

Changes in Developmental-Behavioral Pediatric Referral Trends from a non-Western Country during the Covid-19 Pandemic

Emel Omercioglu (✉ emelomercioglu@gmail.com)

Hacettepe University Faculty of Medicine Department of Pediatrics , Division of Developmental Pediatrics

Ayse Mete Yesil

Hacettepe University Faculty of Medicine Department of Pediatrics , Division of Developmental Pediatrics

Hanife Avci

Hacettepe University Faculty of Medicine Department of Biostatistics

Elif N. Ozmert

Hacettepe University Faculty of Medicine Department of Pediatrics , Division of Developmental Pediatrics

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Abstract

Objectives

The global spread of COVID-19 and associated policies have caused negative factors at the level of children, families, and services, resulting in physical, mental, and developmental issues in children, as well as limited access to healthcare. We evaluated the referral numbers, sources, and trends of a developmental-behavioral pediatrics (DBP) department in Turkey as a Eurasian country, as well as the effects of the COVID-19 pandemic on referral variables.

Methods

This longitudinal observational research examined patient referral data to Hacettepe University Developmental-Behavioral Pediatrics Department (HUDPD) between 2014 and 2021. We analyzed the changes in the number of referrals over time in 3-month intervals using negative binomial regression models (NBR). The impact of the COVID-19 pandemic on referral reasons was evaluated.

Results

The overall number of referrals increased by 1.040-fold [95% confidence interval (CI) 1.015–1.067] per year. There was a 1.070 (95% CI: 1.033–1.110)-fold increase per year before the pandemic, and a 1.077 (95% CI: 0.933–1.24)-fold increase afterward. Referrals for perinatal-neonatal risks were 1.359 (95% CI: 1.269–1.456) times higher than in the pre-pandemic period, and those for suspected autism were 1.209 (95% CI: 0.987–1.478) times higher.

Conclusion

Although it is encouraging that our referral trends have improved in the 1.5 years since the COVID-19 pandemic, it is thought that health service constraints caused a considerable increase in prenatal risk and suspicion of autism referrals following the pandemic. Improvement and innovation in healthcare systems to prevent the long-term detrimental impacts of periodic interruptions in healthcare on children's development and behavior is needed.

Introduction

Early childhood is a sensitive developmental period, and it's known that all interventions that will reduce developmental risks and increase resilience in this period have positive effects on health, academic skills, and economic productivity in adulthood [1]. Currently, primary healthcare providers have a key role during developmental follow-ups but they frequently do not have the competence to promote early childhood development due to the deficiency of educational curricula [2]. However, most of the parents stated that

developmental issues were more frequently addressed during primary healthcare services than by pediatricians [3]. Time constraints, inadequate reimbursements, staffing shortages, and a lack of knowledge concerning are the most critical problems that pediatricians experience when completing developmental screenings [4]. All of these demonstrate the need for regulations in health systems, and it's emphasized that cooperation between health, education, and financial sectors is required to improve early childhood development globally.

Developmental behavioral problems affect approximately 15% of children in high-income countries (HICs), and this rate is expected to be higher in low-middle-income countries (LMICs) [5]. Pediatricians are crucial in preventing, identifying, and properly referring these conditions. The American Board of Medical Specialties accepted the developmental-behavioral pediatrics (DBP) sub-specialty in 1999, despite long-standing conflict concerning department task definitions, particularly between representatives of psychiatry, neurology, and developmental and behavioral pediatric divisions [6]. There are comprehensive studies evaluating the workforce and referral volumes of the department, as well as revealing its competition with other pediatric subspecialties in HICs [5, 7, 8]. In countries where DBP was newly established, comparable research is currently limited [9]. Almost all developmental pediatricians work in academic medical centers as in Turkey, and these institutions are unique facilities for training and supporting pediatric residents in all patient visits, and for establishing collaborations with other disciplines [8, 10].

Since 2020, the COVID-19 pandemic has affected the entire world, and data on the long-term effects of such outbreak periods, particularly on the growth and development of children, are limited. COVID-19, which is predicted to have devastating effects on early childhood development, caught countries off guard, upsetting their healthcare infrastructure. The public's access to health services has been restricted as a result of both government's closure measures and policies aimed at reducing population movement, as well as the resulting economic challenges [11]. Access to health and support services, including early intervention, has grown more limited for at-risk children who are socioeconomically, culturally, and geographically disadvantaged and have developmental issues [12, 13]. High-Risk Infant Follow-Up (HRIF) programs highlight the importance of monitoring the effectiveness of clinical services, which have been interrupted during the pandemic, on neonatal outcomes [14]. Pediatric emergency applications decreased by about half during the pandemic, whereas child mental health applications increased [12]. It is critical to investigate changes in a clinical service capacity, patient referrals, and reasons for hospital admissions throughout the pandemic period, which is full of uncertainty. Examining referrals to child health professionals for developmental and behavioral issues allows policymakers to develop long-term strategies through a better understanding of the consequences of this process.

This study aimed to investigate the referral volume, sources, reasons and trends of the DBP department, including the COVID-19 pandemic process as well as the factors influencing these trends, in one of Turkey's largest academic centers, which is one of the countries where DBP has been established.

Methods

The Department of DBP was established in 2013 at Hacettepe University Medical Faculty Hospital. All pediatric subspecialties, as well as child and adolescent psychiatry, otolaryngology, language-speech unit, physical medicine and rehabilitation are addressed at Hacettepe University İhsan Doğramacı Children's Hospital, which has an annual capacity of 250,000 pediatric outpatient admissions. The department provides services to families and children based on family-centered strategies. The primary patient group is children aged between 0 and 6 years who have developmental risks and delays.

Referral data for Hacettepe University Developmental-Behavioral Pediatrics Division (HUDPD) between May 1st, 2014, and October 21st, 2021, were used in this longitudinal observational study. The researchers entered the patients' referral dates, ages, sexes, and referral sources into the database. Referral resources were classified as general pediatrics, pediatric subspecialties, and non-pediatric departments. Self-referrals were not included in the study, that is, these numbers only represent referrals from other specialists. The main reasons for referrals were grouped with the researchers' collaborative decisions after reviewing the content and taking into account the American Academy of Pediatrics (AAP)-identified potential reasons for referrals to the DBP [15]. Changes in referral sources and reasons were initially investigated on an annual basis, followed by a review of the trend of change over time since 2019, both before and after the COVID-19 pandemic. This study was approved by the Ethics Committee of Hacettepe University Faculty of Medicine (GO 21/1261).

Statistical analysis

The age and sex of children referred to HUDPD, as well as the quantity and distribution of referrals, were analyzed using descriptive statistics. Negative binomial regression (NBR) analyses were performed to determine whether there was a statistically significant increase in the number of referrals over time. The NBR model was selected over Poisson regression because the overdispersion parameters for each model were statistically significant. We analyzed the changes in the number of referrals over time for the general pediatric outpatient clinic, neonatology, pediatric genetics, and pediatric metabolism departments that request the most referrals, in 3-month periods between 2014 and 2021, using NBR models. The effect of COVID-19 on perinatal risk and autism spectrum disorder risk was calculated with 95% confidence relative risk. The statistical analyses were performed using R 4.1.2 with the MASS package's glm.nb function.

Results

After excluding self-referrals, over approximately 8 years, 8412 children were referred to HUDPD. There were 59.5% boys and 40.5% girls among the children, and the median age was 18 months. The departments that requested the most referrals were the general pediatric outpatient clinic (31.0%), neonatology (28.2%), metabolism (9.8%), and genetics (9.8%), respectively (Table I). Child and adolescent psychiatry (3.9%) and otolaryngology (3.0%) had the most referrals among non-pediatric departments. Other pediatric subspecialties, pediatric surgical branches, and non-pediatric departments all had referral rates of less than 3%. Patients were referred to HUDPD due to perinatal and neonatal risks (33.5%),

speech delay (15.7%), a likelihood of developmental delays (14.1%), and developmental evaluation of patients with metabolic disorders (7.0%), respectively (Table II).

Between 2014 and 2021, the number of referrals increased from 302 in 2014 to 1394 in 2021. Even though the referrals from the last two months were not considered, the highest number of referrals was reached in 2021. The number of referrals reduced after the COVID-19 pandemic began in 2020. Comparing the number of referrals over the last 3 years, Fig. 1 shows that there was a considerable drop in referrals during the 3-month lockdown period following March 2020, the start of the outbreak and then began to rise. NBR analysis was used to examine the trend in the number of referrals from 2014 to 2021, and the increase in annual referrals was statistically significant (Fig. 2). The overall number of referrals increased by 1.040-fold [95% confidence interval (CI): 1.015–1.067] per year in comparison with the previous year. The same analysis was performed for the periods before and after March 2020, when the COVID-19 cases first appeared in our country, and there was a 1.070 (95% CI: 1.033–1.110)-fold increase per year before the pandemic, and 1.077 (95% CI: 0.933–1.24)-fold increase afterward.

The annual increase in the number of referrals for the pediatric outpatient clinic (Fig. 3a) and neonatology (Fig. 3b) departments, which had the highest referral volumes, was statistically significant, according to the NBR model. Referrals to the pediatric outpatient clinic increased by 1.047 fold (95% CI: 1.019–1.076) year on year, and neonatology increased by 1.125 fold (95% CI: 1.053–1.201).

Following the pandemic, the number of referrals for infants and children at risk due to perinatal and neonatal history was 1.359 (95% CI: 1.269–1.456) times higher than before the pandemic. Furthermore, it was encountered that the number of children referred with a diagnosis or suspicion of autism was 1.209 (95% CI: 0.987–1.478) times higher after the pandemic.

Discussion

This study reveals the referral trends of the DBP sub-specialty, which provides training, research, and service within one of Turkey's largest and best-equipped academic institutions. Furthermore, the study had to include the COVID-19 pandemic periods to evaluate the possible effects of the pandemic on developmental and behavioral issues, particularly in developing countries.

DBP training and services persisted in a few centers, one of which was an academic facility, throughout the period when referrals to HUDPD were examined between 2014 and 2021. In Turkey, a similar two-center study reported an annual 1.18-fold increase (95% CI: 1.09–1.28) in DBP referrals between 2010 and 2017 [9]. Even though it was established as the third DBP center in the years that followed, annual referrals to HUDPD increased by 1.040-fold (95% CI: 1.015–1.067), indicating a significant expansion of division recognition and workforce. Additionally, given that the number of referrals in longitudinal studies evaluating the DBP workforce trend in HICs has mostly remained constant in recent years, it's clear that the demand for DBP training programs, research, and services continues to grow in countries where DBP was recently established [7, 8].

The general pediatric outpatient clinic, which requests the most referrals from our division, has shown a significant increase in annual referrals. In a comprehensive study conducted in the United States of America (USA), pediatric generalists were responsible for the majority of referrals to the DBP for both time points [7]. This improvement in awareness is quite encouraging, given the critical requirement of a developmental perspective in pediatrics and the lack of knowledge of pediatric residents on psychological and developmental issues [4, 15, 16]. We believe that time and rotation training was the most effective factors in this trend in referrals. As a result, the establishment of DBPs in developing countries, the increase in the number of training and service institutions, and subsequently, the support and collaboration of DBP specialists with young pediatricians throughout their residency training in chronic/inpatient follow-ups, as well as DBP rotations, allows them to improve their necessary knowledge and skills about developmental issues before serving in primary care [10].

The neonatology department was one of the most frequent referral sources, with perinatal risks remaining a common reason for referral and this findings were consistent with other studies in Turkey [17]. In HICs, the number of neonatal follow-up referrals is relatively low [7]. This condition in developing countries is likely to be attributed to an increase in risky babies caused by the inability to entirely remove maternal social, environmental, and biologic risk factors, as well as improved neonatal survival and a lack of health services in rural regions [18, 19]. There is a definite need for policies that will improve mother and newborn health as well as health services. The most common reasons for referral, after perinatal issues, were children with speech delays and developmental delay risk. A longitudinal study of pediatricians' developmental screening and referral trends in the USA reported that most referrals to a developmental or medical specialist were due to developmental delays in milestones and global developmental delays [4].

Neurologists, child psychiatrists and DBP professionals frequently collaborate in the care of children with behavioral, developmental, and learning difficulties, which have become much more common worldwide [15]. The multidisciplinary nature of DBP education and practice is essential. Unfortunately, since the establishment of DBP, specialists working in this discipline have remarked that they face competition with other pediatric subspecialists and practice constraints due to a lack of clinical support from other professionals [5, 7, 8]. According to research, pediatric subspecialists screen and refer children and their families for psychological concerns at an extremely low rate [16]. However, it's well-known that the majority of children followed in these subspecialties have chronic medical conditions and are at high risk for developmental and behavioral problems, and family-level psychosocial stressors [20]. Most pediatric subspecialties, as well as child and adolescent psychiatry, had referral rates of less than 5% in this study. It's well-known that collaboration practices between various disciplines and professions are linked with improved health outcomes, accordingly, we need appropriate strategies to reduce potential competition, recognize DBP's education, service, advocacy, and research roles in pediatrics, and ensure effective collaborations [21]. Given that the majority of DBP specialists in countries where the division was newly established are university-based, improved awareness and collaboration of other pediatric subspecialties in these institutions will eventually have a positive influence on primary care services.

The policies associated with the global COVID-19 pandemic caused negative factors at the level of children, families, and services, led to physical, mental, and developmental issues in children, increased parental anxieties and household stress, and restricted access to healthcare [12]. The pandemic has resulted in a decline in vaccine orders and vaccination admissions, according to reports from the Centers for Disease Control and Prevention (CDC) [22]. Diminished vaccine administrations and, interruptions in well-child follow-up could preclude the diagnosis of developmental delays and referral to early intervention programs for children, who are the most vulnerable to the pandemic's devastating effects [23]. These potential morbidities in children are likely to occur more frequently in developing countries, where healthcare restrictions and economic challenges are more severe. In this study, there was a significant decrease in the number of referrals after March 2020; however, by October 2021, the number of referrals had recovered to its prior trend. This demonstrates that the pandemic's detrimental effects on access to healthcare are being mitigated. Furthermore, as compared with the pre-pandemic period, the increase in referrals due to perinatal risk was a remarkable finding in our research. As shown by studies, pregnant women are minimizing their pregnancy follow-up checkups because of concerns about the danger of COVID-19 infection [24], and they are feeling significant psychological symptoms, particularly depression and anxiety symptoms, as a result of pandemic-related conditions [25]. Additionally, access to healthcare may have negatively affected maternal, fetal, and neonatal health [12, 26], increasing the number of risky babies and the requirement for follow-up.

Identifying Autism Spectrum Disorder (ASD), an increasingly prevalent disorder worldwide, and enrolling children in early intervention services improves outcomes and reduces long-term costs for families and governments [27]. Even though the necessity of face-to-face field evaluations in the autism diagnostic process is well known, the barriers and solutions in autism examinations during the outbreak are being challenged all over the world [28]. Clinic access for children with suspected or diagnosed autism may be further prolonged in developing countries where healthcare interruptions and social inequalities are more severe and telehealth services cannot be structured. The accumulation of children who cannot receive health services due to these disadvantages may be the cause of the 1.209-fold increase in referrals requested from HUDPD with the suspicion of autism after the pandemic. Children have lost opportunities for social interaction with their peers during the pandemic, and their social skills have regressed. Parent-child interactions were also damaged by the chaotic home environment caused by school closures, parental jobs lost, economic challenges, or the requirement of working from home [23]. Furthermore, during the pandemic, children's screen time has increased [29]. Significant longitudinal research has indicated that long screen time is associated with ASD and autism-like symptoms [30]. All of these potential consequences could have resulted in an increase in DBP referrals for suspected autism. The potential impact of the COVID-19 outbreak on the prevalence of autism, a current health issue, will take time to determine, and our study's findings draw attention to this topic.

One of the study's strengths is that HUDPD is one of the three major academic institutions providing residency training and family-centered services in the field of DBP in Turkey and it analyses patient referrals over an 8-year period. The changes in the numbers and reasons for referrals, as well as the departments that request them, over time, indicate that developing strategies and collaborations for both

our department and countries where DBP will be re-established is recommended. Another strength of our study is that it is the first to evaluate DBP referrals during the COVID-19 pandemic, and demonstrating the pandemic's potential deleterious impacts on early childhood, including at-risk children. The aspect that it was a single-center study can be considered a limitation, despite the fact that it was conducted in one of the rare and comprehensive academic centers where a DBP clinic is located.

Conclusion

We believe that time and assistant rotations were the most critical factors in the significant increase in referrals following the establishment of the DBP department. To effectively meet awareness and referral increases, interdisciplinary collaborations should be established and practices that will improve productivity should be planned, given the limited DBP workforce in countries where the division is newly established. Although it's encouraging that our referral trends have improved in the 1.5 years since the COVID-19 pandemic, it's thought that health service constraints caused a considerable increase in prenatal risk and suspicion of autism referrals to our department following the pandemic. Identifying the pandemic's indirect effects is critical for policymakers. Governments in developing countries should improve their healthcare systems to prevent the long-term detrimental impacts of periodic interruptions in healthcare on children's development and behavior.

Abbreviations And Acronyms List

ASD Autism spectrum disorder

CI Confidence interval

DBP Developmental-behavioral pediatrics

HIC High-income countries

HUYPD Hacettepe University Developmental-Behavioral Pediatrics Department

LMIC Low-middle-income countries

NBR Negative binomial regression

USA United States of America

Declarations

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Conflict of Interest: All authors declare that they have no conflict of interest.

Authors' Contributions: Emel Omercioglu design the data collection instruments, collected data, and reviewed the manuscript. Elif Ozmert conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript. Emel Omercioglu, Ayse Mete Yesil and Hanife Avci design the data collection instruments, collected data, carried out the statistical analyses, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. Emel Omercioglu will be the corresponding author.

Ethics approval: This study was approved by the Ethics Committee of Hacettepe University Faculty of Medicine (GO 21/1261).

References

1. Black MM, Walker SP, Fernald LCH, Andersen CT, DiGirolamo AM, Lu C, McCoy DC, Fink G, Shawar YR, Shiffman J (2017) Early childhood development coming of age: science through the life course. *The Lancet* **389**(10064):77–90
2. Ertem IO and World Health Organization (2012) Developmental difficulties in early childhood: prevention, early identification, assessment and intervention in low-and middle-income countries: a review.
3. Yoldaş TÇ, Özmert EN, Bayazıt Y, Tanrikulu B, Yetim H, Çakır B (2021) Developmental concerns, parental perceptions and missed opportunities from different levels of health centers in a middle-income country. *The Indian Journal of Pediatrics* **88**(1):16–22
4. Lipkin PH, Macias MM, Baer Chen B, Coury D, Gottschlich EA, Hyman SL, Sisk B, Wolfe A, Levy SE (2020) Trends in pediatricians' developmental screening: 2002–2016. *Pediatrics* **145**(4)
5. Bridgemohan C, Bauer NS, Nielsen BA, DeBattista A, Ruch-Ross HS, Paul LB, et al. A workforce survey on developmental-behavioral pediatrics. *Pediatrics*. 2018;**141**(3).
6. Haggerty RJ, Friedman SB. History of developmental-behavioral pediatrics. *Journal of Developmental & Behavioral Pediatrics*. 2003;**24**:S1-S18.
7. Roizen NJ, Ruch-Ross HS, Bauer NS, Nielsen BA, DeBattista A, Paul LB, Roizen N (2021) Developmental-Behavioral Pediatrics 13 Years After the First Board Certification: Evolving Subspecialty. *Journal of Developmental & Behavioral Pediatrics* **42**(2):83–90
8. Rimsza ME, Ruch-Ross HS, Clemens CJ, Moskowitz WB, Mulvey HJ (2018) Workforce trends and analysis of selected pediatric subspecialties in the United States. *Academic pediatrics* **18**(7):805–812
9. Bingoler Pekcici EB, Dogan DG, Akin EO, Buyukavci A, Akpinar F, Hayran G, Arslan N, Doganay B, Ertem IO (2021) Referral Trends in Two Pioneering Developmental-Behavioral Pediatric Centers in Turkey. *Journal of Developmental & Behavioral Pediatrics* **42**(3):227–233
10. Stein RE (2015) Are we on the right track? Examining the role of developmental behavioral pediatrics. *Pediatrics* **135**(4):589–591

11. Roberton T, Carter ED, Chou VB, Stegmuller AR, Jackson BD, Tam Y, Sawadogo-Lewis T, Walker N (2020) Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. *The Lancet Global Health* **8**(7):e901-e908
12. Goldfeld S, O'Connor E, Sung V, Roberts G, Wake M, West S, Hiscock H (2022) Potential indirect impacts of the COVID-19 pandemic on children: a narrative review using a community child health lens. *Medical Journal of Australia*
13. Eapen V, Hiscock H, Williams K (2021) Adaptive innovations to provide services to children with developmental disabilities during the COVID-19 pandemic. *Journal of Paediatrics and Child Health* **57**(1):9–11
14. Panda S, Somu R, Maitre N, Levin G, Singh AP (2021) Impact of the Coronavirus Pandemic on High-Risk Infant Follow-Up (HRIF) Programs: A Survey of Academic Programs. *Children* **8**(10):889
15. Weitzman CC, Baum RA, Fussell J, Korb D, Leslie LK, Spinks-Franklin AIA, Voigt RG (2022) Defining Developmental-Behavioral Pediatrics. *Pediatrics* **149**(4)
16. Green C, Stein REK, Storfer-Isser A, Garner AS, Kerker BD, Szilagyi M, Hoagwood KE, Horwitz SM (2019) Do subspecialists ask about and refer families with psychosocial concerns? A comparison with general pediatricians. *Maternal and child health journal* **23**(1):61–71
17. Bingoler Pekcici EB, Sucakli A, Elitok K, Onat FN, Kivilcime M, Ustunyurt Z, Mustafayev R, Ertem O (2020) Addressing early childhood development and developmental difficulties in Turkey: a training program for developmental pediatrics units. *Archivos Argentinos de Pediatría* **118**(4):e384-e391
18. Vaivada T, Gaffey MF, Bhutta ZA (2017) Promoting early child development with interventions in health and nutrition: a systematic review. *Pediatrics* **140**(2)
19. Olusanya BO, Davis AC, Wertlieb D, Boo NY, Nair MKC, Halpern R, Kuper H, Breinbauer C, De Vries PJ, Gladstone M (2018) Developmental disabilities among children younger than 5 years in 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Global Health* **6**(10):e1100-e1121
20. Perrin JM, Anderson LE, Van Cleave J (2014) The rise in chronic conditions among infants, children, and youth can be met with continued health system innovations. *Health Affairs* **33**(12):2099–2105
21. Kelly DP (2013) Interdisciplinary collaborative future for developmental-behavioral pediatrics: barriers and opportunities. *Journal of Developmental & Behavioral Pediatrics* **34**(7):523–528
22. Santolli JM (2020) Effects of the COVID-19 pandemic on routine pediatric vaccine ordering and administration—United States, 2020. *MMWR. Morbidity and mortality weekly report* **69**.
23. Irwin M, Lazarevic B, Soled D, Adesman A (2022) The COVID-19 pandemic and its potential enduring impact on children. *Current opinion in pediatrics* **34**(1):107–115
24. Doncarli A, Araujo-Chaveron L, Crenn-Hebert C, Demiguel V, Boudet-Berquier J, Barry Y, Gomes Do Espirito Santo ME, Guajardo-Villar A, Menguy C, Tabai A (2021) Impact of the SARS-CoV-2 pandemic and first lockdown on pregnancy monitoring in France: the COVIMATER cross-sectional study. *BMC pregnancy and childbirth* **21**(1):1–11

25. Iyengar U, Jaiprakash B, Haitzuka H, Kim S (2021) One year into the pandemic: a systematic review of perinatal mental health outcomes during COVID-19. *Frontiers in Psychiatry* **12**:845
26. Yoshikawa H, Wuermli AJ, Britto PR, Dreyer B, Leckman JF, Lye SJ, Ponguta LA, Richter LM, Stein A (2020) Effects of the global coronavirus disease-2019 pandemic on early childhood development: short-and long-term risks and mitigating program and policy actions. *The Journal of Pediatrics* **223**:188–193
27. Fuller EA, Kaiser AP (2020) The effects of early intervention on social communication outcomes for children with autism spectrum disorder: A meta-analysis. *Journal of Autism and Developmental Disorders* **50**(5):1683–1700
28. Zwaigenbaum L, Bishop S, Stone WL, Ibanez L, Halladay A, Goldman S, Kelly A, Klaiman C, Lai MC, Miller M (2021) Rethinking autism spectrum disorder assessment for children during COVID-19 and beyond. *Autism Research*
29. Aguilar-Farias N, Toledo-Vargas M, Miranda-Marquez S, Cortinez-O'Ryan A, Cristi-Montero C, Rodriguez-Rodriguez F, Martino-Fuentealba P, Okely AD, del Pozo Cruz B (2021) Sociodemographic predictors of changes in physical activity, screen time, and sleep among toddlers and preschoolers in Chile during the COVID-19 pandemic. *International journal of environmental research and public health* **18**(1):176
30. Heffler KF, Sienko DM, Subedi K, McCann KA, Bennett DS (2020) Association of early-life social and digital media experiences with development of autism spectrum disorder–like symptoms. *JAMA pediatrics* **174**(7):690–696

Tables

Table I. Numbers of Referrals According to Departments from 2014 to 2021

	<i>n (%)</i>
General pediatric outpatient clinic	2608 (31.0)
Neonatology	2373 (28.2)
Metabolism	827 (9.8)
Genetics	824 (9.8)
Child and adolescent psychiatry	329 (3.9)
Otolaryngology	256 (3.0)
Neurology	190 (2.3)
Allergy	168 (2.0)
Gastroenterology	149 (1.8)
Endocrine	100 (1.2)
Pulmonology	98 (1.2)
Cardiology	82 (1.0)
Hematology and oncology	69 (0.8)
Immunology	66 (0.8)
Plastic and Reconstructive Surgery	60 (0.7)
Pediatric infectious diseases	57 (0.7)
Pediatric surgery clinics (pediatric surgery, orthopedics, neurosurgery, cardiovascular surgery, and urology)	54 (0.6)
Emergency	40 (0.5)
Others (Nephrology, Rheumatology, Pediatric intensive care unit, Physical medicine and rehabilitation)	35 (0.4)
Ophthalmology	27 (0.3)
Total	8412 (100.0)

Table II. Referral Reasons from 2014 to 2021

<i>Reasons</i>	<i>n (%)</i>
Infants and children at risk due to perinatal and neonatal history	2820 (33.5)
Speech delay	1319 (15.7)
Children at risk of developmental delays	1182 (14.1)
Developmental evaluation of patients with metabolic disease	589 (7.0)
Feeding difficulties	542 (6.4)
Developmental evaluation of patients with a genetic syndrome	535 (6.4)
Global developmental delay	445 (5.3)
Autism diagnosis or suspicion	425 (5.1)
Behavioral problems	240 (2.9)
Motor development delays	181 (2.2)
Sleep problems	75 (0.9)
Problems with toilet habits	46 (0.5)
Children considered as being gifted	13 (0.2)
Total	8412 (100.0)

Figures

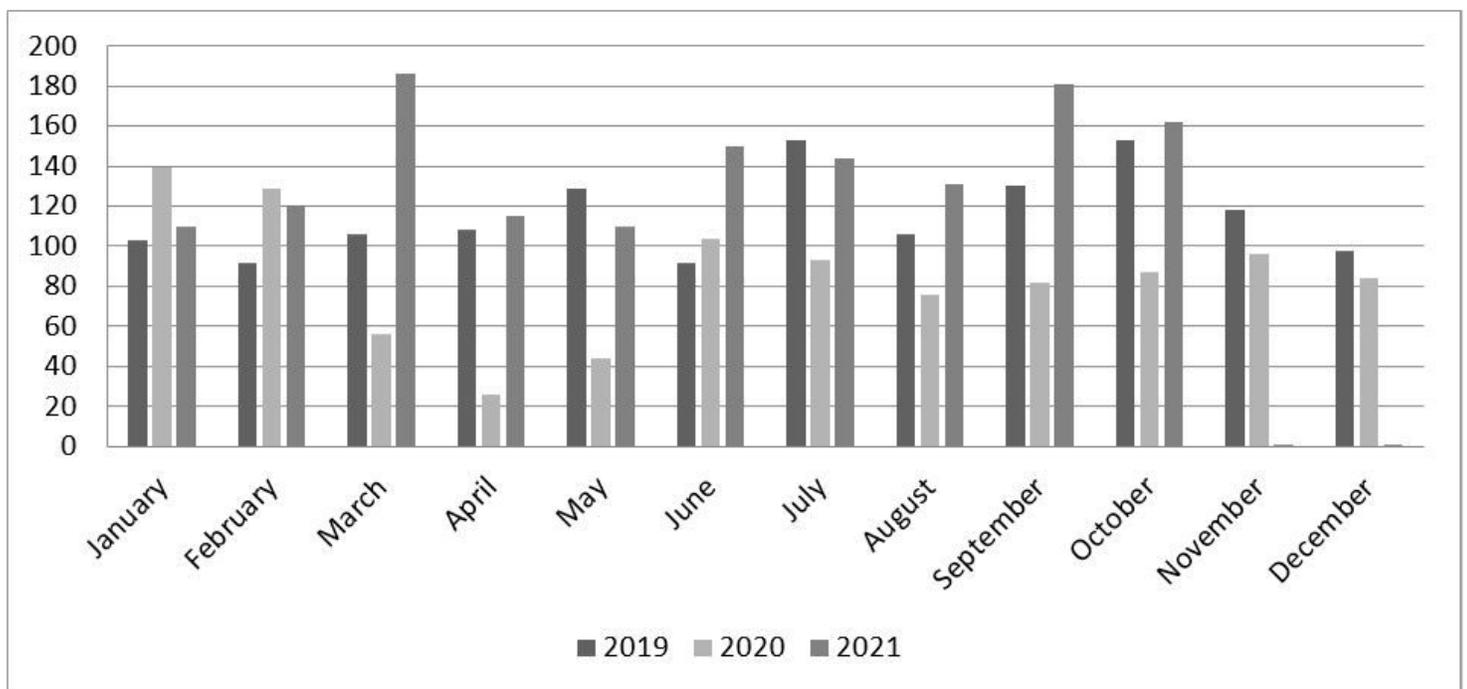


Figure 1

Monthly Distribution of children referred between 2019-2021 (before, during and after the COVID-19 pandemic)

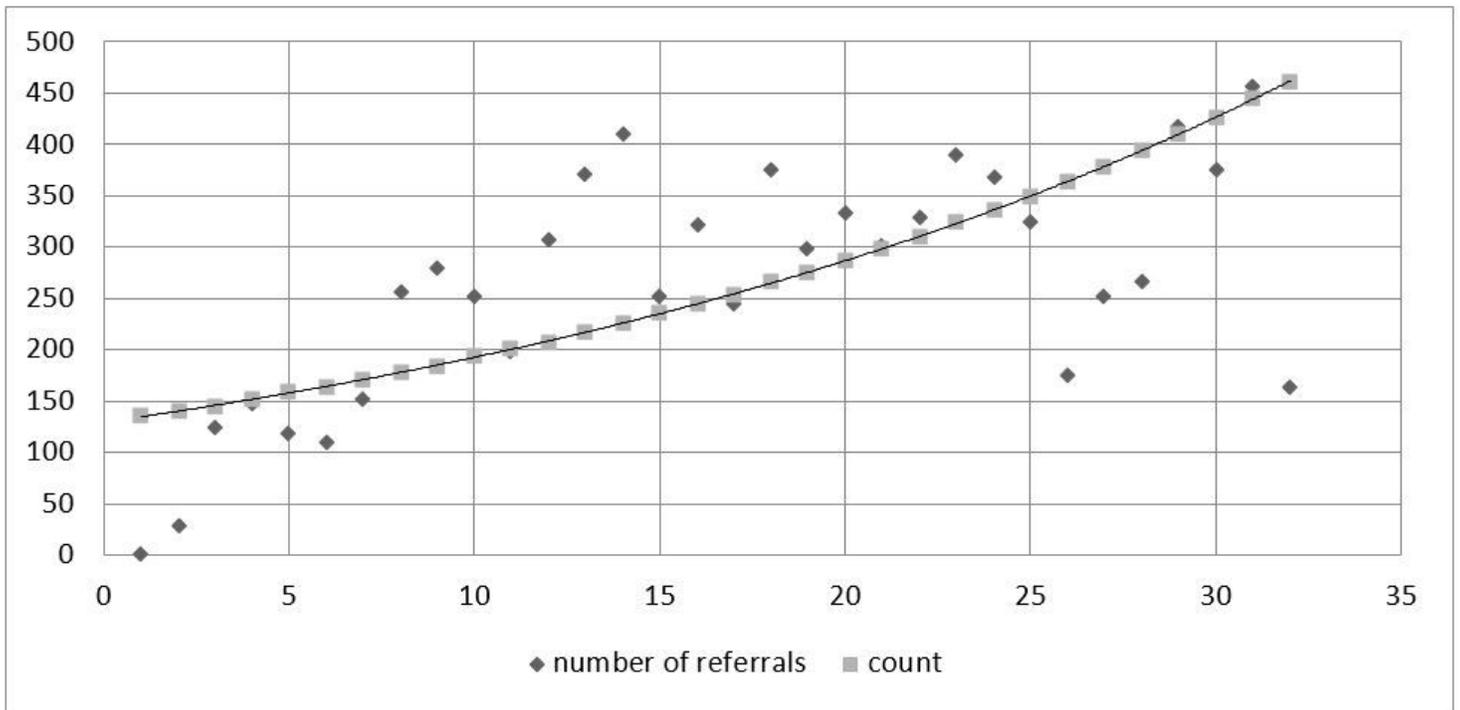
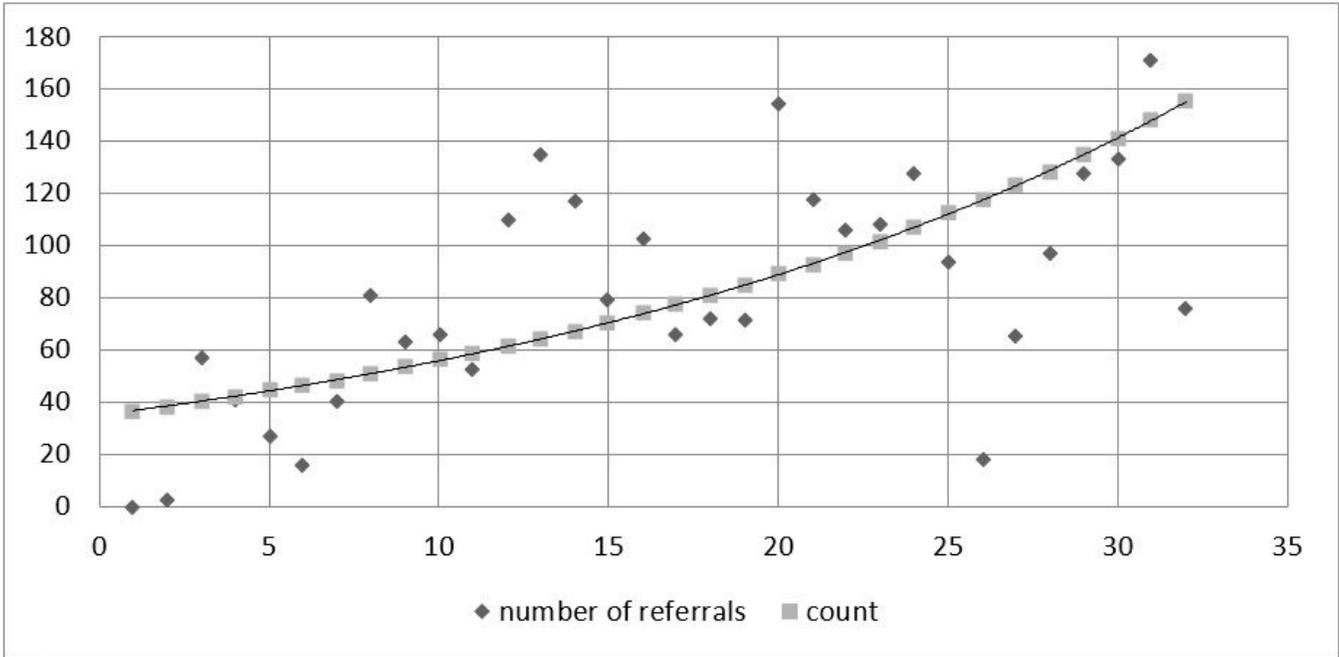
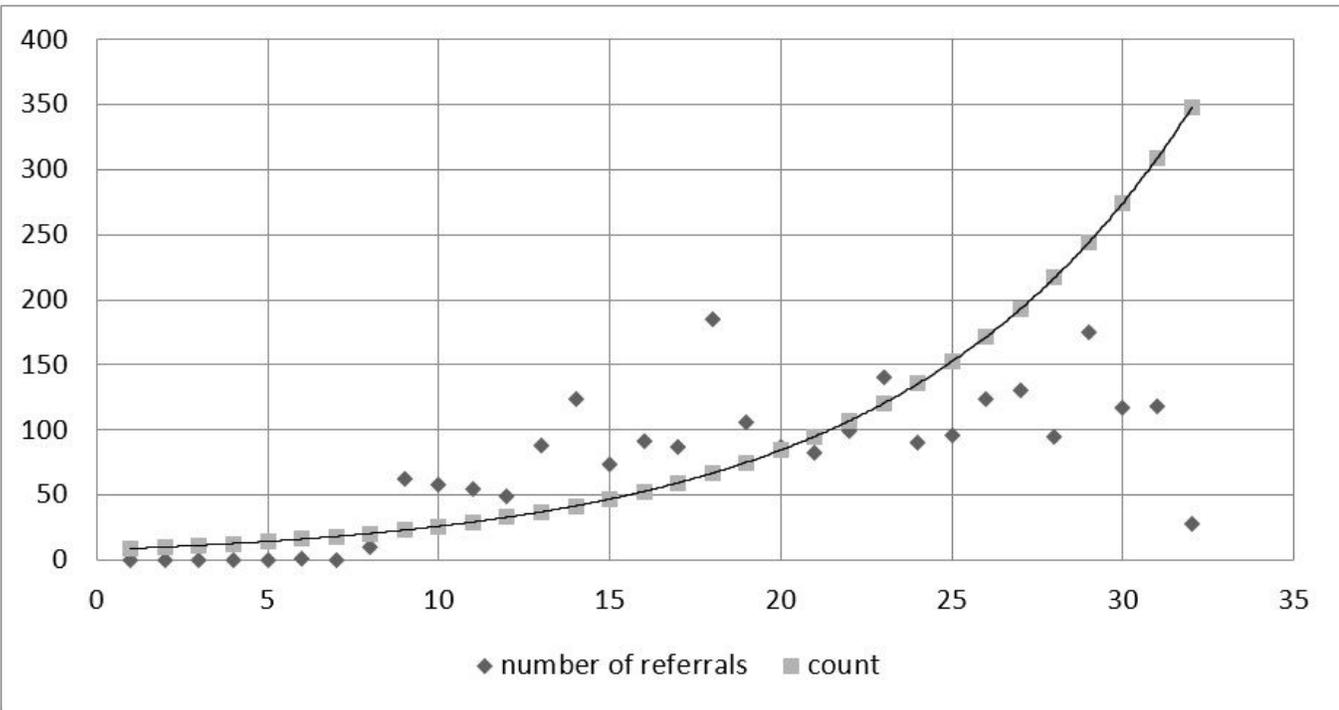


Figure 2

Negative binomial regression models for total referral trends (2014-2021)



3a



3b

Figure 3

3a. Negative binomial regression models for pediatric outpatient clinic referral trends

3b. Negative binomial regression models for neonatology referral trends