analyzed data from patients aged 3–17 years whose symptoms persisted for more than 12 weeks after confirmed SARS-CoV-2 infection, with no alternative explanation for their complaints. Inclusion criteria followed the consensus Delphi definition of long COVID in children [8], which emphasizes the impact of symptoms on daily activities and quality of life.

To enhance the precision of our synthesis, we stratified patients into three age brackets: 3–7 years, 8–12 years, and 13–17 years. We also recorded coexisting conditions—such as marked asthenia, anxiety disorders, and cognitive impairments—to identify distinct clinical phenotypes within PCS. Employed methods included thematic analysis of interviews with children and adolescents under care at long COVID clinics [10], structured evaluation using the Pediatric Quality of Life Inventory (PedsQL), assessment of neurological symptoms, emotional lability, and school maladaptation [7]. Validated instruments—such as the Chalder Fatigue Questionnaire and its pediatric adaptations—were used throughout.

To ensure comparability, we applied symptom-stratification frameworks adopted in national clinical guidelines from the United Kingdom, Italy, and the United States [1], [2], [5]. These approaches allowed us to differentiate predominant syndromes across age groups and to track patterns of health service utilization over time.

In summary, this methodology enables a comprehensive overview of the key clinical features of PCS in children—taking into account age and associated clinical-behavioral patterns. It lays the groundwork for designing targeted diagnostic and management programs that prioritize early stratification and an interdisciplinary approach.

RESULTS AND DISCUSSION

Clinical manifestations of pediatric post-COVID syndrome (PCS) encompass a broad spectrum of symptoms affecting physical, cognitive, and emotional-behavioral domains. Our analysis identified the most frequently observed symptoms, whose prevalence varies by age, sex, and time since the acute infection.

Fatigue is the single most common symptom, reported by 10–40% of children and adolescents studied [2]. This aligns with observations from outpatient clinics in the United Kingdom and South Korea, where persistent tiredness remains the primary factor disrupting daily activities. Emotional and affective disturbances—including anxiety, irritability, and reduced motivation—rank second, affecting 15–35% of patients [2].

Sleep disturbances occur in 8–30% of cases, presenting as difficulty falling asleep, superficial sleep, and nighttime awakenings. These issues exacerbate daytime fatigue and impair academic performance [2]. Headaches (5–20%) and cognitive impairments (5–15%)—such as poor concentration and "brain fog"—are also widespread among children who had COVID-19; according to Rao et al. [7] and Dun-Dery et al. [9], these complaints do not always correlate with objectively measurable neurological deficits. Additional symptoms—such as respiratory issues (cough, shortness of breath), myalgia, loss of appetite, and post-exertional malaise—are reported in 5–25% of cohorts, depending on the study population.

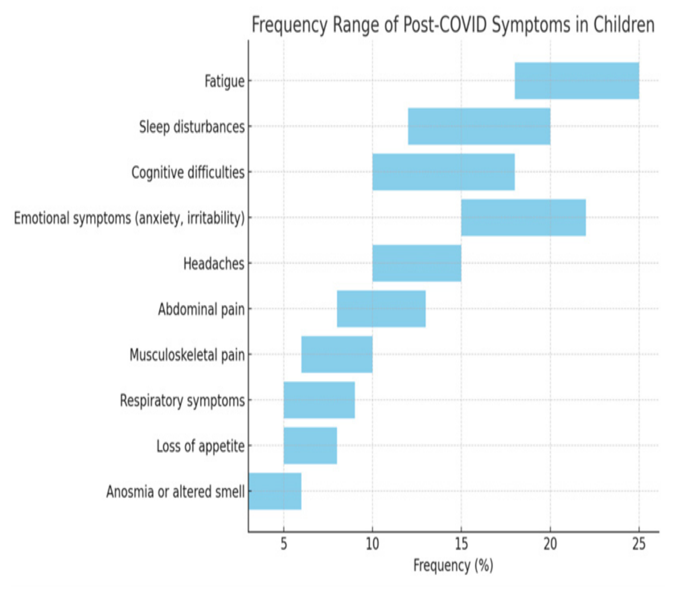

Figure 1. Frequency and Structure of Post-COVID Syndrome Symptoms in Children (Compiled by the author based on sources: [2], [10], [6], [9])

Analysis indicates that symptom intensity is generally higher in adolescents compared with younger children. Girls report cognitive and emotional disturbances more frequently, whereas boys tend to present with more somatoform complaints.

Diagnosing PCS in children requires integrating clinical scales, structured interviews, and pediatric-adapted criteria. The Delphi definition of long COVID—proposed by Stephenson et al. [8]—has played a pivotal role in unifying diagnostic approaches. It emphasizes symptom duration beyond 12 weeks, impact on daily function, and exclusion of alternative diagnoses. This definition was adapted for pediatric cohorts and underpins numerous investigations, including thematic interviews [10].

In clinical practice, validated scales and questionnaires are actively used to assess post-COVID symptomatology in children. Figure 2 lists the primary instruments, specifying the target age range, key assessment parameters, and validation sources.

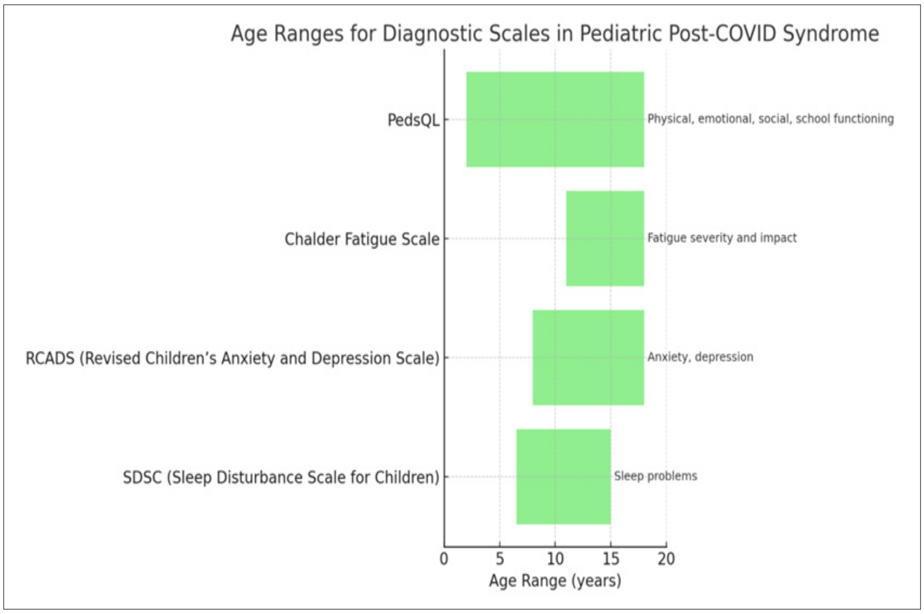

Figure 2. Diagnostic Scales and Questionnaires Used in Pediatric Post-COVID Syndrome (Compiled by the author based on sources: [5], [7], [8], [10])

Following confirmation of PCS, differential diagnosis must consider syndromes such as myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) and functional somatoform disorders [9]. Although these conditions share symptoms—fatigue, cognitive impairment, and emotional lability—PCS is distinguished by greater variability in its course, a specific temporal link to prior COVID-19 infection, and a broader spectrum of neurological and autonomic manifestations [3]. Table 1 presents a side-by-side comparison of diagnostic parameters for pediatric PCS and ME/CFS.

Table 1. Comparative Characteristics of Pediatric Post-COVID Syndrome and Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) (Compiled by the author based on sources: [4], [5], [7], [9])

Parameter	**Pediatric Post-COVID Syndrome**	**ME/CFS in Children**
Onset	Post-infectious, after confirmed SARS-CoV-2	Often post-viral, not necessarily COVID-19
Dominant symptoms	Fatigue, brain fog, emotional lability	Fatigue, post-exertional malaise, pain
Cognitive dysfunction	Often reported (brain fog, memory issues)	Common, includes attention and memory issues
Emotional/psychiatric symptoms	Anxiety, depression, mood swings	Anxiety, irritability, depressive symptoms
Sleep disturbances	Common, often insomnia or unrestful sleep	Very common
Fatigue assessment tools	PedsQL, Chalder, RCADS	Chalder Fatigue Scale, school attendance data
School functioning impact	High; often supported via adjustments	High; associated with long-term absenteeism
Diagnostic clarity	In progress; evolving criteria (Delphi model)	Recognized clinical criteria (Fukuda, NICE)

Traditional laboratory and imaging methods (serology, standard radiology) have limited utility in evaluating PCS among children [5]. Several studies highlight the low diagnostic yield of these tests and call for greater emphasis on clinical assessment scales and behavioral questionnaires [7].

Managing children with PCS remains one of the most challenging aspects of both ambulatory and specialized pediatric care. An analysis of long COVID clinics in the United Kingdom (2021–2023) identified key principles that confer relative effectiveness to outpatient support programs for children with prolonged post-SARS-CoV-2 symptoms [4].

At the heart of rehabilitation approaches is a multidisciplinary model involving a pediatrician, physiotherapist, cognitive-behavioral therapy specialist, neurologist, and, when needed, a school coordinator. This model addresses both somatic issues (fatigue, pain, sleep disturbances) and emotional/cognitive components. Psychoeducation—informing families and children about the nature of PCS, recovery expectations, and the need for gradual return to activity—plays a crucial role in reducing anxiety and preventing the "vicious cycle" of maladaptation [10].

Equally important is support from the school and family. Clinics actively liaise with educational institutions to arrange "reasonable adjustments": flexible class schedules, partial attendance, exam accommodations, and an individualized approach. Qualitative interviews with adolescents treated at such centers demonstrate that feeling understood by teachers and relatives significantly boosts motivation and accelerates recovery [5].

However, infrastructural constraints severely limit program accessibility. Study participants highlighted lengthy wait times for the first consultation (up to 12 months in some cases), a lack of clear clinical pathways, and regional disparities in available services. Despite the similarity of clinical presentations across patients, there are no unified national protocols for diagnosing and managing pediatric PCS, hindering the scaling of effective models [6].

One promising avenue is group online programs that teach self-regulation, basic physical activity, sleep normalization, and peer sharing among adolescents. These formats, grounded in cognitive-behavioral and resource-oriented principles, show preliminary efficacy with minimal resource investment. Telemedicine consultations—used as a primary or hybrid format—reduce fatigue and transportation burdens, especially in regions where specialized care is scarce [10].

Overall, our analysis underscores the need to implement an early-intervention model that combines accessible diagnostics, multidisciplinary support, and coordination between medical and educational systems. Absent this integration, children and adolescents face a high risk of chronic symptoms, loss of academic motivation, and social isolation.

CONCLUSION

This study has systematically summarized the key clinical features, diagnostic approaches, and management strategies for pediatric post–COVID syndrome (PCS), drawing on data from international cohort studies and specialized long COVID pediatric clinics. Despite symptom variability and the lack of universally accepted protocols, global practice is gradually coalescing around a set of methods that enhance early detection and individualized care.

Comparative analysis revealed that asthenic, cognitive, and emotional symptoms remain the most common manifestations of PCS in children—factors that adversely affect quality of life and academic performance. Unlike in adults, pediatric cases tend to present milder but more persistent disturbances, often without clear objective markers, necessitating a synthesis of psychosocial and clinical assessment. Stratifying symptoms by age group and behavioral profile has proven essential to avoid both overdiagnosis and underrecognition.

Diagnostic approaches—anchored by the Delphi definition and employing instruments such as PedsQL, Chalder, RCADS, and SDSC—provide sufficient sensitivity and specificity to track PCS trajectories and their impact on a child's functioning. These tools are widely used in the United Kingdom, United States, and Italy, and could be adapted for national programs once appropriately validated for language and culture. Nevertheless, the absence of unified algorithms to differentiate PCS from ME/CFS and somatoform disorders remains a significant obstacle to standardizing care.

Management strategies underline the efficacy of a multidisciplinary model that combines psychoeducation, school-and-family support, and telemedicine. The most successful programs integrate cognitive-behavioral therapy, physical rehabilitation, and social support. At the same time, critical limitations in existing infrastructure—such as long wait times, uneven access, and disjointed care pathways—have been identified.

In conclusion, pediatric PCS is a complex condition that demands an interdisciplinary response and the adaptation of international best practices to local realities. Future research should focus on developing national registries, empirically validating assessment scales, and creating flexible rehabilitation models that blend medical, psychological, and educational support. Only such an integrative approach will minimize the long-term consequences of PCS and ensure a full recovery for affected children.

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