

The Impact of COVID-19 Pandemic on Patient Admissions to the Developmental Pediatrics Unit: An Outpatient Clinic in Eastern Turkey

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What is already known on this topic?

- The coronavirus disease 2019 (COVID-19) pandemic has reduced non-COVID-19 hospital admissions, including emergency services, all over the world.
- Brain development is very rapid in early childhood, and especially in this period, the brain has a plasticity feature. The decrease in hospital admissions of patients who have developmental delays or who are at risk in this regard during the COVID-19 pandemic has hampered the chance of regular follow-up and early intervention.

What this study adds to this topic?

- During the COVID-19 pandemic, patients with a diagnosis of Down syndrome had fewer admissions to our developmental pediatrics unit. This situation has taken away the opportunity for early intervention of our patients who have developmental delays or who are at risk in this respect, especially in this patient group.
- According to the data we obtained from our study, admissions with speech delay increased.

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ABSTRACT

Objective: The aim of this study was to analyze the impact of coronavirus disease 2019 pandemic on the number and diagnosis of patients admitted to the Developmental Pediatrics Unit.

Materials and Methods: We compared the number and the diagnosis of patients admitted to the Developmental Pediatrics Unit by using International Classification of Diseases and Related Health Problems 10th revision (ICD-10) codes of our institution's electronic health data before and after 18 months from March 16 2020, when coronavirus disease 2019 pandemic was declared in Turkey. Statistical analyses were performed by using International Business Machines Statistical Package for Social Sciences for windows version 22.0 (Armonk, NY) program.

Results: We found that the number of patients admitted to the Developmental Pediatrics Unit decreased during the pandemic period (pre-coronavirus disease 2019 n = 1107, during coronavirus disease 2019 n = 761). There was no significant difference between the ratio of the most common diagnosis (prematurity) before and during the pandemic period (32% and 30.6% respectively). It was observed that the ratio of children with speech delay (17.4%-23%, $P = .003$) increased during the pandemic, while there was a significant decrease in the ratio of admissions with Down syndrome (11.6%-6.6%, $P < .001$).

Conclusion: We found that the number of admissions to the Developmental Pediatrics Unit with developmental difficulties decreased significantly during the pandemic. The ratio of admissions of speech delay increased during the same period, while admissions with Down syndrome decreased. This increase may be due to lockdown, increase in electronic screen exposure, and lack of stimuli and the decrease may be due to the risk of severe illness from coronavirus disease 2019. The decrease in admissions of patients who require developmental follow-up reveals the need for additional efforts such as implementing tele-health to our daily practice.

Keywords: COVID-19 pandemic, developmental pediatrics, patient admission

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic caused many potential risks for the pediatric patient group, including restrictions applied for protection, social isolation, and increased parental stress as well as contamination and difficulty in access to health services.¹ According to the data reported by many centers around the world, hospital admissions of non-COVID-19 patients have decreased in general, including the emergency departments.^{2,3}

Approximately 30% of the total world's population is constituted of children, which is approximately 2.4 billion in number.⁴ In the literature, the conditions required for the acquisition of developmental skills in early childhood are referred to as "nurturing care" and include

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meeting the health needs of the child, including immunization, which depends on a healthy diet, the sensitivity of the caregiver, the supply of tools in the home environment such as toys and books that will facilitate learning, inter-family interaction, and a safe environment to support these conditions, which should be supplied by the parents.⁵ In particular, children younger than 2 years of age need practical exploration and social interaction with reliable caregivers to improve their cognitive, language, motor, and socioemotional skills.⁶ Brain development is most sensitive to nurturing care and environmental stimuli during the infancy and early childhood, and these periods are very important for the prevention and improvement of potential problems that may affect brain development and lead to lifelong developmental difficulties.⁷ According to the 2019 data of the Centers for Disease Control and Prevention (CDC), 1 out of every 6 children aged 3-17 years has developmental, behavioral, physical, or emotional difficulties.⁸ In the literature, it has been shown that previous pandemics and disasters experienced in early childhood, when the brain architecture is rapidly shaped and is highly sensitive to environmental factors, may have negative consequences in the short and long term.⁹ In pandemic and similar crisis situations, parents or primary caregivers contend for keeping up with their children's health, nutrition, safety, and care. In addition, children are deprived of both social and cognitive stimuli due to the closure of childcare centers, pre-school education, and special education centers as well as the interruption of interaction with the home environment and relatives.¹⁰ According to a project carried out by CDC to support children with developmental difficulties and their families, the COVID-19 pandemic negatively affected the detection of developmental delays and difficulties in children aged 0-5 years.¹¹

The American Academy of Pediatrics recommends regular follow-up with standardized developmental screening tools at 9th, 18th, and 30th visits in healthy children, with screening for autism at 18 and 24 months and at every visit when developmental delay is suspected.¹² Detecting developmental delays early is very important because delaying may lead to a miss in the opportunity for early intervention and lead to negative consequences such as learning difficulties, behavioral problems, and functional disorders.¹³

In this context, the COVID-19 pandemic itself has already created an unfavorable environment for all children as well as for children with developmental delays such as Down syndrome and those who are at risk for developmental delays such as prematurity, and therefore health policy makers and especially family physicians, pediatricians, and developmental pediatricians serving children should always be alert to the COVID-19 post-pandemic process and other future crisis situations.

In this study, we aimed to reveal the negative effects of the COVID-19 pandemic on the early childhood period, by evaluating the number of patients and their diagnoses and comparing the pre-pandemic and the pandemic processes and by this way to shed light on the health-care providers in this age group.

MATERIALS AND METHODS

Study Population

This study was conducted on patients aged 0-36 months, who had developmental delays or who were at risk for reaching their developmental potentials, and who were admitted to

our Developmental Pediatrics outpatient polyclinic between 18 months before and 18 months after March 16, 2020, when the COVID-19 pandemic was declared in Turkey. Our Department of Developmental-Behavioral Pediatrics is a sub-specialty of the pediatrics and was established with the aim of giving a family-centered, holistic approach to all children with developmental difficulties, which can be due to various reasons, can last a lifetime, and constitute the most common morbidity group, beginning especially in infancy and early childhood up to the age of 18 years, in eastern Turkey.

Data Collection

The data regarding the number of admissions, the number of patients, the distribution of admissions, and diagnoses by sex and age were scanned from the electronic health record data of our hospital retrospectively, and ICD-10 diagnostic codes were used to determine the diagnoses. In cases of recurrent admissions before and during the pandemic period, each patient was included in the evaluation once.

Diagnoses were grouped as prematurity, Down syndrome, speech delay, genetic/congenital/metabolic diseases, and neurological (i.e., epilepsy, microcephaly, and cerebral palsy) and neurosurgical (i.e., hydrocephalus and meningomyelocele) diseases, according to the most common reasons for admission. Diagnoses with fewer admissions such as eating disorders, sleep disorders, vision loss, hearing loss, behavior and communication disorders, and other perinatal risk factors were grouped as the "others" group.

All patients who admitted to our unit were met by a developmental pediatrics fellow and evaluated by a structured examination including a family-centered and holistic approach, based on observation, lasting approximately 30-60 minutes. In the evaluation, standardized instruments, the validity and reliability of which have been accepted in the literature, including the Guide for Monitoring Child Development, Ages and Stages Questionnaires, Ages and Stages Questionnaires/Social-Emotional, Childhood Autism Rating Scale, and the Vineland Adaptive Behavior Scale were used. By using these tools together with clinical observation, the developmental stage of the patients was determined, and the patients with developmental delay or at risk of developmental delay were followed up closely and referred to the relevant branches when necessary. Ethical for the study was obtained from İnönü University Medical Faculty Health Sciences Non-Invasive Clinical Studies Ethics Committee (06/01/2022-E.129724).

Statistical Analysis

The data were analyzed by using International Business Machines Statistical Package for Social Sciences for windows version 22.0 (Armonk, NY, USA) program. Normality of the quantitative data was explored by Shapiro-Wilk test and summarized by median, 25th percentile, and 75th percentile. Qualitative data were expressed by count and percentage. Pearson's chi-square test was used for comparisons according to qualitative data. A value of $P < .05$ was considered statistically significant.

RESULTS

Admissions of Pre-coronavirus Disease 2019 and During Coronavirus Disease 2019 Pandemic Periods

In our study, the total number of pediatric outpatients admitted to our hospital in the pre-pandemic period and the total

number of patients admitted to the pediatric emergency service were 157 696 and 25 850, respectively. In the pandemic process, these numbers decreased dramatically and were 93 746 and 12 895, respectively. On the other hand, a total of 3559 patients have been admitted to our department during the 3-year period between September 16, 2018, and September 16, 2021.

The Effect of Pandemic on Patient Admissions to Our Unit

When we grouped these admissions in relation to the pandemic, we observed that 2202 (61.8%) admissions were before the pandemic and 1357 (38.1%) were during the pandemic process. We also evaluated the monthly changes in admissions to our unit during the pre-pandemic period and the pandemic period (Figure 1).

In the context of our study, after excluding the repeated admissions, we evaluated 1107 admissions in the pre-pandemic period and 761 admissions during the pandemic period. Before the pandemic, 41.6% (n = 460) of the patients were female and 58.4% (n = 647) were male. The median age at admission was 17.7 (6.63-31.63) months. During the 18 months of the pandemic process, 37.6% (n = 286) of the patients admitted to our unit were female and 62.4% (n = 475) were male. The mean age of the patients at admission was 19.90 (6.57-34.25) months. It was found that the number of male patients with speech delay (n = 272) was statistically significantly higher compared to females with speech delay (n = 96) in both periods (P < .001). We detected that 85.1% of total admissions before the pandemic period and 81% during the pandemic period were aged 3 years and younger (Table 1).

Prematurity was the most common reason for admission with a ratio of 32% (n = 354) in the pre-pandemic period and 30.6% (n = 233) during the pandemic period; however, the difference between the 2 periods was not statistically significant (P = .534). We found that the ratio of patients presenting with speech delay was 23% (n = 175) during the pandemic period, while it was 17.4% (n = 193) in the pre-pandemic period, and the increase was statistically significant (P = .003). In addition, we found that the admission ratio of the patients who were followed up with the diagnosis of Down syndrome was 6.6% (n = 50) during the pandemic period, while it was 11.6% (n = 128) before the pandemic, and this decrease was statistically significant (P < .001).

Table 1. Sociodemographic Characteristics of Patients Admitted to the Developmental Pediatrics Unit Before and During the Pandemic

	Before Pandemic (n = 1107)	During Pandemic (n = 761)
Median (25th percentile-75th percentile) (months)	17.77 (6.63-31.63)	19.90 (6.57-34.25)
Age (months)	n (%)	n (%)
0-12	420 (37.9)	275 (36.1)
>12-24	258 (23.3)	161 (21.2)
>24-36	242 (21.9)	152 (20.0)
>36	187 (16.9)	173 (22.7)
Sex	n (%)	n (%)
Female	460 (41.6)	286 (37.6)
Male	647 (58.4)	475 (62.4)

On the other hand, we found that the percentage ratio of patients presenting with genetic/congenital/metabolic diseases was 9.5% (n = 72) during the pandemic period, while it was 6.9% (n = 76) in the pre-pandemic period, and the increase was statistically significant (P = .041). When the admissions before and during the pandemic were compared in terms of other reasons requiring developmental follow-up and support, no statistically significant difference was found (Table 2).

DISCUSSION

In our study, similar to other studies,¹⁴ during the pandemic process, admissions to our hospital's pediatrics outpatient clinic and admissions to the pediatrics emergency service decreased by 59.4% and 49.8%, respectively, compared to the period before the pandemic. When we compared the total number of patients who admitted to Developmental Pediatrics Unit (DPU) before and during the pandemic, we detected that the number of patients decreased significantly during the pandemic process. We also found that the diagnosis of prematurity was the most common reason for admission in both periods. In addition, the admissions with speech delay and genetic/congenital/metabolic diseases increased and the admissions of children with Down syndrome decreased during the pandemic process. In our study, the mean age of the patients who were admitted to our unit both before and during the pandemic was

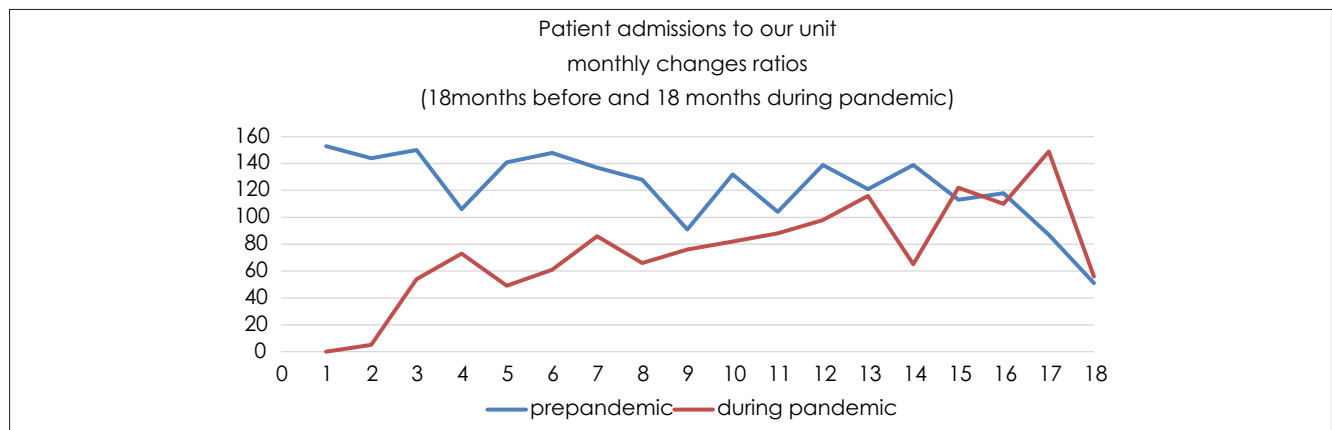


Figure 1. Monthly changes of admissions.

Table 2. The Distribution of Diagnoses of Patients Admitted to the Developmental Pediatrics Unit Before and During the Pandemic

Diagnosis	Before Pandemic	During Pandemic	P
	n (%)	n (%)	
Prematurity	354 (32)	233 (30)	.534
Speech delay	193 (17.4)	175 (23)	.003
Down syndrome	128 (11.6)	50 (6.6)	<.001
Neurosurgical diseases	105 (9.5)	71 (9.3)	.910
Neurological diseases	75 (6.8)	46 (6)	.529
Genetic/congenital/metabolic diseases	76 (6.9)	72 (9.5)	.041
Others	176 (15.9)	114 (15.6)	.590
Total	1107	761	

similar, and most of the patients were in the early childhood period.

It has been reported that the number of hospital admissions of non-COVID-19 patients has decreased worldwide due to the COVID-19 pandemic. In a study conducted in 4 large academic medical centers in the USA, it was observed that both the follow-up of healthy children in the pediatric age group and the hospital admission of children with chronic diseases decreased significantly during the pandemic period.¹⁵ In a study comparing the admissions to the pediatric emergency department before and during the pandemic period in India, it was found that the admissions decreased by 65% during the pandemic.¹⁶ According to a study conducted in an adult emergency department in Turkey, it was observed that the number of emergency admissions decreased by half during the pandemic period compared to the pre-pandemic period. In another study, a 50% decrease was reported in admissions to the pediatric psychiatrics outpatient clinic during the pandemic process.^{17,18} In line with the literature, in our study, the number of admissions to our DPU decreased at a ratio of one-third during the pandemic period.

In our study, prematurity was the most common reason for admission before and during the pandemic. This may be due to the fact that our unit is located in a medical center in eastern Turkey, which has a fairly large neonatal intensive care unit and is considered a regional hospital. In a longitudinal and observational study evaluating the number and diagnoses of patients who were referred to 2 DPUs by other specialties, in Turkey, between 2010 and 2017, prematurity was found to be the most frequently referred patient group to the developmental pediatric unit, with a ratio of 32%.¹⁹ Also, in another study that included 46 neonatal intensive care units in 17 countries, including Turkey, no statistically significant difference was found in the admission to the neonatal intensive care unit during the pandemic compared to the same period in the previous year.²⁰

In our study, it was determined that the admissions with speech delay increased proportionally during the pandemic (17.4% before the pandemic and 23% during the pandemic, respectively). This increase may be due to the stay-at-home strategies applied during the pandemic process, the increase in

screen exposure, and the lack of stimulus in the home environment. Studies on this subject show that screen exposure in early childhood, when the brain development is the fastest, is associated with delays in cognitive, language, and socioemotional domains. This situation is known to develop secondary to the direct effects of rapid progression of the images on the screen on the developing brain, the decrease in the interaction between parents and children when the screen is on, and poor family functionality.²¹⁻²³ In this context, a study, conducted on children between the ages of 3 and 10 years in Turkey, determined that screen exposure in the pediatric age group increased significantly during the pandemic period compared to the pre-pandemic period regardless of sociodemographic data.²⁴ Two separate studies evaluating the relationship with speech delay and screen exposure found that the duration of screen exposure in the first 6 months was correlated with low cognitive and language development at 14 months²³ and that screen exposure of 2 hours or more per day before the 12th month caused speech delay 6-fold more compared to the control group,²⁵ respectively. Similar to our study, in a study conducted in Chile, 2 separate cohort groups were compared and a delay in language development was found in preschool children who experienced the pandemic process.²⁶

As a result of the comparisons made in our study, it was incidentally found that the ratio of males admitted with speech delay was higher compared to females, in both periods, and this was attributed to the fact that difficulties with developmental delay were experienced more commonly by males in general.²⁷ In support of this data in our study, in a longitudinal cohort study involving 1600 caregiver-child pairs, which included children between the ages of 0 and 5 years, in the USA, a significant delay was found in the cognitive and language development of children born during the pandemic compared to children born in previous years. In this study, boys were found to be affected more than girls.²⁸ In a study conducted by Collet et al.²⁹ in France, the relationship between screen exposure and language development was investigated in 167 children with primary language disorders, between the ages of 3.5 and 6.5 years. It was found that 83.3% of the children were exposed to screen before the age of 2, and the ratio of delay in language development was found to be 2.4 times higher in boys compared to girls. In addition, in the same study, the ratio of delay in language development was found to be 6 times higher in children exposed to the screen compared to the control group.

In addition to all these negative effects, the pandemic caused high levels of psychogenic pressure and anxiety due to the risk of death, the rapid spread of the infection, the easy transmission from person to person, and the high mortality rate.³⁰ Along with the pandemic, mental health problems such as anxiety and depression also began to appear in parents and caregivers.³¹ One of the important findings of our study was the decrease in the number of admissions with the diagnosis of Down syndrome during the pandemic (11.6% before the pandemic and 6.6% during the pandemic). According to the CDC data, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2) infection progresses more severely in patients with Down syndrome, due to frequent comorbidities such as cardiac problems, immunodeficiency, obesity, type 1 diabetes

mellitus, and being vulnerable and susceptible to respiratory tract infections. This decrease in the admissions was attributed to the anxiety and awareness of the parents of children with Down syndrome about the transmission of the infection.^{32,33}

Another data we obtained incidentally from our study is that the admissions of patients diagnosed with genetic/congenital/metabolic diseases increased during the pandemic process. Whether this situation is directly caused by COVID-19 infection or whether there is another underlying factor should be supported by further studies.

The strengths of this study are that it was carried out in our DPU, which is 1 of the 2 existing DPUs in our country, and for this reason, it is an indispensable opportunity for children and their families in Turkey, which is considered to be a low- and middle-income country.^{7,19} Therefore, in this study, the data of a center focused directly on infancy and early childhood were scanned. In addition, it covers a period of 3 years, including pre-pandemic and pandemic period, and in this respect, the data analyzed in our study present a fairly large population. The main limitation of this study is that it is a retrospective study conducted at a single center with predominantly rural population in the east of Turkey, and therefore the data we obtained cover the population in our city and neighborhood and cannot be generalized to the whole of Turkey. On the other hand, the fact that our city is far from its neighbors may also be one of the factors affecting the study population, due to the curfews in the pandemic. In addition, another limiting factor is that, since our study was retrospective, it could not be specified which diagnosis such as cognitive delay, stimulus deficiency, or autism spectrum disorder developed in our follow-up patients who were admitted to our unit with speech delay.

CONCLUSION

Millions of children worldwide still experience negative childhood experiences such as chronic health problems, low socioeconomic conditions, child neglect and abuse, and low education level of caregivers.³⁴ Although significant improvements have been achieved in early childhood developmental assessments, intervention programs, and policies, these services for children at risk of failing their developmental potential are still insufficient and unfortunately not evenly distributed among countries. There is an urgent need for early childhood development services to address the growing global burden of children who will not reach their lifetime development potential in terms of health, academic success, and economic gain, especially in low- and middle-income countries.⁵ In fact, the challenges including prematurity, Down syndrome, speech delay, and other developmental delays we have addressed in our study are the tip of the iceberg. In order to detect children who do not have access to the existing health system, whose speech delay cannot be detected until they reach school age, who cannot access special education services due to transportation limitations or economic conditions, who are at risk of developmental delay, or who need special care, family physicians, pediatricians, developmental pediatricians experts, and health policy makers should take responsibility.

In our study, the decrease in hospital admissions in the patient group with developmental difficulties, whose developmental delay diagnosis, follow-up, and treatment must be done regularly during the pandemic process, may suggest the need to include additional methods such as tele-health applications in daily practice for the follow-up of these patients. Currently, increasing interest of families in digital media resources such as mobile applications, online videos, interventions from patient portals and podcasts, and their turn to and satisfaction with virtual environments in behavioral interventions, especially due to the pandemic, supports this hypothesis.^{35,36} The results of a systematic review study conducted on this subject showed that technology-based programs focusing on the socioemotional development of children in low- and middle-income countries have promising effects on parenting.³⁷ Especially due to the pandemic the interest of families in digital media resources such as mobile applications, online videos, interventions from patient portals and podcasts, and satisfaction with virtual environments in behavioral interventions have increased. The results of a systematic review showed that technology-based programs focusing on the socioemotional development of children in low- and middle-income countries have promising effects on parenting.³⁵⁻³⁷ In our study, the decrease in hospital admissions in the patient group with developmental difficulties, may suggest the need to include additional methods such as tele-health applications in daily practice for regular follow-up of these patients.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of İnönü University (Approval No: 2022/2965, Date 25.01.2022).

Informed Consent: Verbal informed consent was obtained from the patients who agreed to take part in the study.

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