**The impact of the Covid-19 pandemic on children’s health in Portugal: a parents’ report**

**O impacto da pandemia Covid-19 na saúde infantil em Portugal: o relato dos pais**

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Impact of Covid-19 on children’s health

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**ABSTRACT**

**Background:** The Covid-19 pandemic poses unprecedented challenges for healthcare services and has led to alterations in its utilization patterns by the pediatric population. We aimed to describe the impact of Covid-19 on children’s health, wellbeing, and access to medical care.

**Material and Methods:** We conducted a retrospective cross-sectional study through an anonymous online survey via social networks. Collected data refers to a period between March 16th and May 17th 2020.

**Results:** We obtained responses to the survey regarding 19,745 children. 54.2% of the previously scheduled medical appointments were postponed by health institutions and 21.6% of planned vaccinations were missed. Parents expressed concerns regarding psychological, social, and physical consequences for their children due to the pandemic.

**Discussion:** The observed reduction of pediatric emergency department visits and the postponement of medical appointments and vaccine administrations are potentially harmful for non-Covid patients. The current pandemic and the imposed social distance might have an important negative impact of children’s mental health.

**Conclusion:** Further studies are necessary to fully comprehend the outcomes of the decreased access to medical care, as well as the collateral damage for children beyond the clinical aspects of the pandemic. Defining strategies regarding the urge to vaccinate children and not postpone urgent evaluations should be a public health priority.

**Keywords:** Pediatrics; Coronavirus; Pandemics; Health Care Quality, Access, and Evaluation; Health Impact Assessment.

**RESUMO**

**Introdução:** A pandemia Covid-19 constitui um desafio sem precedentes para os serviços de saúde e conduziu a alterações no padrão de utilização dos recursos pela população pediátrica. Procurámos descrever o impacto da pandemia Covid-19 na saúde infantil e no acesso à saúde em Portugal.

**Materiais e Métodos:** Realizámos um estudo retrospectivo, recolhendo dados através da aplicação de um inquérito anónimo online nas redes sociais. Os dados referem-se a um período abrangido entre 16 de março e 17 de maio de 2020.

**Resultados:** Obtivemos respostas ao inquérito relativas a 19,745 crianças. 54.2% das consultas previamente agendadas foram adiadas pelas instituições de saúde e 21.6% das vacinações previstas não se realizaram. Os pais expressaram preocupação relativamente a consequências psicológicas, sociais e físicas da pandemia nos seus filhos.

**Discussão:** A reduzida utilização dos serviços de urgência pediátricos, bem como a não realização de consultas e vacinações previamente agendadas é potencialmente lesiva para os doentes não-Covid. A pandemia e o isolamento social imposto poderão causar um impacto negativo na saúde mental das crianças.

**Conclusão:** Estudos adicionais são necessários para melhor compreender as consequências da diminuição do acesso à saúde, bem como os efeitos psicológicos, sociais e físicos nas crianças. A definição de estratégias para incentivar a vacinação e o não adiamento de avaliações médicas urgentes deveria ser uma prioridade da saúde pública.

**INTRODUCTION**

The novel coronavirus SARS-CoV-2, etiologic agent of Covid-19, emerged in December 2019 in the city of Wuhan, China, and has since spread worldwide. The World Health Organization declared Covid-19 to be a pandemic health emergency on March 11th 20201. The first case of the disease in Portugal was diagnosed on March 2nd and until the end of May there were 1,799 children and adolescents (0-19 years old) diagnosed with Covid-192. Most published scientific articles focus on Covid-19 in adults, and, to current knowledge, the virus seems to cause milder symptoms and have lower fatality rates in the pediatric population3–8.

The current pandemic poses new challenges for the healthcare force as well as for patients, potentially leading to changes in medical care utilization patterns9. Concerns have been raised regarding the consequences for non-Covid patients due to decreased access to medical care both in adults10,11 as in children12–14, as visits to emergency departments (ED) have dropped significantly9,12,15–19. Medical resources have been redistributed to meet the needs of this health emergency, with most non-urgent appointments being postponed. There is some evidence of potentially harmful consequences of these measures such as reductions in vaccination coverage comparing to the same period in previous years20,21.

Confinement in the household for a long period of time while being deprived from school, outdoor activities and contact with family-members and friends, has been challenging for children and their parents during the pandemic. The psychological, social and physical consequences due to social distancing are yet to be determined22–24.

This study aims to describe the impact of the pandemic on the utilization of healthcare services by the pediatric population and assess parents’ perspective on the consequences for their children’s health and wellbeing.

**METHODS**

We conducted an observational retrospective cross-sectional study, with data being collected through an anonymous online survey on social networks. The survey consisted of an original non-validated questionnaire. Only fully completed surveys could be submitted, and participants could cease the fulfilment at any time. The survey was available for submission between May 1st and May 17th, the day before the official reopening of kindergarten in Portugal.

We accepted responses from parents with one or more children and adolescents (0 to 17 years and 364 days old) living in Portugal. Parents were asked to answer questions of mixed type (quantitative and qualitative), including multiple choice questions, dropdown questions, Likert scales and short-answer questions, concerning the period between the official school closure by the Portuguese government (March 16th) and the day of the submission of the survey.

Socio-demographic characterization included the child’s living district, nationality, and age, as well as the mother’s and father’s ages and educational status.

We collected information regarding the utilization of healthcare services during the Covid-19 pandemic, namely symptoms presented by the child (fever, cough, dyspnea, nausea or vomiting, diarrhea, otalgia, odynophagia, headache, urinary complaints, injuries following traumas, others), if he/she was taken to an emergency department (ED), whether the parents’ choice of postponing or not visiting the ED would have been different if there were no pandemic and the number of hospital admissions and invasive medical interventions performed on the child (blood drawing for testing, intravenous or intramuscular medication, surgical procedure, others) during the stated period.

Pandemic-related information was gathered by assessing whether the child was part of a risk group for Covid-19 according to the orientations of the Portuguese Directorate-General of Health25 and complemented by the local hospital’s criteria (newborn, prematurity, asthma, bronchopulmonary dysplasia, diabetes, cardiac insufficiency, chronic liver disease, chronic kidney disease, active malignant oncologic disease, inflammatory bowel disease, sickle cell disease, pharmacological immunosuppression, institutionalized child), and parents’ degree of concern of their child contracting the virus in a Likert scale from 1 (not at all concerned) to 5 (extremely concerned).

Consequences of Covid-19 on the child’s health and access to medical care were assessed through questions concerning the fulfilment of scheduled medical appointments, vaccinations of the national vaccination program and neonatal metabolic screening (options being no scheduling, carried out in person, conducted virtually, cancelled/postponed by the family, cancelled/postponed by the health institution or doctor), as well as the parents’ perception of negative consequences of the pandemic on their child’s health on a Likert scale from 1 (strongly disagree) to 5 (strongly agree), complemented by a non-mandatory question characterizing the negative consequences observed. All other questions in the survey were of mandatory response.

We analyzed the data using frequencies and percentages for categorical variables. Counts and percentages were used to describe survey participants. Median values and interquartile range were reported for quantitative variables. Significant associations were evaluated by applying the Pearson’s chi-squared test (χ2), Mann-Whitney U-test (U), Kruskal-Wallis test (H) and the Spearman’s correlation coefficient (rs) when appropriate, using SPSS 20®. Significance for all the results was defined as *p* < 0.05.

The study was approved by the local Ethics Committee.

**RESULTS**

We obtained 12,390 responses to the survey, regarding 19,745 children. No participants were excluded from the study.

Socio-demographic characteristics of the participants are depicted in Table 1. The mean age of children in the study was 6.29 years (SD = 4.84). [Insert Table 1 here]

As far as the utilization of health services during the pandemic is concerned, 20.6% of parents reported at least one of their children to have been ill during the designated period. Most frequently described symptoms were fever (49.3%), cough (34.9%) and odynophagia (21.9%). Among the 2,552 children who were reported to have been ill, 31.8% were taken to an ED. When questioned, 33.9% of parents who visited the ED believed they would have resorted earlier and 16.0% more often to the ED if it were not for the pandemic. Among the inquired whose children were ill and did not visit the ED, 22.8% admitted they would have visited the ED if there were no pandemic. Children’s presentation of symptoms during the designated period did not associate significantly to parental degree of concern towards the virus (U = 12338909.5, *p* > 0.05). During the stated period, 1.0% of children in the survey were hospitalized and 3.2% were submitted to invasive interventions. There were no significant differences in hospitalization rates or invasive interventions between children whose parents stated they would have come earlier (would have come earlier: 19.0%; would not have come earlier: 21.9%; χ2 = 2.184, *p* > 0.05) or more often (would have come more often: 21.5%; would not have come more often: 21.4%; χ2 = 0.001, *p* > 0.05) to the ED in comparison to other children.

Concerning pandemic-related information, almost half of parents (49.6%) affirmed they were extremely concerned (5 on the Likert scale) with the possibility of their child contracting the novel coronavirus (Fig. 1). Only 1.4% of respondents considered to be not at all concerned (1 on the Likert scale). [Insert Figure 1 here] Regarding the risk groups for Covid-19, 18.1% of children in our study were included in at least one of the groups, mainly due to asthma (9.6%), followed by prematurity (5.1%) and being newborn (1.8%). During the designated period children in a risk group presented with symptoms significantly more often than other children but did not attend the ED in significantly higher rates (Table 2). There was a significant association between belonging to a risk group and being submitted to an invasive intervention or hospitalization (Table 2), with the odds being 3.44 times higher if the child had a risk factor than if he or she did not. Being included in a risk group also associated significantly to a higher level of parental concern of their child contracting the virus (risk group: Mdn = 5.00, IQR = 4.00-5.00; no risk group: Mdn = 4.00, IQR = 3.00-5.00; U = 9640774, *p* < 0.001). [Insert Table 2 here]

Regarding the consequences of Covid-19 on children’s health and access to medical care, 48.3% of responders had a medical appointment previously scheduled for their child during the stated period. Of these 5,984 scheduled appointments, 21.7% were carried out in person, 10.9% were conducted virtually (e.g. by telephone), 13.3% were cancelled at the request of the family, while 54.2% of appointments did not take place due to postponement or cancellation by the health institution or doctor (Table 3). Parents’ perception of a negative impact of the pandemic on their child was significantly impacted by the way medical appointments were conducted during this period (H(3) = 40.334, *p* < 0.01). Compared to when consultations were carried out in person, there was no significant difference in parents’ perception when they were cancelled by the family itself (U = 494987.5, *p* > 0.05). However, when appointments were conducted virtually (virtual appointments: Mdn = 2.00, IQR 1.00-3.00; appointments in person: Mdn = 1.00, IQR = 1-00-3.00; U = 389571.5, *p* < 0.01) or cancelled/postponed by the health institution (appointments cancelled by health institution: Mdn = 2.00, IQR 1.00-3.00; appointments in person: Mdn = 1.00, IQR = 1-00-3.00; U = 1874389, *p* < 0.001), parents’ conviction of a negative impact was significantly higher.

Concerning the vaccination appointments scheduled for vaccines included in the national vaccination program, 22.2% (2,747 children) had a vaccine administration planned during the designated period. While 78.4% were vaccinated according to plan, 21.6% (594 children) missed their vaccination – 11.6% due to the families’ preferences and 10.0% due to postponement or cancellation by the health institution (Table 3).

Neonatal metabolic screening (heel prick test) was planned for 2.9% of children included in the survey, 1.4% of whom did not take place (five newborns) – one of them by choice of the family and four because of cancellation by the health institution (Table 3). [Insert Table 3 here]

Nearly half of parents (48.7%) strongly disagreed that the social distancing imposed by the pandemic affected their children’s’ health negatively (1 on the Likert scale), while only 4.4% strongly agreed there were negative health consequences (5 on the Likert scale). When asked to characterize these consequences in a non-mandatory question, 2517 parents described the negative effects observed in their children. Parental concerns included psychological consequences (47.2%) such as anxiety, the most reported negative outcome (417 children), as well as behavioral and emotional changes; social consequences (33.6%) comprising social isolation, diminished outdoor time and augmented screen-time; health related issues (27.0%), namely the loss of medical appointments and therapies considered essential; and physical health (20.6%) including reduction of physical activity, augmented weight and alteration of eating and sleep habits. There was a significant positive correlation between the parents’ degree of concern towards the virus and the conviction of the pandemic and social distancing measures having a negative impact in their children’s health (rs = 0.054, *p* < 0.001).

**DISCUSSION**

This study aims to describe the consequences of the Covid-19 pandemic on children’s health and use of medical care in Portugal. We gathered information concerning circa 1% of the Portuguese pediatric population, according to the national data of 201926.

The Covid-19 pandemic contributed to changes in health-behaviors concerning the pediatric population including a reduction of the use of healthcare services, as one can see by the rate of parents in our study who claim they would have visited the ED earlier, more in seeking often, or instead of other medical services for their children’s symptoms if there were no pandemic. The altered access to healthcare is further evidenced by the reduction of visits to the ED observed in several countries9,12,16,17,19. The *quasi* simultaneous beginning of the pandemic with the decrease of ED visits seems to underline the association between the two events9. Multiple factors seem to be involved in this alteration of the pattern of utilization of the ED. For one, children confined in the household tend to get less acute infections and traumas than when contacting with other children in school and extracurricular activities9,12. The natural reduction in the reasons that motivate visits to the ED is not outbalanced by children with Covid-19 seeking medical care, since most of them have mild symptoms and are treated at home, with no need for hospital admission5,27. Nevertheless, socially isolated children continue to get ill with occasional acute infections, household traumas or exacerbations and acute presentations of chronic conditions, which might pose the need for medical observation. Parental concern about their children being exposed to Covid-19, reported to be extremely high in almost half of the parents in this study, might contribute to the reluctance of bringing their children to an ED, as has been suggest by other studies9,12,15. Some authors have pointed out the fear of “bothering the doctor” who is in the front line against Covid-19 as well as the fear of overburdening the healthcare system as an additional obstacle for seeking medical care10. Reports show that the delayed access to medical care has led to negative consequences in children’s health, including fatal outcomes12,13. A recently published study also evidenced that the diminished access to healthcare was one of the causing factors of the excess mortality rates reported in the Portuguese population since the beginning of the pandemic, though the group under 55 years did not contribute to the observed increase15. Our study did not show significant association between parents who opted to postpone or not visit the ED and negative health consequences such as increased number of invasive interventions, hospital admissions, or fatal outcomes. This might suggest that, apart from all the explanations above, there is a baseline overuse of emergency care in non-pandemic times and that children’s symptoms could be handled by other healthcare services, namely the primary care setting. This is supported by the fact that Portugal is the country with the highest emergency services use *per capita* in the Organization for Economic Cooperation and Development (OECD)28, representing significant numbers of inadequate utilization of this resource9. Nevertheless, the potential danger of delayed access to medical care should not be overlooked and could impact the pediatric populations’ health in the short and long-term.

Regarding the postponement or cancellation of non-urgent medical appointments, our study reveals that most scheduled consultations did not take place during the designated period, mainly by government-imposed measures or decisions from healthcare providers. A major concern is that the reduction of preventive medical care might be detrimental for non-Covid patients, especially those with chronic diseases or belonging to vulnerable groups29. In the long term, this collateral effect of the pandemic may lead to a rise in hospital admissions, health-costs and contribute to the overburden of healthcare facilities already crowded with Covid-patients29. The significant association between medical appointments either carried out virtually or cancelled/postponed by healthcare services and parental perception of negative outcomes for their children underlines how the decision of how consultations are fulfilled could have a damaging impact on children’s health and furthermore contribute to parents’ fear of accessing to healthcare, thus aggravating the reluctance in seeking medical assistance.

The decline in vaccination coverage during the pandemic is particularly important, with 21.6% of the scheduled vaccinations in our study being missed. During the month of April 2020, the vaccine administrations of the Portuguese national vaccination program dropped to almost half the numbers of the previous year20 and data from several countries points to similar potentially harmful health behaviors21,23, posing an increased risk of outbreaks of vaccine-preventable diseases. Considering neonatal metabolic screening, which intends to diagnose genetic diseases that benefit from early treatment, five tests in our study were missed, representing 1.4% of newborns in the study. According to the national data available, neonatal screening coverage in Portugal reaches 99.5%30, meaning the rate in our study poses a 2.8-fold increase in missed screenings.

Looking at the consequences of the Covid-19 pandemic on children and adolescents’ health and wellbeing, it becomes clear that a major threat for this population might lie beyond the clinical aspects of the pandemic31. Parents in our study expressed several apprehensions in different areas of development of their children.

Countries worldwide have opted for school closure in order to reduce the transmission of the virus, although the effectiveness of this measure is not entirely clear32. The closure of schools creates enormous challenges, starting with restrictions to the learning process for children all over the world. It also seems to pose a risk of aggravating the widening gap between children of high and low-income families, since poorer households might have limited resources such as computers or internet access to maintain online learning provided by some schools23. Furthermore, some of these children rely on school meals for adequate nutrition or washing facilities for adequate hygiene31. Other vulnerable groups especially affected by school closure include children with special educational needs and disabilities, to whom the lack of daily routines and appropriate stimuli can cause an important wellbeing disruption. The fact that these children are missing their medical appointments and therapy sessions constitutes a risk for setbacks in their development and progression of essential skills22, and is a worry expressed by parents in our study.

Other outcomes reported by parents in our study concern the reduction of physical activity, augmented weight, alteration of eat and sleep habits as well as increased sedentary activities and screen-time, as has been described by other authors24,31. The disruption of daily routines and the acquired sedentary behaviors might exacerbate childhood obesity33,34, and the establishment of unhealthy habits in the long-term can compromise future cardiovascular and musculoskeletal health31. Furthermore, physical activity contributes positively to mental health, and can be used as a coping mechanism when facing challenges such as pandemics, leading to reduction of anxiety and depression levels34–36.

Mental health seems to be a major concern for parents in our study, with anxiety being the most frequently expressed preoccupation. Reasons for anxiety during pandemics include the fear of infection, frustration, boredom, lack of interaction with family members and friends, increased incidence and severity of domestic violence, abuse, and child neglect22,23, and the above mentioned school closure and reduction of physical activity37. Facing a worldwide pandemic with extraordinary and sudden routine disruptions poses a challenge for children’s resilience and coping mechanisms, and yet mental health seems to be at risk of being overlooked and not prioritized38. When comparing post-traumatic stress responses in children who were quarantined during pandemics and others who were not, the mean scores for post-traumatic stress disorders were found to be four times higher in children who were quarantined39. The long-term effects of these unprecedented social distancing measures on children’s mental health is yet to be determined, and the possible psychological costs should be taken into consideration when imposing these measures22,37.

There are some limitations to our study. Information was gathered via parental recall, which might introduce bias for various reasons, including subjective perception and accuracy of memory. The fact that parents with more than one child submitted a single questionnaire for all their children might hinder the analysis of data, especially when concerning vaccination coverage. By collecting data through an online survey, our inquiry might not have reached the social fringes, since internet access is not transversal to all social strata. Additionally, the dissemination of the survey through social networks poses a risk of biased selection of participants, excluding non-users of those networks. Moreover, Portuguese districts were not portrayed in a representative proportion, with over-representation of major cities. The fact that the study was conducted for a brief period of time potentially biased the responses according to the pandemic-related events during the designated period.

**CONCLUSION**

In summary, the impact of the Covid-19 pandemic on children’s health includes a change in the use of healthcare services as well as psychological, social and physical consequences pointed out by parents that should not be overlooked. The future course of the pandemic is uncertain, as is the reorganization of medical services to face this challenge. Studies to be carried out hereafter will be necessary to better understand the consequences of decreased ED visits, allowing for interventions to avoid potentially negative health outcomes. Efforts should be made to clearly communicate to patients the recommendation of not postponing urgent medical evaluations. Simultaneously, safety conditions must be ensured in healthcare facilities to minimize the risk of exposure to the novel coronavirus to a minimum, protecting patients and healthcare workers and restoring confidence in seeking medical care. It should be a public health priority to compel parents to vaccinate their children and create pathways to allow vaccination without risk of Covid-19 exposure. Psychological, social, and physical consequences for children and adolescents are at risk of being overlooked during the pandemic and should be assessed in further depth in order to set strategies to minimize potentially negative outcomes, especially in the most vulnerable populations.

**PROTECTION OF HUMANS AND ANIMALS**

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee of Hospital Beatriz Ângelo and to the Helsinki Declaration of the World Medical Association.

**DATA CONFIDENCIALITY**

The authors declare having followed the protocols in use at their working centre regarding patients’ data publication.

**CONFLICTS OF INTEREST**

The authors have no conflicts of interest to declare.

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**TABLES**

Table 1 – Socio-demographic characteristics of the participants

|  |  |
| --- | --- |
| **Socio-demographic characteristics** | **No. (and %) of respondents**  **(n = 12390)** |
| **Living districts**  Aveiro  Beja  Braga  Bragança  Castelo Branco  Coimbra  Évora  Faro  Guarda  Leiria  Lisboa  Portalegre  Porto  Santarém  Setúbal  Viana do Castelo  Vila Real  Viseu  Região autónoma dos Açores  Região autónoma da Madeira | 332 (2.7)  120 (1.0)  821 (6.6)  49 (0.4)  84 (0.7)  306 (2.5)  145 (3.4)  416 (3.4)  62 (0.5)  305 (2.5)  6207 (50.1)  68 (0.5)  1240 (10.0)  321 (2.6)  1381 (11.1)  101 (0.8)  64 (0.5)  178 (1.4)  58 (0.5)  131 (1.1) |
| **Children’s age**  0-2 years  3-6 years  7-11 years  12-17 years | 5413 (27.4)  5963 (30.2)  4831 (24.5)  3538 (17.9) |
| **Children’s nationality**  Portuguese  Other nationalities | 12240 (98.8)  150 (1.2) |
| **Mother’s age**  <20 years  20-29 years  30-39 years  40-49 years  >50 years  NA | 14 (0.1)  1136 (9.2)  6360 (51.3)  4421 (35.7)  444 (3.6)  15 (0.1) |
| **Father’s age**  <20 years  20-29 years  30-39 years  40-49 years  >50 years  NA | 1 (0.0)  678 (5.5)  5475 (44.2)  5071 (40.9)  1115 (8.9)  50 (0.4) |
| **Mother’s educational status**  Primary school (1th to 9th grade)  Secondary school (10th to 12th grade)  Bachelor’s degree or equivalent  Master’s or Doctoral degree | 776 (6.2)  2293 (18.5)  6846 (55.3)  2475 (20.0) |
| **Father’s educational status**  Primary school (1th - 9th grade)  Secondary school (10th - 12th grade)  Bachelor’s degree or equivalent  Master’s or Doctoral degree | 2020 (16.2)  3066 (24.7)  5436 (43.9)  1868 (15.1) |

No.: number. NA: not applicable

Table 2 – Comparison between children who belong to a risk group and children who do not

|  |  |  |  |
| --- | --- | --- | --- |
|  | **No. (and %) of respondents** | | ***p*** |
| **Risk group**  **(n = 2,241)** | **No risk group**  **(n = 10,149)** |
| Symptoms presented\* | 600 (26.8) | 1952 (19.2) | < 0.001 |
| ED visits\* | 190 (31.7) | 621 (31.8) | NS |
| Submission to invasive interventions or hospitalization\* | 178 (7.9) | 250 (2.5) | < 0.001 |

No: number. ED: Emergency Department. NS: not significant. \*Presented as percentage, statistical analysis using Pearson’s chi-squared test.

Table 3 – Outcome of scheduled medical appointments, vaccinations, and neonatal screenings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Scheduled appointments** | **No. (and %) of respondents** | | | |
| **Carried out in person** | **Carried out virtually** | **Cancelled/**  **postponed by the family** | **Cancelled/**  **postponed by the health institution** |
| **Medical appointment**  **(n = 5,984)** | 1298 (21.7) | 651 (10.9) | 793 (13.3) | 3242 (54.2) |
| **Vaccination**  **(n = 2,747)** | 2153 (78.4) | - | 320 (11.6) | 274 (10.0) |
| **Neonatal screening**  **(n = 357)** | 352 (98.6) | - | 1 (0.3) | 4 (1.1) |

No: number.

**FIGURES**

Figure 1 – Results of a Likert scale question used in the survey