

# COVID-19: Impact of the Pandemic on Children's Lives

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Port J Pediatr 2023;54(1):9-14

DOI: <https://doi.org/10.25754/pjp.2023.25352>

## Abstract

**Introduction:** The COVID-19 pandemic has had a considerable impact on the biopsychosocial elements of human beings, especially children and teenagers, as vulnerable groups. Social isolation can lead to psychiatric illness, obesity, and sleep disorders in adults. This study aimed to determine the impact of lockdown on children's sleep, diet, physical activity, and behavior.

**Methods:** This was a retrospective observational study conducted from May 1, 2020, to March 31, 2021. Data were collected from four healthcare centers in Cascais (Lisbon, Portugal) by administering a questionnaire in person and online. Descriptive statistical analysis was conducted using Microsoft Excel<sup>®</sup> and the SPSS<sup>®</sup> software (version 23).

**Results:** In total, 790 responses were collected (median age 9 years old) without gender predominance. Family routine and behavioral changes were found in 84% and 63% of children, respectively. In addition, dietary changes were observed in 43% of them, with 62% reporting an increase in quantities and 23% reporting weight gain (more than 5 kg in 18%). Regarding physical activity, 44% exercised more than three times a week before the lockdown. Following COVID-19, 18% maintained this routine, and 48% quit sporting activities. Finally, sleep changes occurred in 42%, including nightmares and difficulty falling asleep.

**Discussion:** Childhood and adolescence are periods of considerable social and psychomotor development, and any routine disruption can cause profound changes in personal and interpersonal experience during this period. The findings of this study revealed that lockdown caused changes in children's behavior, diet, physical exercise, and sleep. It is essential to outline strategies to support children and teenagers with a multidisciplinary approach to reduce the effects of social isolation on their development.

**Keywords:** Adolescent; Child; Child, Preschool; COVID-19; Health Impact Assessment; Pandemics; Quarantine/psychology; Social Isolation/psychology; Surveys and Questionnaires

## Keypoints

### What is known:

- The COVID-19 pandemic has influenced the biopsychosocial essence of individuals and increased the incidence of mental illness and obesity.
- The closure of schools and parks, caregivers' anxiety, and a lengthier stay at home had implications for children's and adolescents' biopsychosocial essence.
- Childhood and adolescence carry enormous physical, social, and psychomotor development; therefore, any routine disruption can cause profound effects in the future.

### What is added:

- A significant percentage of children experienced changes in their dietary patterns (43%), mostly related to higher amounts ingested (62%).
- In total, 48% stopped physical activities and did not resume even after the lockdown, particularly those 6-9 years.
- Sleep disturbance (including falling asleep and nightmares) was found in 42%, statistically significant in the 3-5 years group.

## Introduction

In December 2019, viral pneumonia with unknown etiology was reported in Wuhan, China.<sup>1</sup> The agent was a novel coronavirus, later identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), closely related to coronaviruses responsible for severe

acute respiratory syndrome (SARS) epidemics.<sup>1,2</sup> Since then, it spread to several countries, and on March 11, 2020, it was recognized as a pandemic by the World Health Organization (WHO).<sup>1</sup>

The first case in Portuguese territory was diagnosed on March 2, 2020.<sup>1</sup> Therefore, several measures were taken to control the expansion of SARS-CoV-2 infection,

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Received: 30/08/2021 | Accepted: 30/07/2022 | Published online: 15/12/2022 | Published: 01/01/2023

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and on March 19, a state of emergency was decreed, defining the obligation to stay at home / lockdown in all Portuguese territory. Given the epidemiological evolution, lockdown restrictions gradually began to ease off, and on May 2, a transition occurred from a state of emergency to a state of calamity. However, schools remained closed for most children and adolescents (between 3 and 16 years) until the end of the school year. Until the end of May 1799 children and teenagers (0-19 years) were diagnosed with coronavirus disease 2019 (COVID-19).<sup>3</sup> Despite the prevalence of COVID-19 in children, most studies investigated this pandemic in adults since based on current knowledge, the virus causes milder symptoms and lower fatality rates in the pediatric population.<sup>4</sup>

The impact of pandemic situations on the biopsychosocial essence of individuals is historically known, and COVID-19 is no exception. This study aimed to objectively assess the effect of the pandemic on the pediatric population in Portugal concerning four areas reflecting children's habits: behavior, sleep, diet, and physical exercise.

## Methods

A retrospective observational study was conducted on all children (3-17 years and 364 days old) who had regular appointments in the intervening institutions: USF São Martinho de Alcabideche, UCSP Cascais, USF Cidadela, and USF KosmUS, in Cascais (Lisbon, Portugal). The study lasted 11 months, from May 1, 2020, to March 31, 2021. Data were collected by administering an original questionnaire after filling out a declaration of informed consent. The questionnaire consisted of 15 short-answer questions divided into four categories: behavior, sleep, diet, weight, and physical exercise. It was delivered to parents and caregivers during medical appointments or sent via email in Google Forms® format, which were filled in anonymously. There are few questionnaires evaluating the impact of the pandemic on mental health, and all are validated only on adults. It was impossible to find validated questionnaires assessing the influence of the pandemic in any of the targeted areas / categories on the pediatric population. Therefore, validated available questionnaires were adapted for this study: the children's sleep habits questionnaire (CSHQ)<sup>5</sup> was adapted to assess sleep habits, and the physical activity questionnaire for children (PAQ-C), in addition to the physical activity questionnaire for adolescents (PAQ-A),<sup>6</sup> to quantify physical activity. The resulting questionnaire had a final part in which parents and caregivers could report particular observations in free text.

The evaluated variables included gender, age, changes in the family routine, behavioral changes (such as tantrums), periodicity of physical activity and sleep hours (before, during, and after the lockdown, March to May 2020), changes in sleeping and eating patterns, as well as weight gain during the lockdown (March to May 2020). The results were compared across different age groups (3-5, 6-9, 10-13, and 14-18 years) chosen to have a sample of preschool-age (3-5), school-age (6-9), and later in adolescence (10-13 and 14-18). Statistical analysis was performed using Microsoft Excel® and the SPSS® software (version 23, SPSS Inc, Chicago, IL, USA) through the chi-squared test and a significance level of  $p$ -value < 0.05.

## Results

Questionnaire responses were collected from 790 children (595 were delivered online while 195 were presented during the medical appointments); however, only 762 met the inclusion criteria. This study did not analyze whether there were differences between responses to online questionnaires and those delivered during medical appointments. The median age was 9 years (interquartile range 6 years) without gender predominance. Broken down by age groups, 196 children (26%) were 3-5, 225 (30%) were 6-9, 204 (27%) were 10-13, and 109 (14%) were 14-17 years and 364 days old. In 28 (3%) questionnaires, the age variable was not filled; therefore, they were excluded from analyzing the differences between age groups.

In most cases, there were identified changes in daily family routine (84% of 759 responses to this question) and children's behavior (63% of 761 responses to this question), 48% of whom reported more tantrums.

Changes in dietary patterns were reported by 43% of parents (762 responses), which included an increase in quantities (62%) and being more selective with food (24%) or eating less (15%). Almost 180 children gained weight (23% of 762), 46% of whom gained less than 2 kg, but 18% gained at least 5 kg.

Regarding physical activity, there were 756 responses. Before the lockdown, 44% of children performed some physical activity at least three times a week, but only 18% and 22% maintained this routine during and after the lockdown, respectively. Half (48%) reported having stopped physical activity because of the pandemic and not continuing even after the lockdown. These differences between the physical activity performed before, during, and after the lockdown were statistically significant in the 6-9 age group, compared to the

other age ranges ( $p = 0.01$ ). In this age range, before the lockdown, 20 children performed some physical activity once a week, 87 twice a week, and 116 at least three times a week. During the lockdown, 100 children performed some physical activity once a week, 77 twice a week, and 46 at least three times a week. After the lockdown, 89 children performed physical activity once a week, 70 twice a week, and 62 at least three times a week (Table 1).

Sleep disturbance was found in 316 children (42%, 757 responses), which was more evident in the 3-5 years group and significantly different when compared to other age ranges ( $p = 0.03$ ). Of these 316, 242 specified the type of sleep disorders they had: 32% showed the need to sleep in their parents' or sibling's bed (mainly in the 3-5 age group,  $n = 35$ ), 29% reported difficulty falling asleep (mainly in the 6-9 age group,  $n = 26$ ), 15% suffered from nightmares (mainly in the 6-9 group,  $n = 16$ ), and two children started episodes of sleepwalking (Table 1).

The questionnaire had a final part in which parents and caregivers could write special observations in free text. It is worth highlighting some results that emerged from the analysis of these observations. Some children developed language disorders during the lockdown, namely stuttering ( $n = 3$ ). There were also references to nocturnal enuresis and greater difficulty in sphincter

continence ( $n = 6$ ). Regarding behavior, there were several cases of anxiety and fear in children ( $n = 40$ ), including the fear of death and being alone. Four children and teenagers even needed treatment in pediatric psychiatry, with one teenager presenting suicidal intentions and starting pharmacological therapy. These situations had an immediate referral to hospital care.

## Discussion

The impact of the COVID-19 pandemic on the biopsychosocial essence of individuals is already known, with the increasing incidence of new diagnoses or decompensation of previous mental illness,<sup>7,8</sup> obesity, and other risk factors.<sup>9</sup> Childhood and adolescence are periods of remarkable physical, social, and psychomotor development; therefore, any routine disruption can cause profound effects on children's and future adults' health.<sup>2,10-14</sup> The closure of schools, parks, and usual places where children spent their time, as well as the higher anxiety of their caregivers and a lengthier stay at home, had short- and long-term implications for the biopsychosocial essence of children and adolescents.<sup>2,10-13</sup> As expected, the findings revealed changes in family routine in most children (84%). Since

**Table 1. Differences between age groups in physical activity and sleep disturbance**

AGE (YEARS)	3-5	6-9	10-13	14-17	TOTAL
<b>N (%)</b>	196 (26%)	225 (30%)	204 (27%)	109 (14%)	734 (100%)
<b>Physical activity</b>					
<b>Before lockdown</b>					
Once a week	71 (36%*)	20 (9%*)	22 (11%*)	10 (9%*)	123 (17%)
Two times/week	57 (30%*)	87 (39%*)	82 (40%*)	53 (49%*)	279 (38%)
Three or more TIMES/week	65 (34%*)	116 (52%*)	100 (49%*)	46 (42%*)	327 (45%)
<b>During lockdown</b>					
Once a week	102 (52%*)	100 (45%*)	95 (48%*)	57 (55%*)	354 (49%)
Two times/week	52 (27%*)	77 (34%*)	73 (36%*)	30 (29%*)	232 (32%)
Three or more TIMES/week	40 (21%*)	46 (21%*)	32 (16%*)	17 (16%*)	135 (19%)
<b>After lockdown</b>					
Once a week	102 (52%*)	89 (40%*)	81 (41%*)	47 (45%*)	319 (44%)
Two times/week	56 (29%*)	70 (32%*)	78 (39%*)	32 (30%*)	236 (33%)
Three or more TIMES/week	37 (19%*)	62 (28%*)	40 (20%*)	26 (25%*)	165 (23%)
<b>Sleep disturbance</b>					
Sleep in parents' or sibling's Bed	35 (18%*)	30 (13%*)	11 (5%*)	2 (2%*)	78 (32%†)
Difficulty falling asleep	17 (9%*)	26 (12%*)	20 (10%*)	6 (6%*)	69 (29%†)
Nightmares	10 (5%*)	16 (7%*)	6 (3%*)	3 (3%*)	35 (15%†)
Others	11 (6%*)	13 (6%*)	21 (10%*)	10 (9%*)	55 (23%†)

\* % within the age range.

† Of the 242 who specified what type of sleep disorders they had.



schools were closed and many parents and caregivers were working from home, their day-to-day dynamics changed, and these new family dynamics were probably responsible for the changes in children's behavior, such as the increase in tantrums occurring in 63%.

Previous studies reported reduced physical activity, increased weight, change in eating and sleeping habits, as well as increased sedentary activities and screen time.<sup>1,12-14</sup> This study also found differences in sleep, diet, and physical activity, with sleep and physical activity being statistically significant.

With more time spent at home, the results showed that a significant percentage of children experienced changes in their dietary patterns (43%), with the majority reporting an increase in the amounts ingested (62%). This was probably due to less outdoor activity and more free time, which could lead to more snacks between meals. However, this study did not evaluate the percentiles before and after the weight gain; therefore, the increase in weight may be due to the normal growth in some cases and not just due to changes in dietary patterns.

In addition to changes in dietary patterns, there were statistically significant changes in children's physical activity habits. There was a reduction in the frequency of physical exercise in the quarantine, which would be expected given the closed schools and sports institutions. Furthermore, only a small percentage of children maintained the frequency of physical exercise before the lockdown, even when it ended. This sedentary behavior and unhealthy habits, with the disruption of daily routine, might exacerbate childhood obesity and, in the long term, can compromise future cardiovascular and musculoskeletal health.<sup>1,12</sup> These differences were statistically significant in the 6-9 years age group ( $p = 0.01$ ), which is worrying as this age is a critical time for acquiring healthy habits.

Mental health also seems to be a chief concern, with early findings from China indicating a serious mental health impact of the COVID-19 pandemic on adults.<sup>7,8,14</sup> In children and adolescents, there is a great concern, demonstrated by the publication of guidelines and suggestions regarding the promotion of mental health in children and adolescents during the pandemic by international organizations, such as WHO. The recommendations include an attempt to maintain routines even in periods of isolation, with schedules for school, play, food, and hygiene care. Additionally, WHO recommends encouraging the socialization of children and adolescents with their friends through digital media.<sup>15</sup> The impact of social isolation on children's mental health can even lead to psychiatric pathology,

as demonstrated by studies conducted during similar periods in the past. It was showed that approximately 30% of children quarantined during the Influenza (a virus subtype H1N1) outbreak in the United States of America met the criteria for diagnosing post-traumatic stress disorder. This study also referred to the lack of psychological support provided to the pediatric population during the quarantine.<sup>16</sup> Other studies found similar results. Other authors showed that, regardless of age, children developed greater irritability, behavioral and sleep disturbances, and separation anxiety during a pandemic.<sup>13</sup>

Although this study did not focus on the mental health of children and adolescents, one of the significant accomplishments was diagnosing cases of children dealing with serious disorders, namely stuttering, nocturnal enuresis, anxiety with fear of death or being alone, and even suicidal ideation. These findings were crucial to spot these situations that otherwise could be overlooked and start proper medical approaches for pharmacological therapy or pediatric psychiatry referral. In addition to the concerns already mentioned, there are also studies warning about the risk of long-term effects. It was reported there might be long-term effects due to a pandemic, such as increased use of illicit substances and chronic diseases, namely asthma, obesity, Hyperactivity disorder, and attention deficit disorder.<sup>12</sup>

This study, in addition to having identified some pathological situations, as mentioned above, draws attention to the importance of this theme among parents, family members, children, and various health professionals who collaborated in the study. However, there were some limitations. This study did not evaluate the percentiles before and after weight gain, so this increase may be due to the normal growth of children and adolescents. Moreover, socio-economic variables were not evaluated, which can also influence the obtained results.

The impact of the COVID-19 pandemic on children's health includes psychological, social, and physical consequences. History has shown that these effects should not be devalued or overlooked and thus, it is essential to pay attention to this issue during routine consultations with children and adolescents and question parents and caregivers about these themes.

As this pandemic still exists, it is urgent to outline strategies and a multidisciplinary approach to support children and adolescents and minimize the effects on their biopsychosocial development. Further studies are needed to better understand the negative long-term health outcomes and identify the risk groups.

Some institutions have already created flyers on these themes and short clinical sessions to spread the results throughout the health community to take preventive measures with children and adolescents.

#### Author Contributions

MR, JJ and JP participated in the study conception or design. MR, JJ and JP participated in acquisition of data. MR, JJ and JP participated in the analysis or interpretation of data. MR, JJ, JP and APV participated in the drafting of the manuscript. MR, JJ, JP and APV participated in the critical revision of the manuscript. All authors approved the final manuscript and are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

#### Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this work.

#### Funding Sources

There were no external funding sources for the realization of this paper.

#### Protection of human and animal subjects

The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki 2013).

#### Provenance and peer review

Not commissioned; externally peer reviewed

#### Confidentiality of data

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

#### Acknowledgments

The authors would like to gratefully thank all health professionals who are on the front line of the ongoing pandemic and pay tribute to all administrative, nursing, and medical staff of the USF São Martinho de Alcabideche, UCSP Cascais, USF Cidadela, and USF KosmUS (Cascais, Lisbon, Portugal) whose outstanding contribution provided the information necessary for elaborating this study.

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## COVID-19: Impacto da Pandemia na Vida das Crianças

**Introdução:** A pandemia de COVID-19 teve um impacto biopsicossocial considerável, especialmente nas crianças e adolescentes, como grupos vulneráveis. O isolamento social pode levar a doenças psiquiátricas, obesidade e perturbações do sono em adultos. O objetivo deste estudo foi determinar o impacto do confinamento no sono, dieta, atividade física e comportamento das crianças.

**Métodos:** Estudo observacional retrospectivo realizado entre 1 de maio de 2020 e 31 de março de 2021. Os dados foram recolhidos em quatro centros de saúde de Cascais (Lisboa, Portugal) através da aplicação de um questionário presencial e *online*. Foi realizada uma análise descritiva recorrendo aos programas Microsoft Excel® e SPSS® (versão 23).

**Resultados:** No total, obtiveram-se 790 respostas (mediana da idade 9 anos), sem predominância de sexo. Identificaram-se alterações na rotina familiar e no comportamento em 84% e 63% das crianças, respetivamente. Além disso, foram observadas mudanças na dieta em 43%, com 62% relatando aumento nas quantidades e 23% relatando ganho de peso (mais de 5 kg em 18%). Em relação à atividade física, 44% praticavam-na mais de três vezes por

semana antes do confinamento. Depois da COVID-19, 18% mantiveram essa rotina e 48% abandonaram as atividades esportivas. Ocorreram alterações do sono em 42%, incluindo pesadelos e dificuldade em adormecer.

**Discussão:** A infância e a adolescência são períodos de desenvolvimento social e psicomotor considerável e qualquer interrupção da rotina pode provocar alterações profundas na vivência pessoal e interpessoal durante este período. Os resultados deste estudo revelaram que o confinamento provocou alterações do comportamento, dieta, exercício físico e sono das crianças. É fundamental delinear estratégias multidisciplinares para apoiar crianças e adolescentes de modo a diminuir os efeitos do isolamento social no seu desenvolvimento.

**Palavras-Chave:** Adolescente; Avaliação do Impacto na Saúde; COVID-19; Criança; Inquéritos e Questionários; Isolamento Social/psicologia; Pandemia; Pré-Escolar; Quarentena/psicologia