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RESEARCH ARTICLE

Evaluation of Pediatric Patient Admissions and Outcomes in Adult Intensive Care Units Over a 5-Year Period

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ABSTRACT

Objective: This study aimed to outline the demographic characteristics and mortality rates of pediatric patients managed in the adult intensive care units (ICUs) of Giresun Training and Research Hospital from 2018 to 2023.
Methods: We conducted a retrospective review of records pertaining to 74 patients aged between 6 months and 18 years who were admitted to our ICU and received treatment for 24 h or more. Data collected included patient age, gender, diagnosis, APACHE II scores, requirement for mechanical ventilation, length of stay, Glasgow Coma Scale scores, and mortality rates.
Results: Among the patients included, 59.4% were male, with an average age of 7.79±5.7 years. Most admissions were due to trauma (n = 57, 77.02%). The mean ICU stay was 3.78±3.37 days, and out of the 70 patients who completed their follow-up at our hospital, 4 (5.71%) died.
Conclusions: Similar to global trends, a significant proportion of pediatric intensive care cases in our country are managed in adult ICUs. Mortality and morbidity vary based on the severity of the patient's condition. Consideration should be given to implementing training programs for adult ICU teams until the availability of pediatric ICU beds and specialists is adequate.

Keywords: Pediatric intensive care, adult intensive care, mortality

INTRODUCTION

Pediatric intensive care units (PICUs) are specialized facilities dedicated to the continuous monitoring and support of critically ill infants, children, and adolescents. These units necessitate a larger complement of staff and equipment compared to other medical clinics. As per the 2020 update to the Regulation on the Implementation Principles and Procedures of Intensive Care Services in Healthcare Facilities, pediatric intensive care is described as follows: "Intensive care units (ICUs) for patients older than 28 days but not yet 18 years old, taking into account their age on the application date. These units are equipped with all basic monitoring methods such as ECG, rhythm monitoring, oxygen saturation, blood pressure, pulse, and temperature. They are capable of fluid and blood product replacement, intubation, cardiopulmonary resuscitation, and the initial stabilization of the patient. These units primarily address single organ failure, and they can provide supportive treatments such as hemodialysis and mechanical ventilation" (1).

In essence, PICUs are essential in providing comprehensive care of severely ill pediatric patients, offering a wide array of monitoring and life-support measures. The primary reasons for PICU admissions typically include respiratory issues, neurological conditions, and cases of poisoning, with pediatricians, anesthesiologists, and various surgical teams commonly overseeing their monitoring and treatment. To mitigate mortality and morbidity rates, it is recommended that critically ill pediatric patients receive care in specialized PICUs tailored to their specific needs (2).

The first PICU was established in 1955 at the Goteborg Children's Hospital in Sweden (3). Despite significant advancements globally and within our country, marked by increased technological capabilities and knowledge, the current availability of PICU beds remains insufficient to meet demand.

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When pediatric intensive care services are unavailable, there is a necessity for monitoring and treatment within adult ICUs. Data from 2006 indicates that 56% of pediatric patients receive treatment in adult ICUs (2). In 2014, the Pediatric Intensive Care Association reported that Turkey had a pediatric population of 23 million, yet only 600 pediatric intensive care beds were available, with just 29 pediatric intensive care specialists (4). As of 2022, the Ministry of Health announced that there are now 2,308 pediatric intensive care beds (5). In 2014, the Ministry of Health stated that 570–600 pediatric intensive care specialists would be required for the planned 1,138 pediatric intensive care beds. Consequently, addressing the shortage of pediatric intensive care specialists would necessitate several years to ensure continuous 24/7 coverage.

In our study, we evaluated the demographic characteristics, mortality rates, distribution of attending physicians, and requirement for mechanical ventilation among pediatric patients treated in the adult ICUs of Giresun University Training and Research Hospital from January 2018 to December 2023. Our objective was to highlight the difficulties associated with managing pediatric patients in adult ICUs, the resultant effects on mortality, and the imperative for comprehensive planning and targeted objectives in addressing these challenges.

MATERIAL AND METHODS

All patients aged between 6 months and 18 years who were admitted during the 5-year period from January 1, 2018, to December 31, 2023, were considered for inclusion, except for those lacking medical records and staying in the ICU for less than 24 h. Each admission was treated as a distinct case. We collected demographic information including age, gender, reason for admission, type of trauma, Acute Physiology and Chronic Health Evaluation-II (APACHE II) scores, and need for surgical intervention and mechanical ventilation. Additionally, we documented the duration of mechanical ventilation, mortality outcomes, and the attending physician for each patient.

Table 1: Distribution of the attending physician and admission diagnosis

Characteristics	n=74
Admission diagnosis	
Trauma n (%)	57 (77.02%)
Foreign body aspiration n (%)	8 (10.81%)
Spontaneous pneumothorax n (%)	3 (4.05%)
Hydrocephalus n (%)	2 (2.70%)
Drowning n (%)	2 (2.70%)
Epilepsy n (%)	1 (1.35%)
Septic shock n (%)	1 (1.35%)
Attending physician	
Pediatric surgeon n (%)	35 (47%)
Neurosurgeon n (%)	24 (32%)
Anesthesiology and Reanimation n (%)	15 (20%)

Table 2: Clinical characteristics of the patients

Characteristics	n=74
Age (years, mean±SD)	7.79±5.7
Male gender n (%)	44 (59.4%)
Mechanical ventilation (Required patients)	21 (28.37%)
Duration of mechanical ventilation (days, mean±SD)	2.76±3.01
GCS on admission (mean±SD)	12.84±3.91
GCS on discharge (mean±SD)	14.86±0.86
APACHE-II score (mean±SD)	6.63±6.11
Length of stay (days, mean±SD)	3.86±3.55
Mortality (non-survivors, n (%)	4 (5.71%)

GCS:Glasgow coma score, APACHE-II: Acute Physiology and Chronic Health Evaluation

Data analysis

The findings were presented using numerical values and percentages (%). Age, (APACHE II) score, and duration of mechanical ventilation were reported as mean ± standard deviation.

RESULTS

A total of 79 patients admitted to our ICUs were analyzed through the hospital information management system. After excluding 5 patients with unavailable data and those staying less than 24 h, 74 patients were included in the study. Among these patients, 59.4% were male, with an average age of 7.79±5.7 years. Of the admissions, 57 (77.02%) were due to trauma, with 35 patients having undergone surgery. Specifically, 35 patients were admitted by the pediatric surgery department, 15 by the anesthesia and reanimation department, and 24 by the neurosurgery department.

The primary reasons for ICU admission were trauma (77.02%), foreign body aspiration (10.81%), and spontaneous pneumothorax (4.05%). Intracranial trauma was the most common condition among trauma patients. The average Glasgow Coma Scale (GCS) at ICU admission was 12.84 ± 3.91, increasing to 14.96 ± 0.17 at discharge. Among the patients, 21 (28.37%) required mechanical ventilation, with an average duration of 2.76±3.01 days. Of those intubated, 11 (52.38%) were successfully weaned. Four patients were transferred to the PICU in other hospitals for specialized care. The average ICU stay was 3.78±3.37 days.

The calculated APACHE II scores within the first 24 h were 6.63±6.11. Out of the 70 patients who completed their follow-up at our hospital, 4 (5.71%) died.

DISCUSSION

Reasons for admission to the PICU can vary based on the patient demographic of the served population. Given that the province housing Giresun University Training and Research Hospital lacks a dedicated PICU, pediatric patients are typically managed

in adult ICUs. Patients requiring advanced intensive care, particularly those diagnosed with respiratory and neurological conditions, are often referred to PICUs in other facilities. Consequently, the predominant reasons for admission among pediatric patients admitted were trauma or postoperative complications. An analysis of 124 studies revealed a higher admission rate to PICUs for males, potentially indicating lower overall mortality among females in PICU settings (6). Orhan et al. reported a male gender ratio of 51.7% among 938 patients, while Konca and colleagues found a ratio of 56.3% among 770 patients (7-8). In our study, the male gender ratio was 59.4%, aligning closely with existing literature.

Length of ICU stay varies based on admission reasons. In our ICU, where trauma cases are frequent, the average length of stay was 3.86±3.55 days. Prolonged hospitalization in the PICU is influenced by factors such as diagnosis, comorbidities, procedures, severity scores, complications, and the need for mechanical ventilation upon admission (8-9). Indications for mechanical ventilation in pediatric patients include inadequate oxygenation, altered consciousness, need for airway protection, and circulatory failure. Mechanical ventilation need is directly linked to mortality irrespective of the underlying condition. While consensus is lacking on the duration defining prolonged mechanical ventilation, less than 14 days is generally considered non-prolonged. In our study, 21 patients required mechanical ventilation, with an average duration of 2.76 ± 3.01 days.

In a survey by the Turkish Association of Pediatric Emergency and Intensive Care in 2005, PICU mortality was 14% across 16 PICUs (10). Mortality rates in Turkish PICUs range from 2.4% to 34.4%, influenced by factors such as the presence of fellowship-trained specialists, team experience, unit equipment, and admission reasons (7-8, 11). Mortality rates have decreased in recent decades with advancements in treatment methods, monitoring, and knowledge (12). A retrospective study involving 106,464 patients found a 4% mortality rate, with 15% of deceased children expiring within the first 24 h (13). High mortality during these critical hours underscores the importance of emergency services, especially adult ICUs, in stabilizing vital signs and providing maintenance support until patient transfer to the PICU is feasible. Mortality rates in adult ICUs tend to be higher due to elderly and comorbid patients. In a developing country, a PICU mortality rate exceeding 10% may suggest the application of intensive care treatment without proper prognosis and indication (7).

Various scoring systems are utilized in PICUs to predict mortality rates. Notably, the APACHE II, Pediatric Risk of Mortality (PRISM), and Pediatric Index of Mortality (PIM) are extensively studied. Ağın et al.'s research found that the modified APACHE II mortality scoring system demonstrated superior accuracy in predicting death rates compared to APACHE II, PRISM, and PIM scoring systems (14). At our hospital, APACHE II scores are routinely recorded, with an average score of 6.63±6.11 observed in the study. However, due to insufficient number of deceased patients, we could not evaluate the relationship between mortality and APACHE II scores.

In developing countries, trauma ranks the second leading cause of death in children aged 1–4 years, following infections, while in developed countries, it stands as the primary cause of death in children aged 1–14 years (15). Head trauma is frequently encountered among trauma cases and often leads to trauma-related mortality and morbidity (16). Consistent with our findings, head injury emerged as the most prevalent type of trauma in our study. Patients with a low GCS score upon admission tend to experience prolonged stays and increased mortality rates (17). In our study, all deceased patients were admitted with head trauma, with a GCS score of 3 upon admission.

Pediatric patients in our study were primarily admitted by pediatric surgeons, neurosurgeons, and anesthesia and reanimation specialists. Like many countries, 56% of pediatric patients receive treatment in adult ICUs due to the inadequate capacity in pediatric intensive care beds (2). Recognizing this reality, it is crucial for the entire intensive care team to possess comprehensive knowledge of normal physiological values in pediatric patients and the anatomical and physiological distinctions between children and adults. Seamless implementation of protocols for basic and advanced life support, airway management, respiratory and circulatory stabilization, sedoanalgesia, and fluid-electrolyte and nutrition maintenance treatments is essential.

In conclusion, a significant portion of pediatric patients in our country continues to be managed in adult ICUs. Until an adequate number of PICUs and specialists are available to mitigate mortality and morbidity rates, establishing specialized adult intensive care teams for pediatric patient care in centers could be effective. To this end, the Ministry of Health could organize training programs for anesthesiologists, resuscitation specialists, neurosurgeons, and selected nursing teams primarily involved in caring for pediatric patients in ICUs.

Ethics Committee Approval: This study was approved by the Clinical Research Ethical Committee of Giresun Training and Research Hospital (Number: KAEK-255, Date: 2023-12-04).

Informed Consent: Informed consent was not obtained as it was a retrospective study.

Author Contributions: Conception/Design of Study- A.B.; Data Acquisition- İ.T., F.A.B.; Data Analysis/Interpretation- A.B., M.B.; Drafting Manuscript- A.B., M.B.; Critical Revision of Manuscript- A.B., M.B.; Final Approval and Accountability- A.B., F.A.B., İ.T., M.B.

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REFERENCES

1. https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=15146&MevzuatTur=9&MevzuatTertip=5.
2. Köksal G, Karaören G, Tütüncü Ç, Polat Ç, Alkan F, Tunalı Y, Öz H. Our 13 year- review of pediatric patients in intensive care.

Cerrahpaşa Tıp Dergisi, 2018, 42(1):94-97 doi:10.26650/cjm.2018.42.1.4.

3. Levin D, Downes JJ, Todres ID. History of pediatric critical care medicine J Pediatr Intensive Care. 2013 Dec;2(4):147-167. doi: 10.3233/PIC-13068.
4. https://cayd.org.tr/files/turkiye-de-cocuk-yogun-bakimi-hekim-insan-gucu-raporu-2015-xt.pdf
5. Sağlık İstatistikleri Yıllığı 2022 Haber Bülteni, T.C. Sağlık Bakanlığı Sağlık Bilgi Sistemleri Genel Müdürlüğü 2023
6. Almossawi O, Friend A, Palla L et al. Is there a sex difference in mortality rates in paediatric intensive care units?: a systematic review. Front Pediatr. 2023 Oct 9:11:1225684. doi: 10.3389/fped.2023.1225684.
7. Orhan MF, Yakut İH, İkiz MA. Evaluatıon of 938 ınpatıents for 2 years ın pedıatrıc ıntensıve care unit. Turkish J Pediatr Dis 2012;6:228-31.
8. Konca Ç, Tekin M, Karakoç F, Turgut M. The Evaluation of 770 Patients in Pediatric Intensive Care Units: A Single Center Experience. Turkish Journal of Pediatric Disease. DOI: 10.12956/tjpd.2015.120
9. Alshaikh R, AlKhalifah A, Fayed A, AlYousef S. Factors influencing the length of stay among patients admitted to a tertiary pediatric intensive care unit in Saudi Arabia. Front Pediatr. 2022 Dec 19:10:1093160. doi: 10.3389/fped.2022.1093160.
10. Pediatric Intensive Care Services in Turkey, 2006. Turkish Association of Pediatric Emergency and Intensive Care.
11. Tutanç M, Başarslan F, Karcıoğlu M, Yel S, Kaplan M, Arıca S et al. Evaluation of Patients Hospitalized in Pediatric Intensive Care Unit. 2011, Volume: 13 Issue: 3, 18 - 22, 01.12.2011
12. Botan E, Gün E, Şden EK, Yöndem C, Gurbanov A, Balaban B et al. Characteristics and timing of mortality in children dying in pediatric intensive care: a 5-year experience. Acute Crit Care. 2022 Nov;37(4):644-653. doi: 10.4266/acc.2022.00395. Epub 2022 Nov 11.Johnson KT, Görges M, Murthy S. Characteristics and Timing of Mortality in Children Dying With Infections in North American PICUs.Pediatr Crit Care Med. 2021 Apr 1;22(4):365-379. doi: 10.1097/PCC.0000000000002667.
13. Shann F, A Argent. Pediatric intensive care in developing countries,in Pediatric Critical Care, B.P. Fuhrman and J.J. Zimmerman, Editors.2006, C.V. Mosby: Philadelphia.
14. Ağin H, Büyüktiryaki M, Atlihan F, Asilsoy S, Bak M. A Novel Scoring System for Pediatric Intensive Care Unit Patients: Modified APACHE II and Comparison with Other Scoring Systems. Türkiye Klinikleri. Tip Bilimleri Dergisi: Turkiye Klinikleri Journal of Medical Sciences; Balgat Vol. 30, Iss. 5, (2010): 1611-1621.
15. Grinkeviciüte DE, Kevalas R, Saferis V, Matukevicius A, Ragaisis V, Tamasauskas A. Predictive value of scoring system in severe pediatric head injury. Medicina (Kaunas), 2007;43:861-9.
16. Melo JR, Di Rocco F, Lemos-Júnior LP, Roujeau T, Thélot B, Sainte-Rose C, et al. Defenestration in children younger than 6 years old: mortality predictors in severe head trauma. Childs Nerv Syst, 2009; 25(9):1077-1083.
17. George EC, Walker AS, Kiguli S, et al: Predicting mortality in sick African children: The FEAST Paediatric Emergency Triage (PET) score. BMC Med 2015; 13:1–12

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RESEARCH ARTICLE

Serum Iron, Zinc, and Vitamin A Levels in 2-to-6-Year-Old Children with Small or No Appetite

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ABSTRACT

Objective: This study aimed to compare height, weight measurements and serum iron, serum zinc, and serum vitamin A levels of children identified as having small/no appetites by their parents, with healthy controls.

Methods: The research has been designed as a prospective study involving children ages 2-6 years who have been identified as having small or no appetite by their parents, as well as healthy controls from the same age group. After obtaining the informed consent forms, the parents filled out the questionnaire that includes questions about their sociodemographic parameters and children's eating behaviors. The children's medical and family history were taken and their physical examinations regarding systems, height, and weight were examined. The study also evaluated the children's hemoglobin, serum iron, serum zinc, and serum vitamin A levels. For both groups, the study excluded children who were born prematurely, who had a family history of chronic drug use or chronic disease, who had abnormal laboratory tests, or who received pathological findings from their physical examination. The study uses the package program SPSS 15.0 package program for statistical comparisons, the chi-squared test for qualitative variations, and the Student's t test and Mann-Whitney U test for quantitative variations with a value of $p<0.05$ being considered significant. The study also obtained ethical approval from the regional ethical committee.

Results: The study group includes 54 children (50% female, 50% male), and the control group includes 53 children (59% female, 41% male), each group having similar age and gender distributions. Children with weight and height above the 75th percentile are more common in the control group (28% and 30%, respectively) than among the anorexic children group (2% and 4%, respectively; $p=0.002$). The study group's serum iron and serum zinc levels are lower than the control group's ($p=0.026$, $p=0.002$, respectively). The two groups had similar serum vitamin A levels ($p>0.05$).

Conclusions: Although most children defined as having a small appetite continue to grow normally, evaluating them in terms of iron and zinc deficiencies and supporting them is appropriate in essential cases.

Keywords: Children, appetite, iron, vitamin A, zinc

INTRODUCTION

Appetite is the desire for food. Loss of appetite is the inability to perceive hunger (1). By the end of the second year of life during childhood, nutrient requirements and appetite decline as somatic and brain development slow down. This can lead to picky eating behaviors in children. This physiological decrease in appetite causes concern among parents regarding their children receiving inadequate nutrition (2). Although many children develop and eat normally, they are brought to the physician because they cannot meet the family's demands. A child can be proven to receive adequate nutrition using growth curves that demonstrate normal development, and this alleviates parental concerns (2).

Poor appetite and eating problems lead to medical referrals in 20-35% of healthy children (2-4). While 24% of children have eating problems at the age of two, this percentage is around 17-185 for those aged 3-4 years (5). Limited knowledge is still found regarding the impact loss of appetite has on children's growth, with few long-term studies occurring on this topic (3-7).

A number of organic and social factors can have an impact on a child's appetite. Iron deficiency anemia (IDA) is the most common childhood anemia, with poor appetite a prominent clinical finding (8,9). Additionally, zinc has been reported to be able to impact appetite, with lack of appetite being one symptom of a zinc deficiency (10-12). Animal studies have shown a lack of vitamin A to be able to lead to a reduced

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appetite due to vitamin A affecting both central and taste functions (13-15).

The objective of this study is to assess the growth and iron, zinc, and vitamin A levels in the serum of pre-school children observed by their parents to have small or no appetite and to compare them with children of the same age with normal appetites.

MATERIAL AND METHODS

The study has been conducted as a prospective, cross-sectional, case-control study at the Pediatric Outpatient Clinic of the University of Health Sciences Ankara Training and Research Hospital. The study group consists of 54 children between the ages of 2-6 years who were admitted to the hospital due to poor appetite as reported by their parents. The control group (Group 2) consisted of 53 children who visited the outpatient clinic for a general exam and laboratory tests, which is required by the institution before starting kindergarten, or for routine health check-ups. Group 2's parents reported their children's appetites as normal. The study excluded patients who had low birth weights, were born prematurely, had a family history of chronic drug use or chronic disease, or had abnormal laboratory findings.

After completing the children's examinations and analyses, the investigators interviewed the parents face-to-face during the same visit and asked them about their demographic characteristics, whether the child had been breastfed or not, the duration of breastfeeding in children who had been, the time complementary foods started being added, which food groups the child preferred, which food groups they do not like (the parents were informed that more than one group could be marked), snacking habits, whether the parents gave the children multivitamins or not, and how the parents described their child's appetite. Families' monthly income levels were classified according to data from the Confederation of Turkish Workers' Trade Unions (16). The height (cm) and weight (kg) of the children in the study and control groups were measured by the same researcher using the same scale and height measuring device, with the values being recorded as percentiles (17). Blood samples were taken for a hemogram test and serum iron, serum zinc, and serum vitamin A level tests and sent directly to the laboratory without delay. The immunoturbidimetric method was used to determine serum iron and serum zinc levels at a wavelength of 570-700 using the Olympus AU 2700 from Japan and the Randox kit from the UK. The normal ranges for erythrocyte indices were determined based on the reference values provided for the corresponding age and gender (18). Recommended normal ranges for serum zinc levels were used as a reference (19).

Vitamin A levels were determined by high-performance liquid chromatography (HPLC) (Agilent 1100, Germany; kit-chromsystems, Germany). The reference values for serum vitamin A levels were used to determine the normal ranges for that age group (20).

Written informed consent was obtained from parents for participation in the study. The study adheres to the ethical standards outlined in the 1975 Declaration of Helsinki, as revised in 2000 by the Committee on Human Experimentation. The study received ethical approval from the Local Ethics Committee (Approval No. 3640 dated on 10/26/2011).

The package program SPSS 15.0 was used to analyze the statistical data. The Kolmogorov-Smirnov test was used to calculate the distribution of the data. Normally distributed parameters (i.e., hemoglobin, zinc, and vitamin A levels) were expressed as mean±standard deviation. Non-normally distributed parameters (i.e., age, duration of breastfeeding and vitamin D, age when complementary foods were added to breastfeeding, iron levels) were expressed as median (minimum-maximum). Statistical comparisons were made using the chi-squared test for qualitative variables, while the Student's t test and Mann-Whitney U test was used for the correlation analyses of the quantitative variables. Statistical significance was defined as $p<0.05$.

RESULTS

The median age of the 107 children included in the study is 4 years (2-6 years). No difference was found between the two groups in terms of age or gender ($p>0.05$; Table 1). Parents reported that poor appetite had been present since birth in 22 (40.7%) of the 54 children with small or no appetite. All families in the study had an income below the starvation threshold.

More children in the control group had weights and heights above the 75th percentile than the children with small or no appetite ($p=0.002$; Table 1).

The children's least favorite food group was vegetables, and their most favorite was fruit. Children with small or no appetite were found to be less likely to prefer vegetables compared to the controls ($p=0.005$; Table 2). No significant relationship was found for food preference with gender; age; maternal education level; weight and height percentiles; and hemoglobin, serum iron, serum zinc, and serum vitamin A levels ($p>0.05$). Children's preference for milk and fruit was observed to decrease as the father's level of education increased ($p=0.029$). Six of the eight parents (75%) of children who did not like fruit reported giving their child appetite syrup ($p=0.001$).

Serum iron and serum zinc levels were found to be lower in children with small or no appetite compared to the control group ($p=0.026$; $p=0.002$, respectively; Table 3). In addition, the proportion of children with low serum iron and serum zinc levels was statistically higher in children with small or no appetites compared to the control group (48% vs. 28%; 13% vs. 2%, respectively), while no difference was found between the two groups' vitamin A levels. A positive correlation has been found between serum iron and serum zinc levels ($p=0.024$; $r=0.218$).

No statistically significant difference was found for the hemoglobin, serum iron, serum zinc, and serum vitamin A levels with several factors (i.e., gender, age, parental education,

Table 1: Characteristics of children with poor appetite (Group 1) and controls (Group 2)

	Total (n= 107) (%)	Group 1 (n=54) (%)	Group 2 (n=53) (%)	p
Female /male (n, %)	58 /49 (54.2/45.8)	27/27 (50/50)	31/22 (59/41)	0.440
Mother's education level (n, %)				0.131
≤ 5 years	80 (75)	36 (67)	44 (83)	
6-8 years	16 (15)	10 (18)	6 (11)	
High school and above	11 (10)	8 (15)	3 (6)	
Father's education level (n, %)				0.689
≤ 5 years	66 (62)	33 (61)	33 (62)	
6-8 years	26 (24)	12 (22)	14 (27)	
High school and above	15 (14)	9 (17)	6 (11)	
Exclusive breastfeeding duration (months) [median (min-max)]	14 (0-18)	18 (0-18)	12 (0-8)	0.287
Introduction to complementary foods (months) [median (min-max)]	6 (2-18)	6 (3-18)	6 (2-10)	0.708
Vitamin D intake (n, %)	81 (75.7)	38 (70.0)	43 (81.0)	0.142
Duration of vitamin D supplementation (months) [median (min-max)]	6 (0-24)	6 (1-18)	6 (1-24)	0.205
Multi-vitamin use (n, %)	23 (21.5)	10 (18.0)	13 (24.0)	0.488
Weight (n, %)				0.002
< 10th percentile	7 (6,5)	4 (7)	3 (6)	
10-75th percentile	83 (77,5)	48 (89)	35 (66)	
> 75th percentile	17 (16)	2 (4)	15 (28)	
Height (n, %)				0.002
< 10th percentile	10 (9)	3 (6)	7 (13)	
10-75th percentile	77 (72)	47 (87)	30 (57)	
> 75th percentile	20 (19)	4 (7)	16 (30)	

Table 2: Comparison of dietary habits between children with poor appetite (Group 1) and Controls (Group 2)

	Total (n= 107) (%)*	Group 1 (n=54) (%)*	Group 2 (n=53) (%)*	p
Snacking habits (n, %)	22 (21)	10 (18)	12 (27)	0.859
Disliked foods (n, %)**				
Milk	15 (14)	9 (17)	6 (11)	0.583
Egg	18 (17)	12 (22)	6 (11)	0.273
Meat	32 (30)	17 (32)	15 (28)	0.889
Vegetables	39 (36)	26 (48)	13 (25)	0.005
Fruits	8 (7,5)	4 (7)	4 (8)	0.552
Bread	11 (10)	7 (13)	4 (8)	0.385
Cereal	18 (17)	12 (22)	6 (11)	0.290

*: Column percentage, **: More than one food group

Table 3: Comparison of hemoglobin, serum iron, zinc and vitamin A levels in children with poor appetite (Group 1) and controls (Group 2)

	Total (n= 107) (%)*	Group 1 (n=54) (%)*	Group 2 (n=53) (%)*	p
Hemoglobin (gr/dl) [median (min-max)]	12.2±0.9 (9.1-14)	12.2±0.9 (9.1-13.7)	12.3±0.9 (9.5-14)	0.729
Low (n, %)	5 (5)	3 (6)	2 (7)	1.000
Iron (µg/dl) [median (min-max)]	78 (30-140)	75 (30-140)	80 (35-140)	**0.026**
Low (n, %)	41 (48)	26 (48)	15 (28)	**0.047**
Zinc (µmol/L) [median (min-max)]	14.7±4.2 (7.3-36.7)	13.6±3.3 (9-22)	15.8±4.7 (7.3-36.7)	**0.002**
Low (n, %)	8 (7.5)	7 (13)	1 (2)	**0.042**
Vitamin A [median (min-max)]	0.9±0.2 (0.3-1.7)	0.9±0.2 (0.5-1.7)	0.8±0.2 (0.3-1.5)	0.079
Low (n, %)	24 (22)	11 (20)	13 (25)	0.649

*: Column percentage

multivitamin use, height percentile, breastfeeding, introduction of complementary foods, and eating habits (p>0.05).

Children whose weight was under the 10th percentile were found to have vitamin A levels of 0.8±0.3 µmol/l. Children whose weight was between the 10th-75th percentiles had vitamin A levels of 0.9±0.2 µmol/l, while children in the 75th or higher weight percentile had a vitamin A level of 0.7±0.1 µmol/l. Namely children in 10th-75th weight percentile had higher serum vitamin A levels compared to those in the 75th or higher weight percentiles (p=0.025).

DISCUSSION

Loss of appetite is a common complaint that causes parents to bring their children to the doctor. The impact of reduced appetite on growth remains unclear, and a limited number of long-term studies are found on this topic (3,6,7). Bekem et al. (6) assessed the nutritional characteristics of children with poor appetites and found 63.9% to be malnourished. Malnutrition was more common in children who experienced a loss of appetite before the age of seven months (6). A study was conducted to evaluate the relationship between parents' reports of their children's appetite levels and their weights two years later. The study found that children with poor appetites had body mass indexes below the baseline and remained below at the end of two years compared to children with normal or high appetite levels (7). A follow-up study examining the relationship between eating problems and children's growth found 20% of children aged 30 months to have feeding problems. Children who do not have eating problems were observed to gain more weight (3). The current study found the height and weight percentiles to be lower in the small or no appetite group than in the control group.

One third of the world's population is deficient in vitamins and minerals, especially iron, zinc, and vitamin A (21). Even without anemia, iron deficiency is known to have significant adverse health effects in children and adults, ranging from maternal and infant mortality in the perinatal period to adverse effects on children's physical and mental development and physical motor capacity (22). Iron deficiency anemia (IDA) is a major global nutritional problem that particularly affects infants, children, and pregnant women. According to the World Health Organization (WHO), about 30% of children in Türkiye have hemoglobin levels <11 g/dL (23), with this being 28% in pregnant women. A study conducted in Greece found 7.9% of children aged 12-24 months to have IDA. The study also reported children with IDA to have poor appetite, be sick more often, drink less breast milk, and consume more cow's milk and tea, as well as consume less meat, vegetables, and fruit (24). A study in China found 24.3% of preschool children to be iron deficient, with iron deficiency being more common in urban than in rural areas (25). Öktem et al. (26) conducted a study comparing the serum iron levels of two groups with different socioeconomic backgrounds: the low socioeconomic status group that was nourished on legumes and unleavened bread had lower serum iron levels than the high socioeconomic status group that was nourished on meat and leavened bread. The current study has found iron deficiencies to be present in 48% of the study group, which is higher than reported in the literature. Namely, 48% of the children with small or no appetite were found to be iron deficient, compared to 28% of the control group. Having small or no appetite is a significant indicator of being iron deficient. Iron deficiency has been reported to lead to loss of appetite due to the effect serum iron levels have on ghrelin levels, an appetite-stimulating hormone (8). Although the present study found iron deficiency to occur more frequently in children with small or no appetites than in the control group, no difference was found between the two groups regarding the presence of low hemoglobin levels and anemia. Another finding of the present study was the presence of a positive correlation between serum zinc and serum iron levels, which is in agreement with the literature (27,28).

Zinc plays a key role in the human growth, immune, and reproductive systems. Zinc deficiency causes a loss of appetite, growth retardation, skin problems, and hypogonadism (19). Zinc deficiency rates in the world are reported to range between 4-73% and average at 31%. According to zinc surveys conducted in Türkiye, approximately 25% of children have low serum zinc levels (21, 29). Zinc deficiency results from inadequate dietary intake or malabsorption and, to a lesser extent, losses due to diarrhea. Low levels of animal foods in the diet and elevated levels of phytates (i.e., absorption inhibitors) reduce zinc absorption (21). Zinc deficiency in humans has been reported to be associated with income level. A study in China found 38.2% of preschool children to have low serum zinc levels, and these levels to be lower in people living in rural areas with lower socioeconomic status compared to those living in urban areas (25). In the United States, 42.8% of 12- to 36-month-old children from low-income families were found to have low serum zinc levels. The study also found a positive correlation between zinc levels and consuming over 15 g of meat per day (30). A study conducted in Isparta compared the zinc levels of children from two schools with different socioeconomic backgrounds and found the children from lower socioeconomic backgrounds to have lower zinc levels (26). The current study found low serum zinc levels in 7.5% of all children, which is a lower frequency than in other studies despite being conducted over a very low-income population. The reason for the lower incidence of zinc deficiency in this study despite being conducted over a sample with a low economic level is believed to be able to be related to the widespread use of medications containing zinc in Turkish society, especially for children with small or no appetites.

Zinc is involved in the synthesis of neuropeptides, which are bioactive peptides. These substances have been reported have an effect in regulating food intake (29). The secretion of neuropeptide Y, a peptide involved in appetite regulation, is impaired by zinc deficiency (31). Zinc can affect appetite through its impact on the hypothalamus, ghrelin, leptin, and zinc receptors. Additionally, animal experiments have demonstrated zinc to be able to increase appetite (10). That study found serum zinc levels to be lower in the group with small or no appetites and the number of children with zinc deficiencies to be higher, and therefore suggested that zinc deficiency may be a cause of small or no appetite in preschool children.

The current study has been unable to make a comparison between groups in terms of diverse levels of income. When comparing the dietary habits of the two groups, no correlation was found between zinc levels and children's fondness for meat products. Because the current study did not calculate the amount of food consumed, it is unable to provide data on this issue.

Vitamin A plays a significant role in vision, epithelial cell differentiation, growth, reproduction, and the immune system. Low dietary intake, malabsorption, and increased excretion due to illness can lead to vitamin A deficiency (21). Groups particularly at risk of vitamin A deficiency include infants, children under 5 years of age, and women during the postpartum period when rapid growth increases daily requirements. Children under 5 years of age, especially in infancy and during puerperium, are particularly at risk of vitamin A deficiency due to rapid growth and increased daily requirements. WHO considers the prevalence of serum vitamin A levels below 0.70 µmol/l of 20% or more in preschool children and pregnant women to be a significant public health issue for that population (20). A study conducted over a low-income region of China evaluated the vitamin A levels in children under the age of five and found 20.2% of children to suffer from vitamin A deficiency and this frequency to increase with age (32). A Brazilian study found 15% of the sample with low fruit, vegetable, and meat intake to be vitamin A deficient (33). WHO conducted a study on the prevalence of serum vitamin A levels in preschool children in Türkiye and found 12.5% of children to have a serum vitamin A level under 0.70 µmol/l, indicating

a moderately high health problem in Turkish society (34). The current study also found a higher prevalence of vitamin A deficiency in children aged 2-6 years. This may be due to the low economic level of the group in which the study was conducted. Infection and iron deficiency have negative impacts on serum vitamin A levels. Iron and zinc, together with vitamin A, are required for the bidirectional functioning of many pathways, including absorption of vitamin A and minerals, retinol-binding protein synthesis, cell maturation, signaling pathways and the immune system (35). The present study found no association between vitamin A levels and serum iron and serum zinc levels. Vitamin A deficiency has been reported to cause loss of appetite in animals (13,14), with loss of appetite having been described as the earliest sign of vitamin A deficiency. In humans, however, no clear association between poor appetite and vitamin A deficiency has yet to be identified. The present study also found no relationship between the level of vitamin A and appetite. However, this study was conducted only in a low-income group. Conducting the same study over different income levels and larger groups is believed to be appropriate.

The study has several limitations. Firstly, the patients were only asked whether they were taking vitamins or not, without any further inquiry into the name, amount, or content of the vitamin preparations. Additionally, the amounts of food groups in the diet were not calculated. Finally, the study had a small sample size.

In conclusion, poor appetite is a common reason for children to be referred to a doctor. Although most children continue to grow normally, assessing their growth and development and checking for iron and zinc deficiencies are important, as well as providing treatment for necessary cases.

Ethics Committee Approval: The study received ethical approval from the Local Ethics Committee (Approval No. 3640 dated on 10/26/2011).

Informed Consent: Informed consent was obtained from the participants.

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REFERENCES

1. Saltık-Temizel. İştahsız çocuk. Çocuk Sağlığı ve Hastalıkları Dergisi 2008; 51: 176-81.
2. Carter RG, Susan Feigelman S. The preschool years. In: Kliegman RM, St Geme J, Blum NJ, Shah SS, Tasker RC, Wilson KM, editors. Nelson Textbook of Pediatrics. 21th edition, Philadelphia: Elsevier; 2020.p.143-6.
3. Phalen JA. Managing feeding problems and feeding disorders. Pediatr Rev 2013; 34: 549–57.
4. Kerzner B, Milano K, MacLean WC, Berall G, Stuart S, Chatoor I. A Practical approach to classifying and managing feeding difficulties. Pediatrics 2015; 135: 345-53.
5. Wright CM, Parkinson KN, Shipton D, Drewett RF. How do toddler eating problems relate to their eating behavior, food preferences, and growth? Pediatrics 2007; 120: e1069-75.
6. Bekem Ö, Öztürk Y, Arslan N. İştahsız çocuklarda beslenme özelliklerinin değerlendirilmesi. DEÜ Tıp Fakültesi Dergisi 2003; 17: 181-9.
7. Lee K, Song YM. Parent-reported appetite of a child and the child's weight status over a 2-year period in Korean children. J Am Diet Assoc 2007; 107: 678-80.
8. Isguven P, Arslanoglu I, Erol M, Yildiz M, Adal E, Erguven M. Serum levels of ghrelin, leptin, IGF-I, IGFBP-3, insulin, thyroid hormones and cortisol in prepubertal children with iron deficiency. Endocr J 2007; 54: 985-90.
9. Ghrayeb H, Elias M, Nashashibi J, Youssef A, Manal M, Mahagna L, et al. Appetite and ghrelin levels in iron deficiency anemia and the effect of parenteral iron therapy: A longitudinal study. PLoS One 2020 ;15:e0234209.
10. Suzuki H, Asakawa A, Li JB, Tsai M, Amitani H, Ohinata K, et al. Zinc as an appetite stimulator - the possible role of zinc in the progression of diseases such as cachexia and sarcopenia. Recent Pat Food Nutr Agric 2011; 3: 226-31.
11. Kurtoğlu S, Köklü E, Hatipoğlu N, Atabek ME. The relationship between serum ghrelin levels and hair zinc concentrations in children. J Clin Res Pediatr Endocrinol 2008; 1: 1-7.
12. Thomas DM, Mirowski GW. Nutrition and oral mucosal diseases. Clin Dermatol 2010;28:426-31.
13. Anzano Ma, Lam AJ, Olson JA. Growth, appetite, sequence of pathological signs and survival following the induction of rapid, synchronous vitamin A deficiency in the rat. J Nutr 1979; 109: 1419-31.
14. Anzano Ma, Lam AJ, Olson JA. Impaired salivary gland secretory function following the induction of rapid, synchronous vitamin A deficiency in rats. J Nutr 1981; 111: 496-504.
15. Gökçay G. A vitamin eksikliği. İçinde:Neyzi O, Ertuğul T, Darendeliler T, editörler. Pediatri. İstanbul: Nobel Tıp Kitabevleri; 2021.p. 265-7.
16. Türkiye İşçi Sendikaları Konfederasyonu [Internet]. (Erişim Tarihi: 06 Ağustos 2021). Erişim: http://www.turkis.org.tr.
17. Bundak R. Büyüme. İçinde: Neyzi O, Ertuğul T, Darendeliler T, editörler.. Pediatri. İstanbul: Nobel Tıp Kitabevleri; 2021.p.83-104.
18. Stanley FL. Reference intervals for laboratory tests and procedures. In: Kliegman RM, St Geme J, Blum NJ, Shah SS, Tasker RC, Wilson KM, editors. Nelson Textbook of Pediatrics. 21th edition, Philadelphia: Elsevier; 2020.p. e5-e14.
19. Saner G, Durmaz Ö, Özden TA. Eser elementlerle ilgili bozukluklar. İçinde: Neyzi O, Ertuğul T, Darendeliler T, editörler. Pediatri. İstanbul: Nobel Tıp Kitabevleri; 2021.p. 255-64
20. Ross AC, Tan L. Vitamin A deficiencies and excess. In: Kliegman RM, St Geme J, Blum NJ, Shah SS, Tasker RC, Wilson KM, editors. Nelson Textbook of Pediatrics. 21th edition, Philadelphia: Elsevier; 2020.p. 360-5.

21. Investing in the future: A united call to action on vitamin and mineral deficiency [Internet]. Global Report 2009. (cited 2021 September 13). Available from: URL: https://www.who.int/vmnis/publications/investing_in_the_future.pdf .
22. World Health Organization 2020 [Internet]. WHO guideline on use of ferritin concentrations to assess iron status in individuals and populations. (cited 2021 September 13). Available from: URL: https://apps.who.int/iris/handle/10665/331505 License: CC BY-NC-SA 3.0 IGO.
23. World Health Organization 2015 [Internet]. The global prevalence of anaemia in 2011. . (cited 2021 September 14). Available from: URL: https://apps.who.int/iris/bitstream/handle/10665/177094/9789241564960_eng.pdf.
24. Tympa-Psirropoulou E, Vagenas C, Psirropoulos D, Dafni O, Matala A, Skopouli F. Nutritional risk factors for iron-deficiency anaemia in children 12-24 months old in the area of Thessalia in Greece. Int J Food Sci Nutr 2005; 56: 1-12.
25. Liu J, Ai YX, Hanlon A, Shi Z, Shi Z, Dickerman B, et al. Micronutrients deficiency and associated sociodemographic factors in Chinese children. World J Pediatr 2011; 7: 217-23.
26. Öktem F, Yavrucuoğlu H, Türedi A, Tunç B. Çocuklarda beslenme alışkanlıklarının hematolojik parametreler ve eser elementler üzerine etkisi. SDÜ Tıp Dergisi 2005: 12: 6-10.
27. Ergul AB, Turanoglu C, Karakukcu C, Karaman S, Torun YA. Increased iron deficiency and iron deficiency anemia in children with zinc deficiency. Eurasian J Med 2018; 50: 34-7.
28. Kondaiah P, Yaduvanshi PS, Sharp PA, Pullakhandam R. Iron and zinc homeostasis and interactions: Does enteric zinc excretion cross-talk with intestinal iron absorption? Nutrients 2019; 11: 1885.
29. Taneli B. Anadolu toplumunda çinko. Ege Tıp Dergisi 2005; 44: 1-10.
30. Schneider JM, Fujii ML, Lamp CL, Lönnerdal B, Zidenberg-Cherr S. The prevalence of low serum zinc and copper levels and dietary habits associated with serum zinc and copper in 12- to 36-month-old children from low-income families at risk for iron deficiency. J Am Diet Assoc 2007; 107: 1924-9.
31. Levenson CW. Zinc regulation of food intake: new insights on the role of neuropeptide Y. Nutr Rev 2003; 61: 247-9.
32. Zhang JG, Zhang B, DU WW, Su C, Liu AD, Zhang J, et al. Analysis on the status of vitamin A deficiency among children under 5 years old in poor rural areas of 6 Western Chinese provinces in 2009. Zhonghua Liu Xing Bing Xue Za Zhi 2011; 32: 1224-6.
33. Garcia MT, Granado FS, Cardoso MA. Complementary feeding and nutritional status of 6-24-month-old children in Acrelândia, Acre State, Western Brazilian Amazon. Cad Saude Publica 2011; 27: 305-16.
34. Global prevalence of vitamin A deficiency in populations at risk 1995–2005 [Internet]. WHO Global Database on Vitamin A Deficiency. Geneva, World Health Organization, 2009 . (cited 2021 September 18). Available from: URL: http://whqlibdoc.who.int/publications/2009/9789241598019_eng.pdf.
35. Sheftel J, Tanumihardjo SA. Systematic review and meta-analysis of the relative Dose-response tests to assess vitamin A status. Adv Nutr 2021;12:904-41.

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RESEARCH ARTICLE

Is Nutcracker Syndrome Innocent?

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ABSTRACT

Objective: Nutcracker syndrome (NS) is defined by the compression of the left renal vein by the superior mesenteric artery. The incidence of NS and the exact treatment protocols are not well known. The objective of this study is to analyze children with NS and evaluate the prognosis in follow-up.
Methods: All patients were referred to the pediatric nephrology clinic by pediatricians because of proteinuria. The study includes 74 patients (52 girls, 22 boys) with a mean age of 13.15±2.32 and records the presenting symptoms, degree of proteinuria, and radiologic findings. The diameter ratios of the left renal vein before and after stenosis and peak systolic velocity (PSV) ratios were calculated with a Doppler ultrasound, with a peak systolic ratio of 3.0:1 or greater was accepted as the diagnostic criterion for NS.
Results: The mean age was 13.15±2.32 (5.33-17.42) years, while the mean follow-up duration was 14.6±9.1 months. Proteinuria was not correlated with the degree of compression. Most patients had a good prognosis, and none of them required medical or surgical treatment. A significant reduction or complete normalization of proteinuria was seen in more than half of the patients under conservative management.
Conclusions: Based on our findings, NS seems to have a good prognosis in children who present with isolated proteinuria.

Keywords: Proteinuria, nutcracker syndrome, renal Doppler ultrasound

INTRODUCTION

Classical anterior nutcracker syndrome (NS) results from the compression of the left renal vein (LRV) by the superior mesenteric artery (SMA) as it passes between the SMA and the abdominal aorta, thereby reducing the outflow of blood from the renal vein. Posterior nutcracker syndrome results from compression of the LRV between the aorta and the lumbar spine. This can lead to venous hypertension in the left renal vein, with the rupture of thin-walled venous structures into the collecting system able to cause repeated hematuria [1,2]. Although NS is asymptomatic in most patients, especially in children, it can also cause various symptoms and signs such as proteinuria, left flank pain, left varicocele, and pelvic congestion [2,3]. Unlike NS, the nutcracker phenomenon refers to the presence of radiological findings with no clinical and laboratory symptoms and signs. To diagnose NS in children, the primary examination to be performed is noninvasive renal Doppler ultrasound (RDUS), which is easily accessible and contains no ionizing radiation. Angiographic venous imaging techniques such as computed tomography (CT), magnetic resonance imaging (MRI), and digital subtraction angiography (DSA) can also be performed to show compression in the left renal vein, but these are expensive, laborious, time-consuming, and most importantly apart from MRI, radiation-based examinations. Orthostatic proteinuria, also called daytime proteinuria, is a common finding in NS involving the absence of proteinuria at night (i.e., while in the supine position). Treatment of NS should remain conservative in children, except in cases with severe symptoms. In addition, surgical treatment is rarely required in severe cases [4,5].

The prevalence of NS is not well known, and data about prognosis is limited. This study retrospectively compares imaging findings of pediatric patients with RDUS to their clinical and laboratory findings and aims to evaluate whether a correlation exists between the amount of isolated proteinuria and degree of renal vein stenosis. The study also analyzes the prognosis of these patients in terms of proteinuria and presenting symptoms.

MATERIAL AND METHODS

The study was conducted retrospectively. Institutional ethical committee approval was obtained beforehand (ID:2023/0123). All renal venous Doppler examinations performed on patients

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who were under 18 years of age between 2018-2023 were included in the database. Children diagnosed with NS by Doppler examination were the patients whose proteinuria etiology had been investigated in the pediatric nephrology outpatient clinic or who had been followed up for various reasons such as microscopic hematuria or hydronephrosis. The study excluded renal venous Doppler patients presenting with renal vein thrombus who also had malignancy and coagulation disorders. Renal Doppler ultrasound measurements were performed by the same radiologist with a 3.5 MHz convex array transducer using Aplio 500 (Toshiba, Otawara, Japan) in the supine position. The AP diameter (mm) and peak systolic velocity (PSV; cm/sec) of the left renal vein at its widest point, the diameter (mm) of the left renal vein in the mesoaortic segment between the SMA and the aorta, and its PSV (cm/sec) at this level were measured using the renal Doppler. The diameter ratios of the left renal vein before and after stenosis and PSV ratios were calculated, with a PSV ratio of 3.0:1 or higher being accepted as the diagnostic criterion for NS. As a result of the complete urinalysis, protein values were recorded as trace, 1+, 2+, and 3+. Age, sex, and symptoms were recorded. The presence or absence of hematuria, spot protein-to-creatinine (mg/mg) ratio, and 24-hour urine protein (mg/m2/day) were noted in the complete urinalysis. In addition, serum creatinine, complement levels, antinuclear antibody results, coagulation parameters, normal blood count, and urine culture results were recorded. Body mass index (BMI) was also calculated from the height and weight of the children. The analysis investigates the correlation between left renal vein PSV, mesoaortic PSV, flow rates, left renal vein diameter and diameter at the mesoaortic level, spot protein-to-creatinine ratio, and 24-hour urinary protein. Urinalysis and spot protein-to-creatinine ratio were performed based on first-morning urine.

Statistical analysis

Statistical analyses were performed using SPSS 22 for Windows (IBM Corp., Armonk, NY, USA). Standard descriptive statistics were used, with data being expressed as mean and SD, or median depending on whether the variables were normally distributed or not. Spearman correlation was used to examine the relationships between the parameters conforming to the non-normal distributions. Statistical significance was set as $p<0.05$.

RESULTS

The study includes a total of 74 patients (52 girls, 22 boys). The mean age was 13.15±2.32 (median: 13,25, min-max: 5.33-17.42) years, while the mean follow-up duration was 14.6±9.1 months. All patients had been referred to the pediatric nephrology clinic by pediatricians because of proteinuria. Upon the patients arrival to the pediatric nephrology outpatient clinic, 20 children had 3 positive proteinuria, 21 children had 2 positive proteinuria, 20 children had 1 positive proteinuria, and 3 children had trace amounts of proteinuria. Proteinuria was not observed in 10 children at the first outpatient clinic visit. Microscopic hematuria (27%) was found in 20 children. The spot protein-to-creatinine ratio was 0.70±0.99 mg/mg, creatinine 0.04-5.1 mg. In 32 children, the spot protein-to-creatinine ratio was between 0.2-2. A spot protein-to-creatinine ratio >2 mg/mg was detected in 6 children. The mean 24-hour urine proteinuria was found to be 9 ± 8.31 mg/m2/h (1.34-32.70) and 271.86±241.75 mg/day (40-1180 mg/day). The mean BMI was found to be 17.88±2.46 (13.6-23.8).

No patient had any clinical history of urinary tract infection, and their serum complement levels, coagulation parameters, blood count, and renal function tests were within normal limits. There was no complement consumption, and autoimmune examinations were found to be normal. Urine cultures were negative.

Table 1 shows the patients' clinical characteristics. The most common complaint (73%) at the time of admission was incidental proteinuria in asymptomatic patients.

Table 2 presents the patients' left RDUS findings. The mean left renal vein diameter at its widest point was found to be 8.63±2.12 mm and the mesoaortic level to be 2±0.535 mm.

A minimum compression ratio (CR = P/C) of 3 was found, as well as a maximum CR of 12 and a median CR of 6.

The mean left renal vein PSV was found to be 24.60±5.8 cm/sec and the mean mesoaortic level PSV was found to be 121.8±38.6 cm/sec. Patients with a minimum PSV value of 3.0 or greater

Table 1: The clinical characteristics of the patients

Complaints at the time of admission (n:74)	
Asymptomatic, incidental proteinuria	54 (%73)
Proteinuria with FMF (familial Mediterranean fever)	1 (%1,4)
Hematuria	1 (%1,4)
Detection of hydronephrosis during examination for aberrant vessels	1 (%1,4)
Proteinuria with abdominal pain	9 (%12)
Proteinuria with DM (diabetes mellitus)	2 (2,7)
Nausea	1 (%1,4)
Inability to gain weight, proteinuria	1 (%1,4)

Table 2: BMI values and Renal Doppler ultrasound findings of the patients

	Minimum	Maximum	Mean
BMI	13,6	23,8	17,88±2,46
C-PSV (cm/sec)	10	40	24,6±5,79
P-PSV (cm/sec)	47	241	212,86±3,62
PCV-R: P-PSV/C-PSV	3	12	6,61±3,01
CR: P/C	3	12	5,93±2,65

BMI: Body mass index, PSV: Peak systolic velocity, CR:P/C: minimum compression ratio

were included in the study. The mean PSV ratio of the patients included in the study was found to be 6.6. Fifty-four patients had a 4-fold or more increase in the PSV-R value. Eighteen patients had a 3-to-4-fold increase in the PSV-R value, but they were included in the study because of significant diameter differences.

Compressed peak systolic velocity (C-PSV), peak systolic velocity ratio (PSV-R), pre-compressed peak systolic velocity (P-PSV), compressed ratio (CR), spot protein/creatinine, and 24-hour urine protein were compared with the Spearman correlation test, with a correlation found only between C-PSV and 24-hour urine protein.

None of the patients had medical or surgical treatment. A significant reduction or complete normalization of proteinuria was seen in 41 patients (55.4%). In 20 children (27%), proteinuria persisted at the same level. Only two children had increased proteinuria (2.7%). At the final follow-up, proteinuria was observed in 34 children (45.9%), whereas 40 children (54%) had no proteinuria.

DISCUSSION

Nutcracker syndrome and its wide range of symptoms overlap with other clinical entities and cause complexity. As a result, it may be misdiagnosed, or the diagnosis may be delayed. Although the exact prevalence is not known, it is slightly more common in girls [6]. Most pediatric cases of NS were described in adolescent patients, with the mean age in the current study being 13 years and NS being more common in girls, which are consistent with the literature [7,8]. Frequently, NS is associated with the asthenic constitution and reduced retroperitoneal and mesenteric fat. A positive correlation was found between low-weight children and NS due to decreased abdominal fat predisposing to mesoaortic angle changes [9]. According to the variety of the degree of renal venous hypertension, the most common clinical finding is microscopic or macroscopic hematuria [6-9]. Painless microscopic hematuria is more common in NS children compared to adults [10]. Okada et al. showed that NS syndrome may be one of the important causes of hematuria [11]. Only 27% of the current study's patients had microscopic hematuria. Proteinuria was the leading symptom for diagnostic radiology, and the ratio of hematuria was found to be lower than expected. Orthostatic proteinuria is probably caused by increased pressure in the LRV and changes in renal hemodynamics upon standing, altering the release of angiotensin II and norepinephrine [12]. Abdominal pain associated with proteinuria was observed in 12% of this study's subjects, and the literature also states that both flank and abdominal pain could be seen in 10% due to the activation of the inflammatory cascade prompted by venous hypertension [13-15]. Pelvic congestion syndrome characterized by symptoms of lower abdominal pain, dysuria, pelvic and vulvar varices, and varicoceles did not present in the current study group. None of the patients had been referred from pediatric urology clinics.

Left renal Doppler ultrasound has a diagnostic sensitivity of 78% and a specificity of 100% for NS [16]. A cut-off ratio above 2.25 has been reported to have 91% sensitivity and specificity for the diagnosis of NS [17]. However, Ananthan et al. defined the classic "bird's beak" appearance of NS as a specific finding for the narrowed stenotic segment in CT/MR angiography examinations and accepted this ratio as greater than 4.9 on CT [18]. This bird's beak appearance was present in all our patients diagnosed with NS by Doppler. PSV-R may be more predictive as compression of the transducer in the supine position can produce artifacts, and peak velocities are highly variable depending on the patient's position [19]. When accepting a left renal vein PSV ratio of > 4.7 as the limit for the diagnosis of NS, the sensitivity and specificity of this ratio in children with NS were found to be 100% and 90%, respectively; however, various ratios ranging between 4.0 and 5.0 have been suggested to be important in many studies [20-24]. The current study saw the bird's beak appearance with a PSV ratio of 3.0 and above being accepted as NS.

The current study's patient group seems to be rather lean or even underweight, similar to the literature. One review found a mean BMI of 17.3 [24], while the current study's patients had a mean BMI value of 17.8. Alaygut et al. reported an increase in BMI to be directly correlated with symptom regression in their patient group [12].

The present study's patient group had a good prognosis with most of the children showing improvement in terms of proteinuria and symptoms. Treatment is controversial, and most cases are managed with conservative treatment. Young patients can have spontaneous resolution of symptoms with increased body mass index [12]. Surgery may be needed for gross hematuria and severe symptoms including abdominal pain [25]. Surgical options involved left renal vein transposition, bypass, and SMA transposition. Endovascular treatment options are also present [26]. One systematic review showed approximately 90% of NS patients to be treated conservatively and 94.9% to have had resolution of clinical symptoms [24]. For asymptomatic patients and patients without severe clinical findings, the conservative approach seems to be adequate. The same review recommended a follow-up of 2-3 years due to the possibility of an improvement or resolution over this period.

Knowledge of the presenting symptoms, radiology findings, treatment options, and prognosis has increased in recent years. This study has shown that most NS patients present with proteinuria. In the long term, patients were followed up conservatively, and remission in proteinuria was demonstrated.

Ethics Committee Approval: This study was approved by the ethics committee of İstanbul Medeniyet University (ID:2023/0123).

Informed Consent: The study was conducted retrospectively.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- S.G.B., N.G.; Data Acquisition- S.G.B.; Data Analysis/Interpretation- S.G.B., N.G. ; Drafting Manuscript- N.G.; Critical Revision of Manuscript- S.G.B., N.G.; Final Approval and Accountability- S.G.B., N.G.

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REFERENCES

1. Wolfish NM, McLaine PN, Martin D . Renal vein entrapment syndrome: frequency and diagnosis. A lesson in conservatism. Clin Nephrol 1986;26(2):96-100.
2. Pardinhas C, do Carmo C, Gomes C, Escada L, Alves R . Nutcracker Syndrome: A Single-Center Experience. Case Rep Nephrol Dial 2021;11(1):48-54. doi:10.1159/000512589.
3. K.W. Kim, J.Y. Cho, S.H. Kim, et al. Diagnostic value of computed tomographic findings of nutcracker syndrome: correlation with renal venography and renocaval pressure grandients, Eur. J. Radiol. 2010;80(3):648-54. doi: 10.1016/j.ejrad.2010.08.044.
4. Avgerinos ED, McEnaney R, Chaer RA. Surgical and endovascular interventions for nutcracker syndrome. Semin Vasc Surg 2013;26(4):170-7. doi: 10.1053/j.semvascsurg.2014.06.014. Epub 2014 Jun 25.
5. Zhang H, Li M, Jin W.et al. The left renal entrapment syndrome: diagnosis and treatment. Ann Vasc Surg 2007;21(2):198-203. doi: 10.1016/j.avsg.2006.10.021.
6. Shin JI, Lee JS, Kim MJ . The prevalence, physical characteristics and diagnosis of nutcracker syndrome. Eur J Vasc Endovasc Surg 2006;32(3):335-6. doi: 10.1016/j.ejvs.2006.04.030
7. Granata A, Distefano G, Sturiale A, Figuera M, Foti PV, Palmucci S, et al. From Nutcracker Phenomenon to Nutcracker Syndrome: A Pictorial Review. Diagnostics (Basel) 2021;11(1):101. doi: 10.3390/diagnostics11010101.
8. Bhanji A, Malcolm P, Karim M. Nutcracker syndrome and radiographic evaluation of loin pain and hematuria. Am J Kidney Dis 2010;55(6):1142-5. doi: 10.1053/j.ajkd.2009.10.010.
9. He Y, Wu Z, Chen S, Tian L, Li D, Li M, et al. Nutcracker syndrome--how well do we know it? Urology 2014;83(1):12-7. doi: 10.1016/j.urology.2013.08.033.
10. Vianello FA, Mazzoni MB, Peeters GG, Fossali EF, Camozzi P, Bianchetti MG, et al. Micro- and macroscopic hematuria caused by renal vein entrapment: Systematic review of the literature. Pediatr. Nephrol 2016; 31(2):175–184. doi: 10.1007/s00467-015-3045-2.
11. Okada M, Tsuzuki K, Ito S. Diagnosis of the nutcracker phenomenon using two-dimensional ultrasonography. Clin Nephrol 1998;49(1)35-40.
12. Alaygut D, Bayram M, Soylu A.et al. The clinical course of children with Nutcracker syndrome. Urology 2013;82(3):686-90. doi: 10.1016/j.urology.2013.03.048.
13. Agarwal A, Litra F, Barr LL. A Rare Cause of Abdominal and Flank Pain in Children: Nutcracker Syndrome. Cureus 2021;16;13(7) e16422. doi: 10.7759/cureus.16422.
14. Nutcracker Waldrop RD, Henning P . Nutcracker Syndrome Masquerading as Renal Colic in an Adolescent Athlete: A Case Report. Clin. Pract. Cases Emerg Med 2021;5:415-8. doi: 10.5811/cpcem.2021.6.52140.
15. Gulleroglu K, Gulleroglu B, Baskin E. Nutcracker syndrome. World J. Nephrol 2014;3(4):277–281. doi: 10.5527/wjn.v3.i4.277.
16. Takebayashi S, Ueki T, Ikeda N, Fujikawa A . Diagnosis of the nutcracker syndrome with color Doppler sonography: correlation with flow patterns on retrograde left renal venography. AJR 1999;172(1):39–43. doi: 10.2214/ajr.172.1.9888735.
17. Hangge P, Gupta N, Khurana A, et al. Degree of Left Renal Vein Compression Predicts Nutcracker Syndrome. J Clin Med 2018;7(5):107. doi: 10.3390/jcm7050107.
18. Ananthan K, Onida S, Davies AH. Nutcracker Syndrome: An Update on Current Diagnostic Criteria and Management Guidelines. Eur J Vasc Endovasc Surg 2017;53(6):886-94. doi: 10.1016/j.ejvs.2017.02.015.
19. Takahashi Y, Sano A, Matsuo M. An ultrasonographic classification for diverse clinical symptoms of pediatric nutcracker phenomenon. Clin Nephrol 2005;64(1):47-54. doi: 10.5414/cnp64047.
20. Park SJ, Lim JW, Cho BS, et al. Nutcracker syndrome in children with orthostatic proteinuria: diagnosis on the basis of Doppler sonography. J Ultrasound Med 2002;21(1):39-45; quiz 46. doi:10.7863/jum.2002.21.1.39
21. Shin JI, Park JM, Lee JS, et al. Morphologically improved nutcracker syndrome in an 11-year-old girl with hematuria. Pediatr Int 2007; 49(5):677-9. Doi:10.1111/j.1442-200X.2007.02435.
22. Shin JI, Park JM, Lee JS, Kim MJ. Effect of renal Doppler ultrasound on the detection of nutcracker syndrome in children with hematuria. Eur J Pediatr 2007;166(5):399-404. doi: 10.1007/s00431-006-0252-7.
23. Cheon JE, Kim WS, Kim IO, Kim SH, Yeon KM, Ha IS,et al. Nutcracker syndrome in children with gross haematuria: Doppler sonographic evaluation of the left renal vein. Pediatr Radiol 2006;36(7):682-6. doi: 10.1007/s00247-006-0145-y.
24. Meyer J, Rother U, Stehr M, Meyer A. Nutcracker syndrome in children: Appearance, diagnostics, and treatment - A systematic review. J Pediatr Surg. 2022;57(11):716-722. doi:10.1016/j.jpedsurg.2021.12.019.
25. Ananthan K, Onida S, Davies AH. Nutcracker Syndrome: An Update on Current Diagnostic Criteria and Management Guidelines. Eur J Vasc Endovasc Surg 2017;53(6):886–94. doi: 10.1016/j.ejvs.2017.02.015.
26. Kargın Çakıcı E, Yazılıtaş F, Çınar HG. Nutcracker syndrome in children: the role of Doppler ultrasonography in symptomatic patients. Turkish J Pediatr Dis 2019;5: 348-52.

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RESEARCH ARTICLE

Exploring the Reliability and Accessibility of Youtube for Cerebral Palsy Rehabilitation Information

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ABSTRACT

Objective: Our study aimed to evaluate the characteristics and medical content of YouTube videos pertaining to cerebral palsy (CP) rehabilitation.
Methods: Using the YouTube search engine on August 16, 2021, the term "CP rehabilitation" was searched without any filters. The initial 100 videos were categorized based on their characteristics. The quality, reliability, and accuracy of these videos were evaluated using the Suitability Assessment of Materials (SAM), Global Quality Score (GQS), Journal of American Medical Association (JAMA) benchmark criteria, and modified DISCERN questionnaire.
Results: The average view count of the videos was 38,099 (range: 125–811,777), with an average duration of 444.79 seconds. Most videos were of moderate quality (57%) and contained partially adequate information (86%). In the high-quality category, videos had higher view counts, dislikes, duration, and SAM, JAMA, and modified DISCERN scores compared to low-quality videos ($p < 0.05$). A positive correlation was observed between GQS and the number of views, likes, dislikes, and SAM, JAMA, and modified DISCERN questionnaire scores ($p < 0.05$).
Conclusions: Our findings indicate that the majority of videos were of moderate quality, with some providing adequate information. High-quality videos tended to attract more user engagement, including views, likes, comments, and longer duration, and exhibited better reliability and accuracy scores. YouTube can serve as an alternative resource for patients requiring pediatric rehabilitation, particularly during interruptions in healthcare services such as the COVID-19 pandemic. It is indicated that higher-quality videos produced by healthcare professionals will be more beneficial for patient education in the future.

Keywords: Medical knowledge, e-learning, YouTube, Rehabilitation, Cerebral palsy

INTRODUCTION

With the advancement of the Internet, akin to other domains, the pace of information exchange and the utilization of communication platforms in healthcare have notably accelerated. In the active medical education system, students are encouraged to access visually enhanced educational resources and contemporary online publications. Among social media content, YouTube videos stand out as widely utilized for educational purposes. Park et al. observed that YouTube offers valuable scientific resources for medical and dental students within medical education, highlighting that digital innovations are poised to revolutionize education, rendering it more effective (1).

Not only medical students but also medical educators, physicians, medical support staff, and even patients frequently turn to YouTube to visually comprehend medical issues. Established in 2005 in San Bruno, California, United States, YouTube serves as a platform where approximately 100 videos are uploaded every minute (2). These videos originate from sources whose reliability cannot be ascertained and have not undergone peer review (3). Consequently, some studies evaluating the educational content of YouTube have yielded limited findings. Moreover, these studies often fail to differentiate between educational and non-educational videos or videos from dubious sources. We anticipate that videos produced by credible sources for medical education will exhibit higher quality, exert greater influence on public education, and contribute to scholarly discourse. Reliable YouTube videos addressing various diseases affecting the human body are watched for information regarding treatment adherence, screening, or preventive measures (4). However, the reliability and usefulness of these medical videos on YouTube remain uncertain (5). Fischer et al. reviewed YouTube videos regarding

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knee arthrocentesis and recommended a significant portion of these videos as suitable resources for students, residents, or fellows. However, they noted that certain videos, even those produced by healthcare professionals, lacked adequate and high-quality content (6).

Cerebral palsy (CP) stands as the most prevalent motor disability in childhood. Individuals affected by CP require ongoing physiotherapy and regular check-ups throughout their lives (7). Consequently, patients with CP necessitate rehabilitation, botulinum toxin (Botox) injections, or surgical interventions to mitigate the progression of spasticity. They also need to attend regular hospital appointments.

The emergence of the novel coronavirus (SARS-CoV-2) has significantly disrupted healthcare systems globally, particularly impacting the utilization of healthcare services, especially among children. Although the full extent of the negative consequences of quarantine measures is yet to be fully understood, children have experienced disruptions in the management of their own health conditions. Curfews enforced during quarantine have had notably adverse effects on both elderly individuals and pediatric patients. Furthermore, the reluctance of individuals with disabilities and their families to visit hospitals, coupled with the reassignment of physiotherapists and technicians to pandemic-related duties, has led to the unavailability of physiotherapy and rehabilitation services for a period of time (8). Consequently, some patients have faced the risk of deteriorating physical health, being deprived of Botox treatments, and even experiencing delays in surgical interventions (8).

Throughout the pandemic, a considerable number of healthcare professionals and members of the public have turned to the Internet, particularly YouTube, to seek information about their medical conditions (9). Studies indicate that 80% of individuals in the United States preferred utilizing online resources for health-related information during this period (9). The interruption of treatment for children with motor disabilities, especially those with CP, has been a significant concern for many families. As a result, tele-rehabilitation has gained prominence, with video-based communication, check-ups, and therapies becoming increasingly utilized (10, 11). Simultaneously, individuals affected by such conditions have continued seeking treatment online due to the necessity of staying home amidst pandemic conditions, coupled with reluctance to visit hospitals (12).

To date, our literature review has not revealed any studies assessing the quality of CP rehabilitation videos on YouTube. Consequently, this study aims to evaluate the quality, source, and content of CP rehabilitation videos available on YouTube.

MATERIALS AND METHODS

In this planned cross-sectional study, we utilized the YouTube search engine (www.youtube.com) to search for the term "cerebral palsy rehabilitation" starting from August 16, 2021. Prior to this search, approval was obtained from the Dokuz Eylül University ethics committee (Ethics Committee Decision No.: 6492- GOA 2021/20-10). We specifically sought videos with medical content. To ensure a broad sample, we employed a neutral term ("cerebral palsy rehabilitation"). From the search results, we selected the top 100 videos with educational content and English-language audio. We then assessed various factors including the number of likes and dislikes, views, video duration, comments, release year, presence of animation, high-definition (HD) quality, and the country of origin. The Suitability Assessment of Materials (SAM) (13) was utilized to evaluate the comprehensibility of medical education videos. The Global Quality Score (GQS) (14), Journal of American Medical Association (JAMA) benchmark criteria) (15), and modified DISCERN (16) questionnaires were employed to assess the educational quality, reliability, and accuracy of the videos. Measurements were recorded for each participant regarding each video. In evaluating video content, the educational material in each video was rated based on the presence or absence of 11 factors, as there was no validated rating system for videos. These factors included (1) etiology of CP, (2) diagnosis of CP, (3) classification criteria of CP, (4) symptoms of CP, (5) classification systems of CP, (6) gait disorder, (7) rehabilitation program, (8) bracing, (9) Botox therapy, (10) medical therapy for spasticity, and (11) surgery. This study employed a quantitative approach for both data collection and analysis. To this end, a survey was developed based on behavioral preferences and perspectives. Additionally, the videos were examined based on upload timeframes (<2015, 2015–2019, ≥2020).

Evaluating Video Suitability

SAM evaluated the videos based on several variables, including (1) the content of the videos, (2) literacy demand, (3) graphics, (4) layout and typography, (5) learning stimulation and motivation, and (6) cultural appropriateness. Subsequently, a distinct SAM score was assigned to each video (9).

Videos achieving a SAM score between 70 and 100 were categorized as "superior," those with a cumulative raw score between 40 and 69 were deemed "sufficient," while videos scoring between 0 and 39 were labeled as "insufficient."

Global Quality Score (GQS)

The GQS, devised by Bernard et al. (14), is a 5-point Likert scale utilized to assess the quality, usability, and coherence of websites. The scale ranges from 1 to 5, with 5 indicating excellent quality and flow, rendering the website highly beneficial for patients. A score of 4 suggests good quality and generally smooth navigation, making the site useful for patients. A score of 3 reflects moderate quality with some flaws in flow, resulting in the site being somewhat useful for patients. A score of 2 indicates generally poor quality and flow, offering limited utility to patients. Finally, a score of 1 signifies poor quality and flow of the site, rendering it not useful for patients at all.

Journal of American Medical Association (JAMA) Benchmark Criteria

The JAMA benchmark criteria assess online videos and resources based on four key criteria: authorship, attribution,

disclosure, and currency. Under these criteria, a JAMA score ranging from 0 to 4 is assigned. Authorship (1 point) evaluates whether authors, contributors, their affiliations, and relevant credentials are provided. Attribution (1 point) assesses whether references and sources for all content are listed. Disclosure (1 point) examines the disclosure of conflicts of interest, funding sources, sponsorship, advertising, support, and video ownership. Currency (1 point) checks for indications of when the content was posted and last updated. JAMA is utilized to gauge the accuracy and reliability of videos. A scorer assigns 1 point for each criterion met in the video, resulting in a final score ranging from 0 to 4, with 4 points indicating the highest quality (15).

Modified DISCERN Questionnaire

The Modified DISCERN Questionnaire serves as an assessment tool comprising five yes/no questions aimed at assessing the quality and reliability of health information publications. The questionnaire's score ranges from 0 to 5 points, with the total score derived from the sum of "yes" points, where each "yes" earns 1 point and each "no" earns 0 points. The questionnaire includes the following questions: "Does the video address areas of controversy/uncertainty?", "Are additional sources of information listed for patient reference?", "Is the provided information balanced and unbiased?", "Are valid sources cited? (from valid studies, physiatrists)," and "Is the video clear, concise, and understandable" (16).

Evaluating User Engagement

Five metrics of user interaction were documented for each video: (1) views, (2) likes, (3) dislikes, (4) video duration, and (5) comments. These data were collected between August 16 and 23, 2021.

Evaluation Team

Data analysis was independently conducted by two researchers (E.Ö. and V.H.). In cases where their assessments differed, each video underwent a re-evaluation based on a combined assessment by both scientists. For analysis purposes, only videos aimed at medical education and healthcare professionals were considered.

Exclusion Criteria

Videos unrelated to CP rehabilitation, not presented in English, repetitive content, and promotional videos were excluded from the study.

Video Sources

The sources of the videos were categorized into the following groups: academic, physician, society/professional organization, health-related website, patient, news, commercial, nonprofit organizations, and government.

Statistical Analysis

The acquired data underwent analysis using SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) version 24.0 software. Continuous data were presented as mean ± standard deviation, while frequency data were expressed as number (n) and percentage (%). The Chi-square test was utilized for the analysis of frequency data, while the Kruskal–Wallis test or Mann–Whitney U-test was employed for data with continuous values, depending on the number of groups. Additionally, the Pearson correlation test was used for correlation analysis between groups. A p-value less than 0.05 was deemed indicative of a significant difference.

RESULTS

Our study focused on the first 100 videos obtained from the YouTube search engine using the keyword "CP rehabilitation" between August 16 and 20, 2021. A total viewing time of 12 hours, 21 minutes, and 19 seconds was dedicate to these videos. The longest video observed was 1 hour, 4 minutes, and 50 seconds, while the shortest lasted only 36 seconds. The video garnering with the highest number of likes received 10,000 likes, whereas the least-liked video received no likes. Regarding viewership, the most-watched video accumulated 811,777 views, whereas the least-viewed one had only 125 views. The video with the highest number of comments obtained 459 comments, whereas the one with the lowest received none. On average, each video garnered approximately 38,099 ± 99,692.52. The average number of likes per video was approximately 351.91, with a standard deviation of 1,218.92. The average number of dislikes was approximately11.47, with a standard deviation of 29.30, and the average number of comments was approximately 26.09, with a standard deviation of 66.44. Additionally, the average duration of the videos was approximately 444.79 seconds, with a standard deviation of 597.20. Among the observed videos, 15% were animated, and 53% were in HD format.

Based on their content, the videos were categorized as follows: 23% provided information on the etiology of CP, 20% covered the diagnosis of CP, 22% addressed classification systems of CP, 73% focused on symptoms of CP, 9% discussed classification systems of CP, 57% tackled gait disorders, 80% outlined rehabilitation programs, 18% detailed bracing, 13% provided information on botulinum toxin therapy, 11% discussed medical therapy for spasticity, and 23% covered surgery.

The videos were assessed based on their SAM scores. The highest SAM score recorded was 36 (94.73%), while the lowest SAM score was 12 (31.57%). Upon evaluation according to SAM scores, 12 videos were classified as inadequate, 72 videos were considered sufficient, and 16 videos were deemed superior.

A weak positive correlation was observed between the total SAM score and the number of views ($r = 0.248$; $p = 0.013$), likes ($r = 0.251$; $p = 0.012$), dislikes ($r = 0.300$; $p = 0.002$), and video duration ($r = 0.425$; $p < 0.001$). Similarly, a strong positive correlation was identified between the number of views and likes ($r = 0.907$; $p < 0.001$), dislikes ($r = 0.881$; $p < 0.001$), and the number of comments ($r = 0.713$; $p < 0.001$). Conversely, a weak negative correlation ($r = -0.224$; $p = 0.025$) was found between the number of views and the video's upload year. A significant discrepancy was observed between the continents where the videos were published and those containing classification criteria ($p < 0.001$), while no significant difference was noted among videos addressing other subject matters ($p > 0.05$) (Table 1).

Table 1: Comparison of the content of videos over the years

Video content/years		<2015, n (%)	2015-2019, n (%)	≥2020, n (%)	p
High Definition Videos	+	5 (9.4%)	22 (42.6%)	26 (49.1%)	**<0.001**
	-	18 (38.3%)	20 (41.5%)	9 (19.1%)	
Animation	+	2 (13.3%)	11 (73.3%)	2 (13.3%)	**0.027**
	-	21 (24.7%)	31 (36.5%)	33 (38.8%)	
Etiology	+	6 (26.1%)	11 (47.8%)	6 (26.1%)	0.594
	-	17 (22.1%)	31 (40.3%)	29 (37.7%)	
Diagnosis	+	7 (35%)	6 (30%)	7 (35%)	0.298
	-	16 (20%)	36 (45%)	28 (35%)	
Classification Criteria	+	5 (22.7%)	9 (40.9%)	8 (36.4%)	0.988
	-	18 (23.1%)	33 (%42.3)	27 (34.6%)	
Symptoms	+	18 (24.7%)	30 (41.1%)	25 (34.2%)	0.811
	-	5 (18.5%)	12 (44.4%)	10 (37%)	
Classification Systems	+	0 (0%)	3 (33.3%)	6 (66.7%)	0.071
	-	23 (25.3%)	39 (42.9%)	29 (31.9%)	
Gait disorder	+	13 (22.8%)	28 (49.1%)	16 (28.1%)	0.181
	-	10 (23.3%)	14 (32.6%)	19 (44.2%)	
Rehabilitation Program	+	18 (22.5%)	32 (40%)	30 (37.5%)	0.566
	-	5 (25%)	10 (50%)	5 (25%)	
Bracing	+	3 (16.7%)	8 (44.4%)	7 (38.9%)	0.775
	-	20 (24.4%)	34 (41.5%)	28 (34.1%)	
Botulinum Toxin Therapy	+	3 (23.1%)	6 (46.2%)	4 (30.8%)	0.933
	-	20 (23%)	36 (41.4%)	31 (35.6%)	
Medical Therapy for Spasticity	+	2 (18.2%)	5 (45.5%)	4 (36.4%)	0.920
	-	31 (23.6%)	37 (41.6%)	31 (34.8%)	
Surgery	+	4 (18.2%)	12 (54.5%)	6 (27.3%)	0.465
	-	19 (24.7%)	30 (39%)	28 (36.4%)	
SAM	Insufficient	1 (6.3%)	6 (50%)	5 (31.3%)	0.263
	Sufficient	19 (26.4%)	26 (36.1%)	27 (37.5%)	
	Superior	3 (25%)	10 (62.5%)	3 (25%)	
JAMA	Insufficient data (1 Point)	0 (0%)	23 (100%)	0 (0%)	0.280
	Partially sufficient data (2 or 3 points)	2 (4.8%)	34 (81%)	6 (14.3%)	
	Completely sufficient data(4 points)	2 (5.7%)	29 (82.9%)	4 (11.4%)	
GQS	Low quality (1 or 2 points)	1 (4.3%)	18 (78.3%)	4 (17.4%)	0.078
	Intermediate quality (3 points)	10 (23.8%)	18 (42.9%)	14 (33.3%)	
	High quality (4-5 points)	5 (14.3%)	21 (60%)	9 (25.7%)	
Modified DISCERN	1 Points	0 (0%)	3 (75%)	1 (25%)	0.175
	2 Points	10 (24.4%)	22 (53.7%)	9 (22%)	
	3 Points	8 (29.6%)	9 (33.3%)	10 (37%)	
	4 Points	4 (16%)	7 (28%)	14 (56%)	
	5 Points	1 (33.3%)	1 (33.3%)	1 (33.3%)	

SAM: Suitability Assessment of Material, GQS: Global Quality Score, JAMA: Journal of American Medical Association benchmark criteria, p<0.05, Bold font:statistically significance

When considering the upload dates, it was noted that 12 videos were uploaded prior to 2015, 59 videos were uploaded between 2015 and 2019, and 29 videos were uploaded from 2020 onward (Figure 1). A significant correlation was observed between the upload date and the inclusion of animation content as well as the availability of HD videos ($p < 0.001$). Detailed results for SAM, GQS, JAMA, and modified DISCERN based on upload dates and video characteristics can be found in Table 2.

Regarding GQS assessment, 27% of the videos were classified as high quality, while 57% fell into the medium quality category. The outcomes for all evaluation criteria are presented in Table 3. Although statistically significant associations were identified between GQS scores and factors such as the number of views, likes, dislikes, and video duration, no significant correlation was found with the number of comments ($p < 0.05$).

A notable correlation was observed between JAMA scores and modified DISCERN scores, as well as video duration ($p < 0.05$). However, no significant correlation was detected between these evaluation criteria and other video characteristics.

It was determined that SAM, GQS, JAMA, and modified DISCERN scores exhibited weak correlations among each other (Table 4).

Table 2: Video characteristics according to years and assessment parameters (mean ± standard deviation)

Years	View Mean ± SD	Like Mean ± SD	Dislike Mean ± SD	Comment Mean ± SD	Time Mean ± SD
<2015 (n=23)	57665.17±78940.35	162.39±163.35	10.26±11.92	14.04**±26.15**	274.35±329.89
2015-2019 (n=42)	50823.85±139470.46	589.40±1837.81	17.90±43.25	28.07±80.33	434.79±645.15
≥2020 (n=35)	997140±13281.41	191.45±339.88	4.54±7.10	31.62±67.04	568.80±656.16
p	**0.001**	0.875	0.065	0.180	0.064
SAM group					
Insufficient (n=15)	6007.43±7157.73	48.18±46.18	1.43±1.78	5.18±7.13	330.88±445.65
Sufficient (n=80)	36387.77±101137.35	325.45±1185.39	10.02±24.44	30.75±71.67	360.28±438.02
Superior (n=5)	91155.08±136994.50	915.58±1952.95	1.43±1.78	5.18±7.13	1103.75±1077.64
p	0.050	**0.025**	**0.023**	**0.018**	**0.001**
GQS (1-5 points)					
Low quality (1 or 2 points)	6007.43±7157.73	48.18±46.18	1.43±1.78	5.18±7.13	330.88±445.65
Intermediate quality (3 points)	24942.33±43230.79	177.52±284.41	7.12±9.18	25.36±55.51	318.70±306.12
High quality (4-5 points)	84891.40±174646.06	900.03±2247.24	26.59±52.39	40±98.34	778.48±939.74
p	**0.036**	**0.006**	**0.008**	0.116	**0.005**
JAMA score (0-4 Points)					
Insufficient data (1 Point)	7488.75±9566.01	76.20±83.34	1.75±2.36	18.50±19.67	630±755.26
Partially sufficient data (2 or 3 points)	36878.23±93538.30	308.09±1114.24	10.77±27.62	24.79±66.24	360.87±443.60
Completely sufficient data (4 points)	60841.70±130076.06	839±2073.57	21.30±45.60	40.30±81.99	1092.40±1151.42
p	0.473	0.573	0.459	0.731	**0.019**
Modified DISCERN score (0-5 points)					
1 Points	7387±10898.64	33.25±31.73	1.50±2.38	6.75±10.43	346.50±453.15
2 Points	37726.43±126535.96	383.82±1569.90	9.87±31.43	23.19±73.73	284.59±327.11
3 Points	35307.14±82238.81	397.07± 1268.74	10.88±27.95	37.40±84.15	366.56±335.16
4 Points	47423.48±81316.07	320.12±499.89	16.08±31.33	22.16±34.54	753.44±953.56
5 Points	31562.66±33770.90	199±166.27	13.33±15.94	22.33±19.75	897.33±841.58
p	0.555	0.059	0.199	0.209	**0.008**

SD: Standart Deviation, SAM:Suitability Assessment of Material, GQS: Global Quality Score, JAMA: Journal of American Medical Association benchmark criteria, Bold font:statistical significance , p<0.05,statistacally significant

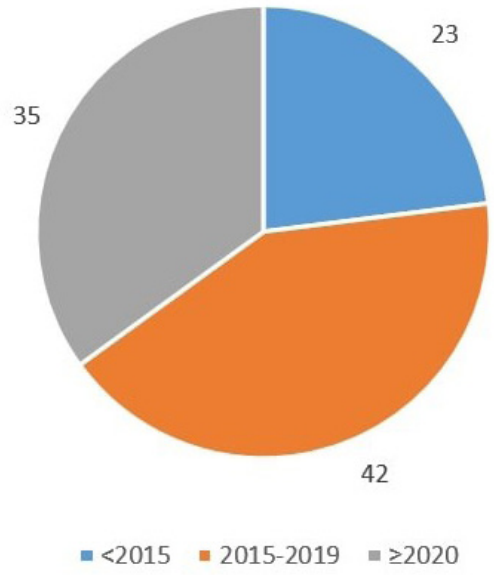

Figure 1: Number of videos by year.

The top two countries contributing video sources on CP rehabilitation are the United States (69%) and India (16%). From a continental perspective, 69% of the videos originate from the Americas, while 31% are sourced from other continents. A significant association was identified between the countries of video origin and the number of comments ($p = 0.028$). This statistical difference is notably attributed to videos from Australia, China, and Switzerland. Additionally, a significant correlation was found between the countries of video origin and video duration ($p < 0.001$). This discrepancy is primarily due to the longer duration of videos from England and India.

No statistically significant difference was observed between the sources from which the videos were uploaded and the results of the reliability and quality surveys (GQS, $p = 0.112$; JAMA, $p = 0.100$; GQS, $p = 0.302$; SAM, $p = 0.169$) (Table 5).

Table 3: Scores of assessment parameters

		n
GQS (1-5 points)	Low quality (1 or 2 points)	16
	Intermediate quality (3 points)	57
	High quality (4-5 points)	27
JAMA score (0-4 points)	Insufficient data (1 Point)	4
	Partially sufficient data (2 or 3 points)	86
	Completely sufficient data (4 points)	10
Modified DISCERN score (0-5 points)	1 Points	4
	2 Points	41
	3 Points	27
	4 Points	25
	5 Points	3
SAM	Insufficient	12
	Sufficient	72
	Superior	16

GQS: Global Quality Score, JAMA: Journal of American Medical Association benchmark criteria *SAM:Suitability Assessment of Material*

Table 4: Correlations between quantitative variables and scores

	SAM	GQS	JAMA	Modified DISCERN
Number of views	0.248*	0.277*	0.096	0.048
Number of likes	0.251*	0.251*	0.133	-0.004
Number of dislikes	0.301**	0.249*	0.127	0.098
Number of comments	0.156	0.127	0.071	0.024
Video duration;second	0.425**	0.261**	0.261**	0.314**
SAM	-	0.931**	0.660**	0.650**
GQS	0.931**	-	0.609**	0.632**
JAMA	0.660**	0.609**	-	0.335**
Modified DISCERN	0.650**	0.632**	0.335**	-

GQS: Global Quality Score, JAMA: Journal of American Medical Association benchmark criteria *SAM:Suitability Assessment of Material;* *p<0.05, **p<0.001 Nonparametric Spearmens's rank correlation coefficients

When assessing the numbers of video likes ($p = 0.028$) and dislikes ($p = 0.012$) based on video upload sources, a notable distinction was identified in the Kruskal–Wallis test. Notably, videos uploaded by patients garnered a considerable number of likes. However, no significant disparity was noted between other video parameters and their respective sources ($p > 0.05$).

DISCUSSION

This study examined the content, relevance, and user engagement of YouTube videos pertaining to CP rehabilitation. While a majority of the videos were uploaded between 2015 and 2019, a significant proportion, comprising 30%, were uploaded by 2020. The onset of the COVID-19 pandemic post-2020 significantly impacted the global healthcare system,

Table 5: Video sources by quality, reliability parameters and time periods

		Academic(n)	Physician(n)	Society/Professional Organization(n)	Health-related Website(n)	Patient(n)	News(n)	Commercial(n)	Nonprofit Organization	Government	p
GQS (1-5 points)	Low quality (1 or 2 points) (n=16)	0 (0%)	2 (12.5%)	0 (0%)	8 (50%)	0 (0%)	0 (0%)	6 (37.5%)	0 (0%)	0 (0%)	0.111
	Intermediate quality (3 points) (n=57)	3 (5.3%)	3 (5.3%)	6 (10.5%)	17 (29.8%)	3 (5.3%)	5 (8.8%)	16 (28.1%)	3 (5.3%)	1 (1.8%)	
	High quality (4-5 points) (n=27)	2 (7.4%)	3 (11.1%)	4 (14.8%)	5 (18.5%)	0 (0%)	0 (0%)	6 (22.2%)	6 (22.2%)	1 (3.7%)	
JAMA score (0-4 Points)	Insufficient data (1 Point) (n=4)	0 (0%)	0 (0%)	0 (0%)	2 (50%)	0 (0%)	1 (25%)	0 (0%)	1 (25%)	0 (0%)	0.100
	Partially sufficient data (2 or 3 points) (n=66)	5 (5.8%)	5 (5.8%)	9 (10.5%)	25 (29.1%)	3 (3.5%)	4 (4.7%)	27 (31.4%)	6 (7%)	2 (2.3%)	
	Completely sufficient data (4 points) (n=10)	0 (0%)	3 (30%)	1 (10%)	3 (30%)	0 (0%)	0 (0%)	1 (10%)	2 (20%)	0 (0%)	
Modified DISCERN score (0-5 points)	Very Poor (n=4)	0 (0%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (75%)	0 (0%)	0 (0%)	0.302
	Poor (n=41)	3 (7.3%)	2 (4.9%)	7 (17.1%)	14 (34.1%)	2 (4.9%)	2 (4.9%)	10 (24.4%)	1 (2.4%)	0 (0%)	
	Fair (n=27)	1 (3.7%)	4 (14.8%)	1 (3.7%)	8 (29.6%)	1 (3.7%)	3 (11.1%)	7 (25.9%)	2 (7.4%)	0 (0%)	
	Good (n=25)	1 (4%)	1 (4%)	2 (8%)	6 (24%)	0 (0%)	0 (0%)	7 (28%)	6 (24%)	2 (8%)	
	Excellent (n=3)	0 (0%)	0 (0%)	0 (0%)	2 (66.7%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)	0 (0%)	
SAM	Superior Material (n=12)	0 (0%)	1 (8.3%)	1 (8.3%)	3 (25%)	0 (0%)	0 (0%)	3 (25%)	4 (33.3%)	0 (0%)	0.169
	Adequate Material (n=72)	5 (6.9%)	5 (6.9%)	9 (12.5%)	19 (26.4%)	3 (4.2%)	5 (6.9%)	19 (26.4%)	5 (6.9%)	2 (2.8%)	
	Not Suitable Material (n=16)	0 (0%)	2 (12.5%)	0 (0%)	8 (50%)	0 (0%)	0 (0%)	6 (37.5%)	0 (0%)	0 (0%)	
Timeframes	<2015, (n=23)	1 (4.3%)	2 (8.7%)	1 (4.3%)	6 (26.1%)	0 (0%)	1 (4.3%)	8 (34.8%)	3 (13%)	1 (4.3%)	**0.014**
	2015-2019, (n=42)	3 (7.1%)	4 (9.5%)	9 (21.4%)	5 (11.9%)	1 (2.4%)	4 (9.5%)	13 (31%)	3 (7.1%)	0 (0%)	
	>2020, (n=35)	1 (2.9%)	2 (5.7%)	0 (0%)	19 (54.3%)	2 (5.7%)	0 (0%)	7 (20%)	3 (8.6%)	1 (2.9%)	

Pearson Chi-square test, $p<0.05$ statistically significant; GQS: Global Quality Score, JAMA: Journal of American Medical Association benchmark criteria, SAM: Suitability Assessment of Materials

including physiotherapy and rehabilitation practices. Children's access to hospitals became limited to emergency situations, leading to disruptions in their routine treatments and a setback in pre-pandemic progress. Additionally, quarantine measures resulted in reduced activity levels, disrupted sleep and eating patterns, and difficulties in readjusting to normalcy (7). In response to the pandemic, various innovative initiatives in pediatric rehabilitation have become indispensable, including tele-rehabilitation and the use of internet-based patient-oriented videos for treatment continuation (10). This study seeks to analyze the content of YouTube videos addressing CP rehabilitation within these challenging circumstances and evaluate their clarity and reliability.

Originally conceived as a social media platform primarily for entertainment purposes, YouTube is anticipated to evolve into a favored source of information for patients, encompassing health-related content, and serving as a platform for medical professionals to access current academic information. Despite being a compelling source for medical education, concerns have been raised regarding the inadequacy of some videos, even when uploaded by healthcare professionals (6). The presence of unregulated videos with subpar content contributes to information pollution on the Internet, underscoring the need for professionals to upload higher-quality content. For instance, in a study by Yildiz et al. (17) focusing on vestibular rehabilitation videos on YouTube, it was found that while many videos lacked quality, the inclusion of high-quality content by healthcare professionals could potentially alleviate vestibular symptoms in patients. Nevertheless, medical practitioners have been exploring various concepts, such as tele-rehabilitation, to assist patients in improving their clinical conditions from home, leveraging advancements in technology (18). Consequently, social media platforms like YouTube have emerged as crucial mediums for disseminating and exchanging health-related information.

In Askin et al.'s (19) examination of YouTube videos pertaining to transcranial stimulation treatment for stroke, they observed that videos of higher garnered increased views and engagements and had longer durations. Similarly, Tolu et al. (20) highlighted that informative and high-quality videos tend to attract greater popularity and likes. Consistent with existing literature, our study revealed that videos with elevated SAM and GQS scores tended to accumulate more views, likes, and dislikes and featured lengthier durations. Conversely, Koçyiğit et al. (21) found no significant correlation between video quality and metrics such as views, likes, and dislikes.

Notably, videos sourced from health organizations exhibited higher SAM values. Desai et al. (13) reported a median SAM value of 24 in their analysis, noting that videos with superior SAM ratings tended to have longer durations. Similarly, our study indicated a median SAM value of 20.12. Moreover, statistically significant associations were observed between SAM, JAMA, GQS, and modified DISCERN scores and video duration. It was evident that high-quality videos, as indicated by higher rating scores, tended to be longer. This observation aligns with the notion that presenting comprehensive and high-quality content necessitates a longer duration. Özdemir et al (22) also reported similar findings in their examination of cancer rehabilitation videos on YouTube. When crafting video content, it is imperative to strike a balance between providing high-quality information and maintaining audience engagement without sacrificing essential content. Thus, careful consideration should be given to the duration of videos to ensure optimal delivery of information.

Chen et al. (23) discovered that YouTube videos serve as an effective educational tool, with HD videos being particularly impactful for this purpose. Conversely, Gençpınar et al. (24) did not identify a significant correlation between liking, disliking, number of comments, impressions, video duration, total SAM score, and whether the videos were in HD format. Our study yielded results consistent with existing literature regarding these video attributes. However, we did find a statistically significant association between the upload date and the prevalence of HD videos. This indicates that while video quality, content, and audience response may not always align, videos with high image quality are uploaded with the intention of attracting more viewership in the current landscape.

In our study, we observed that the content of the videos remained relatively consistent across different time periods. However, when assessing videos based on the continents to which they were uploaded, a statistically significant relationship emerged, indicating that videos addressing CP classification were more prevalent outside the American continent. Additionally, a significant correlation was identified between the duration of the videos and their geographical origin. Specifically, videos originating from non-American continents, particularly those from England and India, exhibited longer durations. This finding suggests that video topics and lengths may have been tailored to meet the expectations of their respective audiences in their respective countries.

Recent research underscores the significant impact of videos featuring patient narratives, experiences, and involvement in therapy sessions on peer-to-peer communication among patients. Our study indicates that interviews with patients participating in CP rehabilitation programs and their families have garnered attention and motivated individuals with similar conditions to engage in such programs. Similar to findings by Chou et al. (25) in the context of cancer rehabilitation, these shared experiences have demonstrated positive effects on patients. Consequently, an increasing availability of such videos holds promise in facilitating broader access to these beneficial programs for other patients. Moreover, Bertamino et al. (26) highlighted the pivotal role played by families of children with pediatric and perinatal strokes during the COVID-19 pandemic in facilitating their treatment. It is imperative for healthcare professionals to enhance communication with children and their families during this challenging period and provide necessary support to ensure uninterrupted care.

Asano et al. (27) highlighted the importance of maintaining CP rehabilitation treatments, even amidst the pandemic, and advocated for the future development of tele-rehabilitation services. Similarly, Cankurtaran et al. (28) proposed that collaborative tele-rehabilitation and telemedicine initiatives involving the families of CP patients could effectively mitigate the adverse effects of potential future pandemics. Various options such as gaming platforms (29), active video games, and virtual reality (30) for in-home tele-rehabilitation during the COVID-19 era present alternative avenues for rehabilitation prior to hospitalization. YouTube serves as a valuable resource not only for cerebral palsy but also for numerous neurological conditions and treatments like selective dorsal rhizotomy (31). Given the findings of our study indicating that higher-quality videos garner more views, it is evident that high-quality content uploaded on YouTube serves as another beneficial resource for patients and their families throughout the treatment journey.

In the current study, no statistically significant difference was observed between the sources of video uploads and the final results of reliability and quality assessments. Similar findings have been reported in prior research (32,33). For instance, Bakulan et al. (34), in their examination of YouTube videos on CP, found that videos uploaded by physicians received higher quality ratings. In our study, videos uploaded by physicians were categorized under both academic and physician titles. Discrepant findings across studies may stem from variations in how authors evaluate the sources of videos.

Furthermore, our study revealed that videos uploaded by patients garnered a significantly higher number of likes. Baker et al. (35) similarly noted a notably greater number of comments in patient-generated videos, with 28% of these comments seeking additional information. This phenomenon can be attributed to the increased attention received by videos featuring patient experiences, thereby leading to noteworthy changes in video interaction metrics.

Our study is subject to certain limitations. These limitations encompass a relatively small sample size and the inclusion of only the initial 100 videos with relevant content. Additionally, our study is restricted to videos with English-language content, thereby excluding non-English videos and the insights they may offer from different nationalities. However, given that English is widely spoken worldwide, the impact of this limitation on our study may be relatively minor.

CONCLUSION

Based on our study findings, the majority of the videos exhibited moderate quality, with some containing adequate information. Videos of high quality tend to attract more user engagement, including views, likes, comments, and longer durations, while also receiving better reliability and accuracy scores. Particularly for individuals requiring pediatric rehabilitation, such as patients with CP who experienced disruptions in healthcare during the COVID-19 pandemic, YouTube videos can serve as an alternative to telecommunication methods. Therefore, future videos produced by healthcare professionals in this domain should prioritize high quality, as they will be more beneficial for patients, aiding in symptom regression and facilitating patient education.

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REFERENCES

1. Park JC, Kwon HE, Chung CW. Innovative digital tools for new trends in teaching and assessment methods in medical and dental education. J Educ Eval Health Prof. 2021;18:13.
2. Raikos A, Waidyasekara P. How useful is YouTube in learning heart anatomy? Anat Sci Educ. 2014;7(1):12-8.
3. Deal SB, Alseidi AA. Concerns of Quality and Safety in Public Domain Surgical Education Videos: An Assessment of the Critical View of Safety in Frequently Used Laparoscopic Cholecystectomy Videos. J Am Coll Surg. 2017;225(6):25-730.
4. Stellefson M, Chaney B, Ochipa K, Chaney, D., Haider, Z., Hanik, B., et al. YouTube as a source of chronic obstructive pulmonary disease patient education: a social media content analysis. Chron Respir Dis. 2014;11(2):61-71.
5. Drozd B, Couvillon E, Suarez A. Medical YouTube videos and methods of evaluation: Literature review. JMIR Med Educ 2018;4:e3.
6. Fischer, J., Geurts, J., Valderrabano, V., Hügle, T. Educational quality of YouTube videos on knee arthrocentesis. Journal of clinical rheumatology : practical reports on rheumatic & musculoskeletal diseases, 2013;19(7), 373–376.
7. Dogruoz Karatekin B, İcagasioglu A, Sahin SN, Kacar G, Bayram F. How Did the Lockdown Imposed Due to COVID-19 Affect Patients With Cerebral Palsy?. Pediatr Phys Ther. 2021;33(4):246-249.
8. Yağcı İ, Sarıkaya S, Ayhan FF, Bahsi, A., Bilir Kaya, B., Erhan, B., et al. The effects of COVID-19 on Physical Medicine and Rehabilitation in Turkey in the first month of pandemic. Turk J Phys Med Rehabil. 2020;66(3):244-251. Published 2020 Jul 7. doi:10.5606/tftrd.2020.6800
9. Shukla A. COVID-19 pandemic: An analysis of popular YouTube videos as an alternative health information platform. Health informatics journal, 2021;27(2), 1460458221994878
10. Ganesan, B., Fong, K., Meena, S. K., Prasad, P., Tong, R. Impact of COVID-19 pandemic lockdown on occupational therapy practice and use of telerehabilitation - A cross sectional study. European review for medical and pharmacological sciences, 2021;25(9), 3614–3622.

11. Nobakht, Z., Rassafiani, M., Hosseini, S. A., Hosseinzadeh, S. A web-based daily care training to improve the quality of life of mothers of children with cerebral palsy: A randomized controlled trial. *Research in developmental disabilities*, 2020;*105*, 103731.
12. Huang, Q., Lin, P., Dang, J., Fu, L., Ding, L. Effect of internet-based self-management on pulmonary function rehabilitation and living quality in patients with chronic obstructive pulmonary disease. American journal of translational research, 2021;13(5), 5224–5231.
13. Desai, T., Shariff, A., Dhingra, V., Minhas, D., Eure, M., Kats, M. Is content really king? An objective analysis of the public's response to medical videos on YouTube. PloS one, 2013;8(12), e82469.
14. Bernard, A., Langille, M., Hughes, S., Rose, C., Leddin, D., Veldhuyzen van Zanten, S. A systematic review of patient inflammatory bowel disease information resources on the World Wide Web. The American journal of gastroenterology, 2007;102(9), 2070–2077.
15. Silberg, W. M., Lundberg, G. D., Musacchio, R. A. Assessing, controlling, and assuring the quality of medical information on the Internet: Caveant lector et viewor--Let the reader and viewer beware. JAMA, 1997;277(15), 1244–1245.
16. Charnock, D., Shepperd, S., Needham, G., Gann, R. DISCERN: an instrument for judging the quality of written consumer health information on treatment choices. Journal of epidemiology and community health, 1999;53(2), 105–111.
17. Yildiz, S., Toros, S. Z. The Quality, Reliability, and Popularity of YouTube Education Videos for Vestibular Rehabilitation: A Cross-sectional Study. Otology & neurotology : official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology, 2021;10.1097/MAO.0000000000003197.
18. Manasco, M. H., Barone, N., Brown, A. A Role for YouTube in Telerehabilitation. International journal of telerehabilitation, 2010;2(2), 15–18.
19. Askin, A., Sengul, L., Tosun, A. YouTube as a Source of Information for Transcranial Magnetic Stimulation in Stroke: A Quality, Reliability and Accuracy Analysis. Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association, 2020;29(12), 105309.
20. Tolu, S., Yurdakul, O. V., Basaran, B., Rezvani, A. English-language videos on YouTube as a source of information on self-administer subcutaneous anti-tumour necrosis factor agent injections. Rheumatology international, 2018;38(7), 1285–1292
21. Kocyigit, B. F., Nacitarhan, V., Koca, T. T., Berk, E. YouTube as a source of patient information for ankylosing spondylitis exercises. Clinical rheumatology, 2019;38(6), 1747–1751.
22. Bahar-Ozdemir Y, Ozsoy-Unubol T, Akyuz G. Is YouTube a high-quality source of information on cancer rehabilitation? [published online ahead of print, 2021 Aug 4]. J Cancer Surviv. 2021;10.1007/s11764-021-01093-9.
23. Chen, H. M., Hu, Z. K., Zheng, X. L., Yuan, Z. S., Xu, Z. B., Yuan, L. Q., et al. Effectiveness of YouTube as a Source of Medical Information on Heart Transplantation. Interactive journal of medical research, 2013;2(2), e28.
24. Gençpınar T, Bilen Ç, Bayrak S, Akkaya G, Hancı V, Büyükçoban S. Extra-corporeal Membrane Oxygenation Procedures on YouTube: What Practices Have Being Show. EJCM 2019;7(1):28-35.
25. Chou WY, Hunt Y, Folkers A, Augustson E. Cancer survivorship in the age of YouTube and social media: a narrative analysis. J Med Internet Res. 2011;13(1):e7. Published 2011 Jan 17.
26. Bertamino, M., Cornaglia, S., Zanetti, A., Di Rocco, A., Ronchetti, A., Signa, S., et al. Impact on rehabilitation programs during COVID-19 containment for children with pediatric and perinatal stroke. European journal of physical and rehabilitation medicine, 2020;56(5), 692–694.
27. Asano, D., Kikuchi, N., Yamakawa, T., Morioka, S. Decline in Motor Function during the COVID-19 Pandemic Restrictions and Its Recovery in a Child with Cerebral Palsy: A Case Report. Children (Basel, Switzerland), 2021;8(6), 511.
28. Cankurtaran D, Tezel N, Yildiz SY, Celik G, Unlu Akyuz E. Evaluation of the effects of the COVID-19 pandemic on children with cerebral palsy, caregivers' quality of life, and caregivers' fear of COVID-19 with telemedicine. Ir J Med Sci. 2021;190(4):1473-1480.
29. da Silva TD, da Silva PL, Valenzuela EJ, Dias, E. D., Simcsik, A. O., de Carvalho, M. G., et al. Serious Game Platform as a Possibility for Home-Based Telerehabilitation for Individuals With Cerebral Palsy During COVID-19 Quarantine - A Cross-Sectional Pilot Study. Front Psychol. 2021;12:622678. Published 2021 Feb 2
30. Demers M, Martinie O, Winstein C, Robert MT. Active Video Games and Low-Cost Virtual Reality: An Ideal Therapeutic Modality for Children With Physical Disabilities During a Global Pandemic. Front Neurol. 2020;11:601898. Published 2020 Dec 14.
31. Canty, M. J., Breitbart, S., Siegel, L., Fehlings, D., Milo-Manson, G., Alotaibi, N. M., et al. The role of social media in selective dorsal rhizotomy for children: information sharing and social support. Childs Nerv Syst. 2019;35(11):2179-2185.
32. Oydanich M, Shah Y, Shah K, Khouri AS. 2022. An analysis of the quality, reliability, and popularity of YouTube videos on glaucoma. Ophthalmology Glaucoma 2022;5(3):306–312
33. Hartnett DA, Yang DS, Lama CJ, McDonald CL, Daniels AH, Blankenhorn BD. YouTube as a source of patient information for ankle arthroplasty: quantitative analysis of video reliability, quality, and content. Foot & Ankle Specialist 2022;16(3):233–242
34. Bakılan F, Sarıçimen G, Ortanca B, Mutlu F, Armagan O. A Quality Analysis of Cerebral Palsy Videos on YouTube. Fiziksel Tıp ve Rehabilitasyon Bilimleri Dergisi. 2023;26. 299-305
35. Baker, D. M., Marshall, J. H., Lee, M. J., Jones, G. L., Brown, S. R., Lobo, A. J. YouTube as a source of information for patients considering surgery for ulcerative colitis. The Journal of surgical research, 2017;220,133–138.

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RESEARCH ARTICLE

Pregnancy in Patients with Thalassemia: A Single-Center Study

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ABSTRACT

Objective: In thalassemia syndromes, iron accumulation due to transfusion or excessive iron absorption adversely affects many organ functions, including the endocrine system. Due to advances in effective transfusion and chelation therapy in recent years a significant increase as occured in the life expectancy and quality of life of patients. This situation has also led to an increase in patients' expectation of having children.

Methods: This study retrospectively, evaluates the transfusion characteristics, complications and conditions of the babies with regard to pre-pregnancy, pregnancy and delivery of our transfusion-dependent thalassemia patients who've had children and were monitored at the Istanbul University Medical Faculty, Department of Pediatric Hematology and Oncology.

Results: The study includes 15 patients with a gestational age between 22-34 (28±3,9) years, five with thalassemia major, nine with thalassemia intermedia, and one with thalassemia trait and alpha triplication. While 14 patients came for regular follow-ups, one did not. The patients on a regular transfusion program had an increased frequency of transfusions throughout pregnancy; four patients with thalassemia intermedia, who had never undergone a transfusion before, were observed to have been included in a regular transfusion program starting with the 2nd trimester of pregnancy. None of the patients developed cardiac and/or thromboembolic complications. One patient diagnosed with thalassemia intermedia and one patient diagnosed with thalassemia major each had a stillborn baby, three patients diagnosed with thalassemia intermedia had preterm babies and four other patients had babies with intrauterine growth restrictions (IUGR).

Conclusions: Thalassemia patients who are followed up with a regular multidisciplinary approach will be able to have a healthy pregnancy and children through the early recognition, prevention and treatment of complications.

Keywords: Thalassemia, pregnancy, child

INTRODUCTION

Thalassemia syndromes are a group of diseases characterized by the presence of genetic mutations that cause hemoglobin (Hb) alpha (α) or beta (β) chain defects, and are common all over the world. Depending on the severity of the genetic mutation and its reflection on the phenotype, thalassemia includes a wide spectrum of diseases from silent carriers to severe transfusion-dependent forms. With the development of transfusion strategies in transfusion-dependent thalassemia, the early determination of iron load, and introduction of new oral chelators, effective chelation practices have extended the life span of patients and increased their life quality (1). A long side the increased expected life expectancy of patients so has their desire to marry and have children also increased over time (2-7). Although the view that only women with thalassemia intermedia could have children had been dominant in previous years, cases have shown that both women with thalassemia major (TM) and women with thalassemia intermedia (TI) can give birth to healthy children (1). The first successful pregnancy was reported in a patient with TM in 1969, with more than 400 successful pregnancies also being described afterward (8). Multi-center studies on this subject are scarce. In 2004, Skordis et al. (9) evaluated the pregnancies of 86 TM and 12 TI patients, emphasizinged pregnancy to be safe in thalassemia and to have no harmful effects on the course of the disease (9). A multi-center study conducted in 2010, examined 58 pregnancies of 46 patients with TM and 17 pregnancies of 11 women with TI, and reported that 91% of pregnancies to have resulted in successful deliveries, with the rate for preterm deliveries was being 29% (2). Based on that study, successful pregnancy processes were concluded to have been observed in patients who are followed up on regularly. A study conducted by the Thalassemia Clinical Research Network (TCRN) group, found in 8% of thalassemia women had had pregnancies, while 2013 this was reported as 25.1%. A total of 129 pregnancies

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were seen in 72 out of the 264 female patients who were involved in the study, with more than 70% of these pregnancies resulting in live births, and 88 of these deliveries were full-term births (10,11). Despite effective chelation, most patients with TM have impaired gonadal function, leading to primary or secondary amenorrhea, especially in women. Among all endocrine complications, hypogonadotropic hypogonadism is the most common disorder and has been shown to be directly related to the serum ferritin value (12). Pituitary insufficiency has been reported to develops in 40-90% of patients with transfusion-dependent TM due to iron accumulation in the pituitary. For this reason, most expectant mothers with thalassemia need hormone replacement therapy. Again, most TM patients have infertility problems. The prevalence of fetal and maternal complications is seen to be higher in these women compared to the general population (2,12-14). Other problems reported in these patients include increased transfusion need, increased heart rate and cardiac output, arrhythmia, preterm and low birth weight due to maternal anemia and hypoxia, newly diagnosed diabetes or difficulties in controlling existing diabetes, increased risk of thrombosis and embolism, placental insufficiency, ablatio placenta, gestational hypertension, kidney and gallstones, and urinary tract infections (2,13). In patients with TI, the need for transfusion increases during pregnancy, with 60-80% of patients receive erythrocyte suspension during pregnancy, including patients who had not been transfused before. This situation exposes patients to the risk of alloimmunization. Other publications on the same patient group, also again show an increased risk of miscarriage, preterm delivery, intrauterine growth retardation (IUGR) and thromboembolism (2,12,13). The current study, evaluates 19 spontaneous or treated pregnancies, their pregnancy complications and the treatment approaches of 15 patients who were followed up for TI and TM.

MATERIAL AND METHOD

The research is a retrospective, study that has obtained and evaluated the data related to 22 gestational periods for 15 patients diagnosed with TM and TI, who were followed by ITF Pediatric Hematology and Oncology Department, based on their files and computer records. Consent was obtained from all patients, as well as approval from the Health Sciences University Umraniye Training and Research Hospital Ethics Committee. (Approval No: B.10.1.TKH.4.34.H.GP.0.01/07 dated January 26, 2023). The study evaluates the patients' gestational age, pre-pregnancy transfusion and chelator use status, transfusion status during pregnancy, complications during pregnancy, applied treatments, delivery process, status of babies (live/stillbirth, IUGR, prematurity), complications developing in newborn and postnatal babies and follow-up processes (Table 1).

FINDINGS

Of the patients 5 are TM, 9 are TI, and 1 patient is thalassemia carrier (TC) with alpha triplication. The patient with TC and alpha triplication was receiving regular transfusions at 3-week intervals. The gestational age of the patients is between 22-34 (28±3.9) years. Liver iron accumulation (LIC) was determined as

Table 1: General characteristics of the patients

		n	%
Diagnosis	TM	5	30,8
	TI	9	61,5
	TC and alpha triplication	1	7,7
Age	37± 4,2	15	100,0
Splenectomy	TI	5	33,4
	TC and alpha triplication	1	6,6
	TM	2	13,3
Pre-pregnancy transfusion	None	5	33,3
	Intermittently	4	26,7
	Regular	4	26,7
	More often than 3 weeks	2	13,3
Ferritin level (ng/dL)	TI: 827,27 ± 586,56	10	66,6
	TM: 1743.11± 727,12	5	33,4
LIC (n=11, mg Fe/g dry liver weight)	T: 8,96 ± 6,4	4	26,7
	TI: 7.37± 5,21	7	46,4
Hormone replacement therapy	TM	2	13,3
	TI	1	6,7
IVF	TI	1	6,7
Number of pregnancies (multiparity)	1	9	60,0
	2	5	33,3
	3	1	6,7
Gestational age	28±3,9	22	100,0

TM: Thalassemia major, TI: Thalassemia intermedia, TC: Thalassemia carrier, LIC: Liver Iron Concentrations, IVF: In vitro fertilization method

5.52±4.53 mg/g dry liver weight in the liver T2*MR evaluation of the patients before pregnancy. Regular pregnancy follow-up was performed on 14 patients. The one pregnancy without a follow-up ended in a miscarriage. Two patients diagnosed with TM and one diagnosed with TI received hormone replacement therapy (clomiphene citrate, human menopausal gonadotropin) in the pre-pregnancy period. One patient diagnosed with TI had twin pregnancy through in vitro fertilization. All of the patients who were followed up on had taken folic acid during pregnancy. Splenectomy was performed in the pre-pregnancy period on five of the patients with TI, two of the patients with TM, and one patient with TC and alpha triplication. Transfusion need and frequency increased in the five patients with TM who received regular transfusions. While initially receiving transfusions every three weeks, the transfusion interval was shortened to 2 weeks, especially during the third trimester. While four of the patients with TI were given intermittent transfusions (3-4 times a year), five had never been transfused. While an increase occurred in transfusion frequency for patients with TI who'd been previously transfused, four of those who'd not been transfused ended up needinged monthly transfusions after the first trimester. One patient with TI intermedia did not need any transfusion. While the one patient with TC and alpha triplication received transfusion intermittently in the pre-pregnancy period, an increase in the transfusion frequency was detected during pregnancy, with transfusions being performed every month during pregnancy. The amount of erythrocyte suspension given by transfusion was observed to be 14-66 U/10 months (30.3±2.8 U). Spontaneous pregnancy developed in one patient with TI

Table 2: Complications and treatments during pregnancy in patients

Transfusion during pregnancy	None	1	6,7
	Intermittently	4	26,7
	Regular	4	26,7
	More often than 3 weeks	6	40,0
Prophylaxis (n=15)	Folic acid	15	100,0
	Aspirin use	1	6,7
	Aspirin and LMWHs	5	33,3
	LMWHs	2	13,6
Type of birth (n=20)	VD	7	31,8
	CS	13	59,0
Complication (n=22)	Abortion	1	4,5
	Stillbirth	1	4,5
	Twin pregnancy	1	4,5
	Prematurity	5	22,7
	IUGR	4	18,1
	Respiratory distress	2	9,0
	Use of hydroxyurea	1	4,5

Aspirin: Acetyl salicylic acid, LMWHs: low-molecular-weight heparins, IUGR: Intrauterine growth restriction, VD: Spontaneous vaginal deliveries, CS: Caesarean section deliveries

using hydroxyurea. The hydroxyurea used in the first 5 weeks of pregnancy was discontinued after pregnancy was detected upon detecting pregnancy. Genetic counseling was then performed with additional fetal risks be investigated. At the request of the family, the decision was made to continue the pregnancy. The baby was born healthy and no problem was faced in the follow-up. Low-molecular-weight heparins(LMWHs) were used for thrombosis prophylaxis during pregnancy in four patients with TI who'd undergone a splenectomy, two patients with TM, and the one patient with TC and alpha triplication. Aspirin (acetylsalicylic acid) was additionally used duo to the high platelet counts in these patients. One patient had had a pulmonary embolism as a child. One patient received only aspirin. Three patients with TI and two patients with TM had preterm babies. The baby of one patient with TI was taken to the intensive care unit with the diagnoses of intrauterine growth retardations (IUGR) and meconium aspiration syndrome. After receiving mechanical ventilation support for 20 days, the baby was discharged in good health and with no problems. One of the patients with TI had preterm twin babies, with no problems occurring in the follow-up. Two patients with TM had a multiparous pregnancies. One patient who had three pregnancies had one result in abortion, with the other two pregnancies resulting in a healthy full term delivery. One patient with TI had two pregnancies, one baby was born healthy at full term, the second full term-born baby needed short-term intensive care due to respiratory distress (Tables 1,2).

DISCUSSION

Endocrine problems such as hypogonadism, hypothyroidism, hypoparathyroidism and diabetes mellitus may be seen in thalassemia syndromes due to iron accumulation. While these complications had been more difficult to manage in previous years, patients now live a longer life and want to have children due to the increased developments in treatment in recent years. As in every chronic disease, adherence to treatment and multidisciplinary approaches affect the success rate. The current study has evaluated 22 pregnancies of 15 patients with TM and TI, all but two of which resulted in live births. One of other two, one could not be followed up regularly. Similar to the more than 400 TM patients reported in the literature, the current study shows that patients with TM can have a healthy pregnancy and delivery process through with regular transfusions and effective chelation, as well as medical treatments when necessary (15). Most of this patient group may need hormone replacement therapy due to the anovulatory cycle (12). The study saw hormone replacement therapy to have been applied to two patients with TM and to one patient with TI, as well as the patient with TI having a child using in vitro fertilization. The literature has reported ovarian hyperstimulation syndrome (increased vascular permeability, thromboembolism, ascites, liver and kidney failure) to be able to rarely develop during hormone replacement therapy (14,16,17). None of the patients in the current study developed ovarian hyperstimulation syndrome, hypersplenic crisis, or cardiac failure. While cross-sectional ferritin levels were low in seven of the patients with TI (430.79±137 ng/ml), these levels were found to be above 1000 ng/ml in one patient. Of the study's patients with TI five had not been transfused before, while four patients had been transfused intermittently. An increase was observed in the ferritin levels of the patients whose transfusion need had occurred and increased during pregnancy. The ferritin levels of the patients with TM were over 1500 ng/ml and all of them had been using an oral chelator (deferasirox) before their pregnancy. The literature recommends oral chelation therapy be discontinued when pregnancy develops (18,19). The current study saw oral chelation therapy discontinued in the patients who develops pregnancy. Oral chelation therapy may result in pregnancy/maternal anemia and hypoxia which may develop then increase the risk of preterm birth, this is why patients with a pre-transfusion Hb level of 10 grams/dl are recommended to be included in a regular transfusion program (20). The pre-transfusion Hb levels of this study's patients were found to be 8.2±2.3 grams/dl on average. The need for transfusion increases in patients with TI during pregnancy, with 60-80% of the patients having received transfusions while pregnant, including those who had not been transfused before (21). As a result patients face the risk of alloimmunization. The recommendation has been made that the frequency of transfusion and Hb level before transfusion in pregnant women with thalassemia intermedia should be determined in pregnant women with TI according to the clinical condition of the patient and fetal development. However, other authors are also found to have suggested that the Hb level should be determined as 10 grams/dl before applying a transfusion as in TM (22). The study found the frequency of transfusions for patients with TM increase after the second trimester of pregnancy. Of nine patients with TI four had previously been dedected during pregnancy. Four patients who had not been transfused before were included in the regular transfusion program. Alloimmunization did not develop in any of the patients. The transfusion frequency for the patient with TC and alpha triplication, had been every 3 weeks but increased during pregnancy; her ferritin levels were also >1500

ng/ml. Studies conducted with regard to deferoxamine have stated pregnant women with severe liver and heart iron load to be able to used it after the second trimester of pregnancy. Kumar et al. reported that deferoxamine that had beed used in the 2nd and 3rd trimesters in 32 patients, had not increased fetal risk (2,23,24). The current study found the liver dry iron weight was found to be 7.85±5.27 mg/g in the T2*MR performed on the pre-pregnancy patients, with no complication associated with hyperferritinemia occurring nor any need for deferoxamine during pregnancy. The study learned that one patient with TI, who was using hydroxyurea, had became pregnant unplanned and continued taking the drug until she learned that she was pregnant. Animal studies, have reported that the drug, which is not recommended for use during pregnancy due to its potential teratogenic effect, may cause fetal meningomyelocele when used (25). This patient, had been given genetic counseling and offered the option of a medical abortion; she continued her pregnancy voluntarily and had a healthy baby. Preterm delivery occurred in five patients, one of which was a twin pregnancy, and four patiens had IUGR deliveries. This study's patients had no complaints of a significant decrease in effort capacity, significant tachycardia or need for cardiological drug support or chelation during pregnancy. While pregnancy alone adds a 4-folds increase in risk of thrombosis this rate increases more for pregnant women with TM. Because the presence of additional prothrombotic risk factors will increases the risk of thrombosis and pulmonary embolism, short-term use of anticoagulants during pregnancy and after delivery has been recommended for those with significant risk factors and patients with splenectomy (2,26,27). The risk has been reported is higher in splenectomized patients who are not transfused or have received very few transfusions (28). Aspirin and low-molecular-weight heparin (LMWH) prophylaxis were given to one patient who'd had a pulmonary embolism in childhood who'd used aspirin during pregnancy, and whose protein S level was found to be low (45%). During the follow-up, no thromboembolic event developed during pregnancy, and LMWH treatment continued for 6 weeks after delivery. Publications are found showing an increased risk of miscarriage, preterm delivery, IUGR and thromboembolism in pregnant women with TI (21). A spontaneous abortion occurred in one of the patients with TI without follow-up. Thalassemia disease being considered an indicator or for a cesarean section in patients with the disease is controversial. Due to a short stature and skeletal deformities, the head-pelvis mismatch of those with the disease is shown to be an indication for cesarean section (21,29). However, vaginal delivery may be preferred in young patients with no deformities. Because intubation may be difficult during a cesarean section as a result of skull deformity, if there a cesarean delivery with spinal epidural anesthesia should be offered as an alternative when there is no skeletal deformity. An elective cesarean section was preferred as the delivery method for most of study's patients (59%).

As a result, diagnosing and treating complications early is possible with a multidisciplinary approach and regular pregnancy follow-ups for patients with thalassemia during pregnancy, most of which are planned. A safe pregnancy and healthy delivery become possible as a result of evaluating heart and liver functions, screening for viral infections, reviewing of endocrinological problems and improving the quality of life before and, with the onset of pregnancy, as well as through folic acid, calcium, and vitamin D replacement, close monitoring of cardiac functions; involvolving patients in a transfusion program who have a pre-transfusion Hb level of 10 grams/dl, initiating of anticoagulant therapy if necessary, antibody screening and close sonographic follow-up of the fetus. In this study's limited number of cases, the pregnancies were successful and all but one of the patients with thalassemia delivered their children. Multi-center studies on this subject will contribute to the determining patients' methods regarding having children and to creating of guidelines.

Ethics Committee Approval: This study was approved by the ethics committee of the Health Sciences University Umraniye Training and Research Hospital Ethics Committee. (Approval No: B.10.1.TKH.4.34.H.GP.0.01/07 dated January 26, 2023).

Informed Consent: Written consent was obtained from the participants.

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REFERENCES

1. Petrakos G, Andriopoulos P, Tsironi M. Pregnancy in women with thalassemia:challenges and solutions. Int J Womens Health 2016;8:441–51
2. Origa R, Piga A, Quarta G, Forni GL, Longo F, Melpignano A et al. Pregnancy and beta thalassemia:an Italian multicenter experience. Haematologica 2010;95(3):376-81.
3. Galanello R. A thalassemic child becomes adult. Rev Clin Exp Hematol 2003;7(1):4-21.
4. Cunningham MJ. Update on thalassemia: clinical care and complications. Pediatr Clin North Am 2008;55(2):447-60.
5. Modell B, Khan M, Darlison M, Westwood MA, Ingram D, Pennell DJ. Improved survival of thalassaemia major in the UK and relation to T2* cardiovascular magnetic resonance. J Cardiovasc Magn Reson 2008; 10(1):42.
6. Telfer P, Coen PG, Christou S et al. Survival of medically treated thalassemia patients in Cyprus. Trends and risk factors over the period 1908-2004. Haematologica 2006;91(9):1187-92
7. Psihogios V, Rodda C, Reid E, Clark M, Clarke C, Bowden D. Reproductive health in individuals with homozygous beta-thalassemia: knowledge, attitudes, and behavior. Fertil Steril 2002;77(1):119-27.

8. Walker EH, Whelton MJ, Beaven GH. Successful pregnancy in a patient with thalassaemia major. J Obstet Gynaecol Br Commonw 1969;76(6):549-53.
9. Skordis N, Petrikkos L, Toumba M, Hadjigavriel M, Sitarou M, Kolnakou A et al. Update on fertility in thalassaemia major. Pediatric Endocrinol Rev 2004;2 (Suppl2):296-302
10. Cunningham MJ, Macklin EA, Neufeld EJ, Cohen AR; Thalassemia Clinical Research Network. Complications of beta-thalassemia major in North America. Blood 2004;1;104(1):34-9.
11. Thompson AA, Kim HY, Singer ST, Vichinsky E, Eile J, Yamashita R et al. Thalassemia Clinical Research Network. Pregnancy outcomes in women with thalassemia in North America and the United Kingdom. Am J Hematol 2013;88(9):771-73.
12. Gulino FA, Vitale SG, Fauzia M, Cianci S, Pafumi C, Palumbo MA. Beta-Thalassemia major and pregnancy. Bratisl Lek Listy 2013;114 (9) 523-25 .
13. Cassinerio E, Baldini IM, Alameddine RS, Macron A, Borroni R, Ossola W et al. Pregnancy in patients with thalassemia major:a cohort study and conclusions for an adequate care management approach. Ann Hematol 2017;96(6):1015-21.
14. Smith V, Osianlis T, Vollenhoven B. Prevention of Ovarian Hyperstimulation Syndrome: A Review. Obstet Gynecol Int 2015;2015:514159
15. Origa R and Comitini F. Pregnancy in Thalassemia. Mediterr J Hematol Infect Dis 2019;11(1): e2019019,
16. Ansari S, Azarkeivan A, Tabaroki A. Pregnancy in patients treated for beta thalassemia major in two centers (Ali Asghar Children's Hospital and Thalassemia Clinic):outcome for mothers and newborn infants. Pediatr Hematol Oncol 2006;23(1):33-37.
17. Toumba M, Kanaris C, Simamonian K, Skordis N. Outcome and management of pregnancy in women with thalassaemia in Cyprus. East Mediterr Health J 2008;14(3):628-35.
18. Singer ST, Vichinsky EP. Deferoxamine treatment during pregnancy: is it harmful? Am J Hematol 1999;60(1):24-26.
19. Galanello R, Origa R. Beta-thalassemia. Orphanet J Rare Dis. 2010; 5: 11.
20. Farmakis D, Porter C, Taher A, Cappellini MD, Angastiniotis M, Eleftheriau A. 2021 Thalassaemia International Federation Guidelines for the Management of Transfusion-dependent Thalassemia. Hemasphere. 2022 Aug; 6(8): 732e.
21. Voskaridou E, Balassopoulou A, Boutou E, Komninaka V, Christoulas D, Dimopoulou M et al. Pregnancy in beta-thalassemia intermedia:20-year experience of a Greek thalassemia center. Eur J Haematol 2014;93(6):492-99.
22. Nassar AH, Usta IM, Taher AM. Beta-thalassemia intermedia and pregnancy:should we anticoagulate? J Thromb Haemost 2006;4(6):1413-14.
23. Kumar RM, Rizk DE, Khuranna A. Beta-thalassemia major and successful pregnancy. J Reprod Med 1997;42(5):294-298.
24. Tsironi M, Karagiorga M, Aessopos A. Iron overload, cardiac and other factors affecting pregnancy in thalassemia major. Haemoglobin 2010;34(3):240-50.
25. Choudhary DR, Mishra P, Kumar R, Mahapatra M, Choudhry VP. Pregnancy on imatinib: fatal outcome with meningocele. Ann Oncol 2006;17:178-79
26. Tuck SM. Fertility and pregnancy in thalassemia major. Ann N Y Acad Sci 2005;1054:300-307 .
27. Daskalakis GJ, Papageorgiou IS, Antsaklis AJ, Michalas SK. Pregnancy and homozygous beta thalassaemia major. Br J Obstet Gynaecol 1998;105(9):1028-32.
28. Roumi JE, Moukhadder HM, Graziadei G, Pennisi M, Cappellini MD, Taher AT. Pregnancy in β-thalassemia intermedia at two tertiary care centers in Lebanon and Italy: A follow-up report on fetal and maternal outcomes. Am J Hematol 2017;92(6):96-99.
29. Aessopos A, Karabatsos F, Farmakis D,Katsantoni A, Hatziliami A, Youssef J et al. Pregnancy in patients with well-treated beta-thalassemia: outcome for mothers and newborn infants. Am J Obstet Gynecol 1999;180(2 Pt 1):360-65.

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RESEARCH ARTICLE

The Results of Echocardiography Applied to Heart Murmurs in Two Different Centers: is Geography Destiny?

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ABSTRACT

Objective: Heart murmurs in childhood are the most common reason for pediatric cardiology consultations worldwide. The aim of this study is to investigate the frequency and etiology of congenital heart disease (CHD) in two different centers possessing significant differences in factors such as geography, climate, and sociocultural conditions.

Methods: The study involves patients who'd been referred to the pediatric cardiology outpatient clinic due to heart murmurs between November 2022-October 2023. All patients were evaluated by echocardiograph to investigate the causes of the murmur.

Results: The study includes 2,127 patients (1,452 from Şırnak and 675 from Giresun; median age = 1.95 years). The gender distributions were similar in both regions. Pathological heart murmurs were more prevalent in Şırnak (21.6%) compared to Giresun (7.7%), while Giresun had a higher percentage of innocent murmurs (92.3%). Cyanotic conditions were rare. Surgery was required for 3.7% of patients overall (4.5% in Şırnak; 1.9% in Giresun). Normal echocardiograms were found in 46% of the total population, with variations being 41% in Şırnak and 56% in Giresun. Pathological murmurs were more common in females. Patients with pathological murmurs were more likely to require surgery. Şırnak had more pathological echocardiography results and a higher need for surgery. Neonates were the age group most frequently requiring surgery in both centers.

Conclusions: Educating society and fostering awareness are imperative steps for preventing consanguineous marriages and encouraging appropriate birth intervals. Swift public education is particularly crucial in developing nations marked by elevated consanguinity rates and limited financial resources, highlighting the potential detrimental consequences of inbreeding.

Keywords: Child, echocardiography, cardiac murmur

INTRODUCTION

Congenital heart defects (CHDs) represent a significant share of clinically notable birth abnormalities and are a crucial aspect of pediatric cardiovascular conditions, with an estimated occurrence of 6–9 CHD cases per 1,000 live births [1,2]. Heart murmurs are one of the most common warning signs for pediatricians in the diagnosis of CHD. Heart murmurs are sounds created by turbulent blood flow in the heart and vascular structures and are transmitted to the chest wall between 20-2,000 Hz. Heart murmurs in the childhood age group are the most common reason for pediatric cardiology consultations worldwide. Innocent heart murmurs can be heard in 70-85% of healthy children. This type of murmur develops due to increased blood flow rate without any cardiac pathology and occurs in cases where cardiac output increases, such as fever, anemia, and thyrotoxicosis. Innocent murmurs are defined as short-term, single, soft, non-propagating rhythmic sounds systolic in nature that change character with breathing and position. Heart murmurs can also occur as a sign of congenital or acquired heart disease. A child with a heart murmur needs to be evaluated with a history and a systemic examination, as well as a detailed cardiovascular system examination. Therefore, having pediatricians distinguish between innocent and pathological murmurs is of great importance. In this way, incorrect diagnoses, unnecessary referrals, and loss of money and time can be prevented [3–5].

This study's objective is to assess the frequency and complexity of CHD alongside echocardiographic findings in patients presenting to one of two pediatric cardiology outpatient clinics

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with heart murmurs. The study has chosen two cities in pursuit of this, one being Şırnak, a mountainous region that has a lower sociocultural level, higher fertility rates, and a greater number of consanguineous marriages. The other is Giresun, a coastal area with lower fertility rates where consanguineous marriages are relatively less common. Based on the 2022 data from the Turkish Statistical Institute (TURKSTAT), the crude birth rate in Şırnak is 23.7 per thousand, which is significantly higher than that of Giresun, which stands at 8.3 per thousand. Additionally, Şırnak has a 14.5% rate of consanguineous marriages, while Giresun's is 8.5%. Both of these differences have been found to be statistically significant ($p < 0.005$) through the chi-squared test. The aim is to explore the etiology of CHD in two distinct centers that differ significantly in terms of such factors as geography, climate, and sociocultural conditions.

MATERIAL AND METHODS

This retrospective study was conducted between November 2022-October 2023 at two medical centers, one in Şırnak and the other in Giresun. The study focuses on patients who'd been referred to the pediatric cardiology clinic due to the presence of heart murmurs. All patients who presented during this period were included in the study, and their demographic characteristics and echocardiographic findings are analyzed retrospectively. The study received ethical approval from the Şırnak University Faculty of Medicine Ethics Committee (Approval No: 71172 dated 8/10/2023) and was conducted in accordance with the principles outlined in the Helsinki Declaration.

Patients with pre-existing cardiac diagnoses who were under follow-up, as well as those who presented with symptoms unrelated to heart murmurs (e.g., chest pain, syncope, palpitations) or for obtaining a sports medical certificate were excluded from the study. The remaining patients were categorized into two groups (i.e., innocent heart murmurs, pathological heart murmurs) based on the referral made by pediatric physicians. Comprehensive medical histories were obtained from all patients. Two-dimensional, M-mode, and color Doppler echocardiography techniques were employed to evaluate the patients, and the examination findings were compared with the results from their echocardiography.

Statistical analysis

The data were analyzed using IBM SPSS Statistics 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented in terms of the number of units (*n*), percentages (%), and median values. The study assesses the normality of the single numerical variable of age using the Shapiro-Wilk normality test. Categorical variables such as gender, the child cardiology center to which the patient belonged, the need for surgery, the presence of cyanosis, and type of murmur are evaluated using the chi-squared test. A p-value less than 0.05 is considered statistically significant.

RESULTS

The study involves a total of 2,127 patients, with 1,452 patients being from Şırnak and 675 from Giresun. The median age of the patients is 1.95 years (Range: 1 d - 18 yrs.). Figure 1 shows the patients' age distributions. Of the total cohort of cases, 45.3% are girls and 54.7% are boys. Similarly, both Şırnak and Giresun have similar gender distributions. Regarding the presence of pathological or innocent heart murmurs, a higher percentage of patients in Şırnak had pathological murmurs (21.6%) compared to Giresun (7.7%), resulting in an overall average percentage of 17.2% for the total population. Meanwhile, Giresun had a higher percentage of innocent murmurs (92.3%) compared to Şırnak (78.4%). Cyanotic conditions were rare in both centers, with only a small percentage of the total cohort of patients presenting with cyanosis. The need for surgery was present in a small proportion of cases, with 3.7% of patients in the total cohort requiring surgery (4.5% in Şırnak; 1.9% in Giresun). Finally, when assessing the echocardiography results, 46% of the total population had normal echocardiograms. Şırnak had a slightly lower percentage of normal echocardiograms (41%), while Giresun had a higher percentage (56%) of normal echocardiography findings (Table 1).

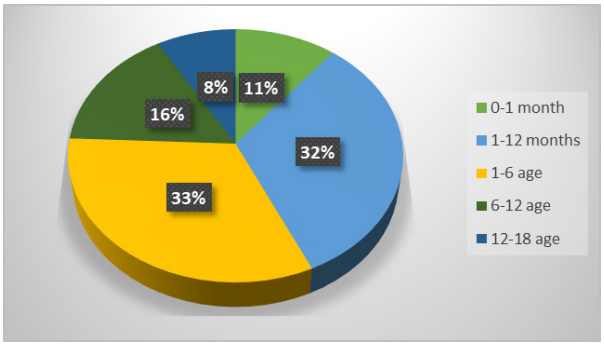

Figure 1: Distribution of patients by age groups.

A significant statistical difference was observed when examining the relationship between heart murmurs and gender. Pathological heart murmurs were found to be more prevalent among females ($p = 0.017$). However, no significant dependence was observed between gender and the need for surgery ($p > 0.05$). Additionally, the patients with pathological heart murmurs were observed to require surgery more often ($p < 0.001$). Additionally, an approximately 42% correlation was found between type of heart murmur and the need for surgery. When comparing the echocardiography results from both centers, pathological echocardiography results were found more often in patients in Şırnak ($p < 0.001$). When evaluating the center where the patients were located alongside the need for surgery, the patients in Şırnak were determined to require surgery more often ($p = 0.005$; Table 2). No significant dependence was observed between the center where the patients were located and their diagnosis of cyanotic heart disease ($p = 0.443$).

A significant difference was observed between the groups based on whether the patients were referred for surgery and their age. When evaluating each center internally, the neonatal age group was the age group most frequently in need of surgery in both centers ($p < 0.05$; Table 3).

Table 1: Demographic characteristics of the patients, murmur types, cyanosis status and main diagnoses detected after echocardiography

Variables	Total (n=2127)	Şırnak (n=1452)	Giresun (n=675)
Median Age (years)	1.95 (1 day-18 years)	2.23 (1 day-17.6 years)	1.29 (1 day-18 years)
Female/Male	964/1163 (45.3%/54.7%)	663/789 (45.7%/54.3%)	301/374 (44.6%/55.4%)
Pathological/Innocent Murmur	365/1762 (17.2%/82.8%)	313/1139 (21.6%/78.4%)	52/623 (7.7%/92.3%)
Cyanotic/Non-Cyanotic	7/2120 (0.3%/99.7%)	6/1446 (0.4%/99.6%)	1/674 (0.1%/99.9%)
Need for Surgery	78 (3.7%)	65 (4.5%)	13 (1.9%)
Echocardiographic results			
Normal	979 (46%)	600 (41%)	379 (56%)
Patent foramen ovale	486 (22.8%)	398 (27.4%)	88 (13%)
Atrial septal defect	195 (9.2%)	120 (8.3%)	75 (11.1%)
Mitral regurgitation	105 (4.9%)	77 (5.3%)	28 (4.1%)
Ventricular septal defect	99 (4.6%)	75 (5.2%)	24 (3.6%)
Patent ductus arteriosus	98 (4.6%)	89 (6.1%)	9 (1.3%)
Pulmonary stenosis	49 (2%)	24 (1.6%)	15 (2.2%)
Aortic regurtitation	37 (1.7%)	25 (1.7%)	12 (1.8%)
Peripheral pulmonary stenosis	25 (1.1%)	10 (0.6%)	15 (2.2%)
Coronary fistula	11 (0.5%)	3 (0.2%)	8 (1.2%)
Aortic coarctation	7 (0.3%)	3 (0.2%)	4 (0.6%)
Atrioventricular septal defect	6 (0.2%)	5 (0.34%)	1 (0.2%)
Aortic stenosis	6 (0.2%)	3 (0.2%)	3 (0.4%)
Ascending aortic dilatation	8 (0.4%)	0	8 (1.2%)
Tetralogy of Fallot	5 (0.2%)	4 (0.3%)	1 (0.2%)
Other	21 (1%)	16 (1.1%)	5 (0.7%)

Table 2: Comparison of Echocardiography Results by Centers when Evaluated as Normal-Pathological

Center	Normal (n, %)	Pathological (n, %)	p-value	Need for surgery	No-need for surgery	p-value
Şırnak	600 (41.3%)	852 (58.7%)	**<0.001**	65 (%4,5)	1387 (%95,5)	**0,005**
Giresun	379 (56.1%)	296 (43.9%)		13 (%2)	662 (%98)	

Table 3: The comparison of patients' referral for surgery based on age groups at the * and **** centers**

Center	Age Groups	p-value	0-1 month (n, %)	1-12 months (n, %)	1-6 years (n, %)	6-12 years (n, %)	12-18 years (n, %)
Şırnak	No Surgery	**<0.001**	117 (88%)	438 (94.2%)	427 (96.8%)	257 (98.5%)	148 (97.4%)
	Surgery		16 (12%)	27 (5.8%)	14 (3.2%)	4 (1.5%)	4 (2.6%)
Giresun	No Surgery	**<0.05**	90 (93.8%)	220 (98.7%)	248 (98.8%)	78 (100%)	26 (96.3%)
	Surgery		6 (6.3%)	3 (1.3%)	3 (1.2%)	0 (0%)	1 (3.7%)

DISCUSSION

Cardiovascular malformations affect 0.4-1.4% of live births, and a quarter of these cases require specialized cardiac treatment in infancy. However, delayed or unsuccessful diagnoses occur in 20-30% of cases, despite prenatal CHD screening being successful and widely available. Over 10% of severe CHD cases currently still experience delayed identification [6]. Therefore, accurate detection of cardiac murmurs protects patients with innocent murmurs from the fear of heart disease, unnecessary medication, and physical activity restrictions while ensuring that patients with pathological murmurs are quickly diagnosed and given the necessary intervention and treatment. To distinguish between innocent and pathological murmurs, a suitable environment must be provided for the examination, and the physician performing the examination must be experienced. Yıldız et al. [7] observed that valve insufficiency and atrial septal defects that may require follow

up were detected in the echocardiograms of patients who were thought to have had innocent murmurs. They emphasized that echocardiographic examinations may also be required for innocent heart murmurs.

Studies have reported the prevalence of innocent murmurs in patients admitted with a cardiac murmur to range from 63-80% [3,5]. The current study found this rate to be 82.8% over the entire patient group. Of the echocardiographic evaluations of patients presenting with heart murmurs, 46% resulted in normal cardiac findings. Of the patients presenting with murmur, the most common abnormal cardiac findings were patent foramen ovale (PFO), atrial septal defect (ASD), and mitral regurgitation (MR). Similar to this study, two other studies conducted in Turkey found the order of frequency (highest to lowest) to be PFO, ASD, and pulmonary stenosis [5,7], while another study instead found mitral valve prolapse and mitral regurgitation to come after ASD [3].

The echocardiographic evaluations of patients presenting with heart murmurs in the current study reveal abnormal cardiac findings in 54% of the entire group. However, these data show significant differences between the two centers, with the patients living in Şırnak having a greater number of abnormal cardiac findings. At the same time, the patients living in Şırnak were also determined to require cardiac operations more frequently. Several reasons for this situation have been considered. According to 2022 TURKSTAT data, 14.3% of marriages in Şırnak are consanguineous, while this rate is 8.5% in Giresun [8]. Previous investigations have explored the connection between consanguinity and various diseases in children. The findings indicate that, despite higher fertility rates in consanguineous marriages compared to non-consanguineous ones, the percentage of living children is similar in both groups. This is attributed to the increased child mortality rate in consanguineous marriages. The results underscore the impact of homozygous recessive genes in causing different types of CHD, suggesting a potential multi-factorial genetic pattern. Consanguinity among parents enhances the accumulation of recessive genes in their offspring, consequently elevating the likelihood of congenital malformations, including heart anomalies. Consequently, raising awareness within communities, particularly in countries with high consanguinity rates and an elevated disease burden, about the adverse effects of inbreeding is crucial [9,10].

Of course, the presence of genetic influences in the development of CHD is very crucial. The recent advancements in genetic and genomic techniques have facilitated the discovery of over 100 genes linked to CHD. Despite these significant breakthroughs, only one-third of CHD cases have been attributed to straightforward genetic causes. This is due to the complex nature of CHD, where factors such as oligogenic influences, environmental elements, and gene-environment interactions also play pivotal roles. One of these is hypoxia, a secondary effect of living in high altitudes. In the early 1950s, the initial reports highlighted an elevated incidence of atrial septal defect and patent ductus arteriosus cases among infants born at high altitudes. Maternal exposure to varying levels of reduced oxygen during mid-gestation, even for brief periods, has been identified as a factor causing conotruncal heart defects [11]. Other studies have demonstrated an 8%-14% exposure to hypoxia midgestation to reduce the levels of the cardiac transcription factor Nkx2-5, leading to heart defects [12]. This interaction between the environment and a gene may offer insight into the intriguing clinical observation that populations at high altitudes exhibit significantly higher rates of complex CHD compared to those at sea level [13]. These observations align with the findings from the current study, indicating a lower frequency of abnormal cardiac findings in the coastal province of Giresun (altitude = 14 meters) compared to the mountainous region of Şırnak (altitude = 1,700 meters). However, importance is had in noting that this association should be interpreted cautiously and that the need exists for more extensive investigations to establish a direct link between altitude and the development of CHD. Additionally, the potential influence of other factors such as the duration of maternal residence in these regions during pregnancy requires further exploration.

In addition, evidence exists that a mother's decreased intake of vital nutrients may increase her offspring's risk of developing CHD [11]. The decrease in essential nutrients in mothers can be attributed to various factors. Firstly, maintaining a well-balanced diet that prevents deficiencies is crucial and requires both nutritional knowledge and the financial means to afford such dietary support when necessary. Achieving this demands a favorable socioeconomic status. In the Southeastern Anatolia region (SAR) where Şırnak is located, however, 41.5% of the population falls into the lowest welfare category. In contrast, in the Eastern Black Sea region (EBR) that is represented by Giresun, 25.5% of the population is categorized as having the lowest welfare level [14].

According to the 2022 TURKSTAT data, Şırnak is the province in Turkey with the second highest fertility rate (23.7 per thousand), while Giresun has the fourth lowest fertility rate (8.3 per thousand; Figure 2) [8]. Şırnak's high number of patients with heart murmurs may be attributed to its high birth rate and child population. Given the need to avoid missing diagnoses, especially in the newborn and young child group, many patients in Şırnak are inevitably directed to pediatric cardiology for heart murmur diagnosis. Although women are known to have many children with little time in between births in Türkiye, especially in the SAR, the 2018 Turkey Population and Health Survey (TNSA) states the median birth interval of women to have been 33 months in the SAR, while this value was 50 months in the EBR [14]. Previous publications have determined low birth weight to also be an independent risk factor [9]. While the rate of children born smaller than average and very small in SAR is 26.7%, this rate is 21.8% in EBR [14].

This study has limitations that are secondary to its retrospective character. Importance is had in noting that the specific consanguinity statuses of the individual cases included in the

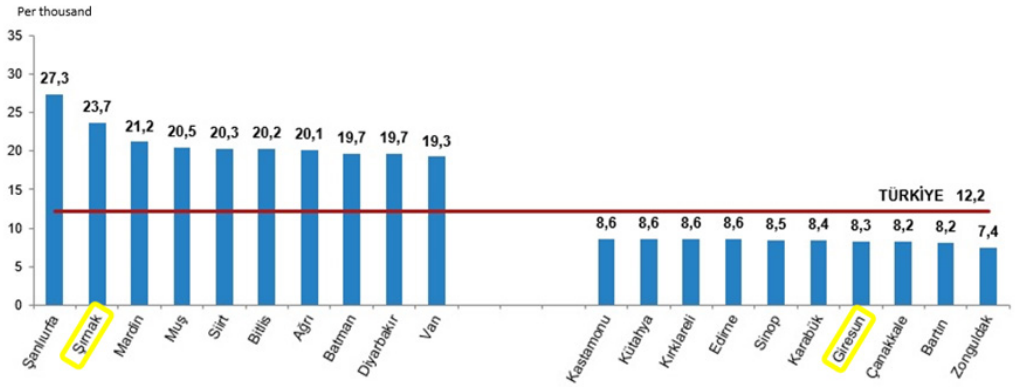

Figure 2: The 10 provinces with the highest and lowest crude birth rates, 2022[8].

analysis were unavailable and that the study had to use the 2022 TURKSTAT data to compare consanguinity situations in the two regions. Despite efforts to obtain this information, its absence limits the study's comprehensiveness. Other factors that have been found to have an impact in the literature regarding the prospective design can also be examined, such as mothers' drug and cigarette use. Nevertheless, this study is believed to be able to contribute to the literature by being a heart murmur etiology study with a large population and by shedding light on the realities in Türkiye.

CONCLUSION

In conclusion, this study had delved into the prevalence and complexity of CHD among pediatric patients presenting with heart murmurs in two distinct regions with varying sociocultural, geographical, and climatic conditions. The findings underscore the significance of distinguishing between innocent and pathological murmurs, as incorrect diagnoses can lead to unnecessary referrals and resource expenditures. The study's results reveal a higher prevalence of pathological murmurs in the mountainous region of Şırnak, which might possibly be attributable to factors such as consanguinity rates, altitude-related hypoxia, and socioeconomic conditions. The need for cardiac surgery was also more pronounced in this region, emphasizing the importance of early detection and intervention. This study highlights the impact consanguinity has on CHD, with Şırnak exhibiting higher rates of both compared to Giresun. Despite these limitations, the large population size and comprehensive analysis contribute valuable insights into the heart murmur etiology landscape in Türkiye. Prospective studies that consider additional factors such as maternal habits and a broader range of socioeconomic indicators will be able to further enrich the world's understanding. In essence, this research underscores the intricate interplay of genetic, environmental, and sociocultural factors in shaping the prevalence and complexity of CHD. Awareness of these factors is crucial for healthcare practitioners, policymakers, and communities in implementing targeted preventive measures and ensuring timely and accurate diagnoses for pediatric patients with heart murmurs.

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Ethics Committee Approval: The study received ethical approval from the Şırnak University Faculty of Medicine Ethics Committee (Approval No: 71172 dated 8/10/2023) and was conducted in accordance with the principles outlined in the Helsinki Declaration.

Informed Consent: Written consent was obtained from the participants.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- M.M.A.; Data Acquisition- M.M.A., B.Y., V.T.; Data Analysis/Interpretation- B.Y.; Drafting Manuscript-M.M.A., V.T. ; Critical Revision of Manuscript-M.M.A., B.Y.; Final Approval and Accountability- M.M.A., B.Y., V.T.

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REFERENCES

1. Patel SS, Burns TL.; Nongenetic risk factors and congenital heart defects. Pediatric Cardiology 2013;34:1535–55. https://doi.org/10.1007/s00246-013-0775-4.
2. Salihoğlu M, Palanduz A, Yolar L, Arapoğlu M, Kiliç D, Kayaalp N.; Doğumsal Kalp Hastalığı Ön Tanısı ile İzlenen Yenidoğanların Değerlendirilmesi. Şişli Etfal Hastanesi Tıp Bülteni 1999;33:23–7.
3. Karacan M, Olgun H, Orhan MF, Altay ND, Öztürk CF, Karakelleoğlu C, et al.; Undiagnosed cardiac abnormalities among school-aged children. Guncel Pediatri 2010;8:63–6.
4. Kocabas A, Cetinkaya Ozer S, Kardelen F, Ertug H, Akcurin G.; Evaluation of the Skills of Pediatric Residents in Childhood Cardiac Murmurs. Turkish Journal of Pediatric Disease 2013;7:163–7. https://doi.org/10.12956/tjpd.2013.4.01.
5. Türe M, Akın A, Kaya İK, Yavuz Ş.; Üfürüm ile Başvuran Çocukların Ekokardiyografi Sonuçlarının Değerlendirilmesi. Harran Üniversitesi Tıp Fakültesi Dergisi 2021;18:273–8. https://doi.org/10.35440/hutfd.
6. Kostopoulou E, Dimitriou G, Karatza A.; Cardiac Murmurs in Children: A Challenge For The Primary Care Physician. Current

Pediatric Reviews 2019;15:131–8. https://doi.org/10.2174/1573396315666190321105536.

7. Yıldız J, Çetin İİ, Aktaş D, Arı ME, Kocabaş A, Ekici F, et al.; Is Echocardiographic Evaluation Necessary for all Children with Cardiac Murmur? Turkish Journal of Pediatric Disease 2015. https://doi.org/10.12956/tjpd.2015.158.
8. (TÜİK) TİK.; Doğum İstatistikleri 2021. https://data.tuik.gov.tr/Bulten/Index?p=Dogum-Istatistikleri-2022-49673#:~:text=Türkiye verisinin kaynağı TÜİK%27tir.&text=Kaba doğum hızı%2C bin nüfus,yılında 12%2C2 doğum düştü.
9. Haq FU, Jalil F, Hashmi SK, Jumani MI, Imdad A, Jabeen M, et al.; Risk factors predisposing to congenital heart defects. Annals of Pediatric Cardiology 2011;4:117–21. https://doi.org/10.4103/0974-2069.84641.
10. Nabulsi MM, Tamim H, Sabbagh M, Obeid MY, Yunis KA, Bitar FF.; Parental consanguinity and congenital heart malformations in a developing country. American Journal of Medical Genetics 2003;116 A:342–7. https://doi.org/10.1002/ajmg.a.10020.
11. Kalisch-Smith JI, Ved N, Sparrow DB.; Environmental risk factors for congenital heart disease. Cold Spring Harbor Perspectives in Biology 2020;12. https://doi.org/10.1101/cshperspect.a037234.
12. Moumne O, Chowdhurry R, Doll C, Pereira N, Hashimi M, Grindrod T, et al.; Mechanism Sharing Between Genetic and Gestational Hypoxia-Induced Cardiac Anomalies. Frontiers in Cardiovascular Medicine 2018;5:1–10. https://doi.org/10.3389/fcvm.2018.00100.
13. Zheng JY, Qiu YG, Li DT, He JC, Chen Y, Cao Y, et al.; Prevalence and composition of CHD at different altitudes in Tibet: A cross-sectional study. Cardiology in the Young 2017;27:1497–503. https://doi.org/10.1017/S1047951117000567.
14. Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü.; 2018 Türkiye Nüfus ve Sağlık Araştırması. Ankara: T.C. Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı ve TÜBİTAK; 2019.

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RESEARCH ARTICLE

The impact of the COVID-19 Pandemic on Breastfeeding Practices among Mothers*

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ABSTRACT

Objective: This study aimed to evaluate the impact of the COVID-19 pandemic on breastfeeding practices among mothers with infants aged 0– 24 months.
Methods: The research was carried out at the Ankara City Hospital's breastfeeding support/relactation clinic and mother-infant bonding service from December 2021 to May 2022. A sample of 511 mothers who visited these clinics during the study period, agreed to participate, and met the research criteria was included. Data collection was done using a descriptive data form.
Results: The average age of the mothers was 28 ± 4.7 (18–44), and 51.66% had undergone cesarean delivery. Approximately 54.41% of the mothers were university graduates. During the pandemic, 13.0% of the mothers reported breastfeeding-related issues, and all those who faced problems refrained from seeking hospital assistance. Additionally, 12.14% of the mothers had COVID-19 during pregnancy, 76.13% contracted it after childbirth, and 69.70% of those who had COVID-19 discontinued breastfeeding. Furthermore, 28.79% of the mothers who continued breastfeeding reported feeling anxious while nursing. Approximately 57.6% of the mothers stated they did not receive any breastfeeding-related information during the pandemic, and 17.50% experienced breastfeeding issues after quarantine. While hospitalized due to COVID-19, 48.7% of the mothers breastfed their infants, 41.0% fed expressed breast milk and formula, and 10.3% exclusively used formula.
Conclusions: The findings underscored the necessity for breastfeeding counseling services for mothers during the COVID-19 pandemic.

Keywords: Pandemic, breastfeeding, breast milk

INTRODUCTION

The COVID-19 outbreak, originating in Wuhan, China in December 2019, swiftly spread globally, promting infections across numerous countries. By the end of January, as COVID-19 reached 19 countries, the World Health Organization (WHO) declared it a "Public Health Emergency of International Concern." With millions of deaths worldwide, it was declared a pandemic by March 2020 (1).

As the virus proliferated worldwide, nations implemented measures to curb its spread, including social distancing and home isolation. Both public and private sectors adopted flexible work arrangements like staggered shifts and remote work. Schools transitioned to distance learning, and gatherings were canceled. These measures altered daily routines for individuals and societies, impacting everyone (1,2,3).

The COVID-19 pandemic is believed to have influence the breastfeeding process for mothers, much like its impact on various aspects of life. Studies indicate no transmission of the virus through breastfeeding. Nonetheless, the widespread infection and its alarming nature have instilled fear and anxiety among mothers. Many have been unable to attend prenatal classes, access breastfeeding education, and seek healthcare for postnatal breastfeeding challenges (4,5,6,7,8).

Policies concerning breastfeeding following COVID-19 infection have varied among pregnant women across different countries. The WHO has recommended breastfeeding during the outbreak, emphasizing the importance of mothers wearing masks, maintaining breast hygiene, and practicing hand washing before and after contact with the baby (9).

The primary mode of transmission for the COVID-19 virus is through droplets. Studies have found no evidence of the COVID-19 virus in amniotic fluid, cord blood, placenta, or breast milk (7,10,11). Transmission of the virus occurs primarily through close contact and droplets, with potential routes including the enteral route, conjunctival mucosa, or

*This study was prepared as a master thesis.

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contaminated surfaces (12). Therefore, the possibility of transmission through droplets between mother and baby warrants careful consideration. However, due to the novelty of the infection, research on this topic is limited (13).

Although literature indicates that the COVID-19 virus does not pass through breast milk, it is acknowledged that the risk of transmission via contact and droplet infection, alongside the social life restrictions and anxieties imposed, have impacted the breastfeeding period. Hence, this study was conducted descriptively to evaluate the effects of the COVID-19 pandemic on the breastfeeding status of mothers with infants aged 0–24 months.

METHODS AND PROCEDURES

Study Design
The study was conducted in a descriptive manner.

Location and Timeframe
The study took place at Ankara City Hospital within the Maternal Support Breastfeeding/Relactation Polyclinic (Breastfeeding/Relactation Support Clinic) and the Mother-Baby Bonding Unit from December 2021 to May 2022.

Population and Sample
The study encompassed a total population of 4,498 mothers who visited the Maternal Support Breastfeeding/Relactation Polyclinic (2,102) and the Mother-Baby Bonding Unit (2,396) at Ankara City Hospital. Utilizing a commonly employed formula for known populations, a minimum sample size of 380 was determined. Ultimately, a sample of 511 mothers with children aged 0–24 months, who attended the specified clinics during the study period, consented to participate, and met the research criteria, was included in the study.

Inclusion Criteria
- Mothers with infant aged 0–24 months
- Proficient in the Turkish language
- No communication difficulties
- Mothers who provided consent to participate in the research

Data Collection Tools
Descriptive Data Form
The researchers devised a questionnaire comprising 48 inquiries, structured in accordance with the existing literature. The questionnaire encompasses 4 questions pertaining to the sociodemographic attributes of the mothers, 8 questions concerning the birth-related characteristics of both the mother and the infant, 17 questions addressing the breastfeeding status of the mothers during pregnancy and postpartum, 7 questions focusing on the mothers' knowledge regarding infant feeding, and 12 questions dedicated to assessing the mothers' behaviors regarding breastfeeding and infant feeding amidst the COVID-19 pandemic.

Research Implementation
Data collection for the research was carried out by the researcher either through face-to-face interviews or utilizing the Google Forms survey tool, based on the preferences of the participating mothers. The estimated time required to complete the survey form ranged from 10 to 15 minutes.

Ethical Considerations
The research obtained written approval from the Zonguldak Bülent Ecevit University Human Research Ethics Committee (25.11.2021/105435) and the Ankara Provincial Health Directorate. Prior to commencing the study, participants received detailed information regarding the research objectives and procedures, and their consent was sought. Participant identities remained confidential, with no names disclosed. A voluntary consent form was incorporated at the outset of the Google Forms survey, ensuring participants' consent before proceeding to answer the survey questions.

Data Analysis
Data analysis was conducted using SPSS 16.0 software. Frequencies and percentages were utilized for analyzing categorical variables, while descriptive statistics including minimum and maximum scores, mean, standard deviation, and median values were employed to assess continuous variables.

Limitations and Challenges in the Research
The findings of this study are constrained by the timeframe during which the research was conducted and the responses elicited from participants through the data collection tools employed.

RESULTS

The average age of the participating mothers was determined to be 28.34 ± 4.72 years, ranging from 18 to 44 years. The mean gestational age of the infants was found to be 38.96 ± 3.42 weeks, with a range from 32 to 42 weeks. Mothers breastfed their infants for an average duration of 12.22 ± 3.81 months, ranging from 0 to 24 months. Regarding the educational attainment of the mothers, 30.33% (n = 155) had completed high school education, while 54.41% (n = 278) had completed university education (Table 1).

Table 1: Distribution of maternal and infant socio-demographic characteristics

Feature		Ort.±SS	Median (Min-Maks)	
Mother's age		28.34±4.72	27.00 (18.00-44.00)	
Week the baby was born		38.96±3.42	38.00 (32.00-42.00)	
Baby's age (in months)		12.22±3.81 (00.00-24.00)		
Breastfeeding duration (in months)		16.44±4.62 (00.00-24.00)		
			n	**%**
Mother's educational status	Literate		2	0.39
	Primary school		12	2.35
	Middle school		64	12.52
	High school		155	30.33
	University		278	54.41
	Total		**511**	**100.0**

Approximately 48.34% (n = 247) of the mothers delivered their babies normally, and 72.02% (n = 368) gave birth at a state hospital. Among those who underwent cesarean delivery, 20.71% (n = 54) reported a previous cesarean delivery, 12.85% (n = 34) opted for cesarean delivery due to pelvic constriction, and 15.47% (n = 41) chose it because of health issues (Table 2).

Table 2: Distribution of birth-related characteristics of mother and baby

Feature		n	%
Type of Birth	Normal Birth	247	48.34
	Cesarean section	264	51.66
Place of birth	At home	1	0.20
	Public Hospital	368	72.02
	Private Hospital	127	24.85
	University Hospital	15	2.93
Reason for cesarean delivery (n=264)	First birth by cesarean	54	20.71
	Mother's health problems	41	15.47
	Pelvic stenosis	34	12.85
	Inverted position	32	12.07
	Slowing baby's heart beat	23	8.57
	Decreased amniotic fluid	16	5.86
	Big Baby	23	8.59
	Pre-articular-articular	13	4.97
	Multiple pregnancy	9	3.5
	Cord entanglement	8	3.12
	Early birth	8	3.12
	Baby developmental delay	3	1.17
	Total	**511**	**100.0**

During the pandemic, 13.0% (n = 66) of the mothers encountered breastfeeding-related issues, and all of them refrained from seeking hospital assistance. Among the 66 mothers who hesitated, 82.9% (n = 54) cited fear of contracting COVID-19 as the reason for their hesitation (Table 3).

Table 3: Distribution of mothers' characteristics regarding breastfeeding during the COVID-19 pandemic period

Feature		n	%
Having problems with breastfeeding	Yes	66	13.0
	No	445	87.0
Do not hesitate to go to the hospital* (n=66)	Yes	66	15.0
	No	0	0.0
if yes why	Due to fears of Covid transmission	54	82.9
	Because of the crowd	6	8.55
	Due to the curfew	6	8.55

A total of 87.86% (n = 423) of the mothers reported no history of COVID-19 infection, while 12.14% (n = 88) confirmed contracting the virus. Among them, 76.13% (n = 66) stated contracting COVID-19 postchildbirth. Throughout the COVID-19 period, 79.54% (n = 70) of the mothers were not hospitalized, while 20.46% (n = 18) required hospitalization (Table 4).

Table 4: Distribution of mothers' COVID-19 infection and treatment status

Özellik		n	%
Passing COVID-19	I didn't pass	423	87.86
	I spent	88	12.14
Time to COVID-19 (n=88)	Post-natal	66	76.13
	During pregnancy	22	23.87
COVID-19 hospital treatment (n=88)	Yes	18	20.46
	No	70	79.54

Among mothers who contracted COVID-19 post child birth, 30.30% (n = 20) continued breastfeeding. Among these, 71.21% (n = 47) reported no feelings of anxiety while breastfeeding, while 28.79% (n = 19) expressed experiencing anxiety. Regarding the duration of inability to breastfeed due to COVID-19 infection, 22.72% (n = 15) reported 14 days, 10.61% (n = 7) reported 15 days, 3.03% (n = 2) reported 20 days, and 1.52% (n = 1) reported 21 days. It was found that 42.4% (n = 28) of the mothers sought information on breastfeeding during COVID-19, with 86.5% (n = 32) receiving it from healthcare professionals, 5.41% (n = 2) from the Internet, and 5.41% (n = 2) from social media (Table 5).

After the quarantine period, 82.50% (n = 33) of the mothers reported no breastfeeding-related issues, while 17.50% (n = 7) reported experiencing problems. The problems mentioned included the baby being hospitalized due to a COVID-19 infection, a decrease in the mother's milk supply resulting in the baby not latching, and the baby becoming accustomed to bottle feeding in the hospital and subsequently refusing to breastfeed (Table 5).

Among mothers, 48.7% (n = 19) breastfed their babies, while 41.0% (n = 16) fed them with expressed breast milk and formula. During feeding, 52.8% (n = 19) used a syringe, 22.2% (n = 8) used a bottle, and 16.7% (n = 6) used a spoon (Table 6).

DISCUSSION

Breastfeeding is widely acknowledged for its numerous health benefits for both mothers and babies, as well as its economic advantages. As a result, breast milk is considered the optimal nourishment for infants, ranking first. The most effective means of acquiring and sustaining breast milk is through breastfeeding, a feeding method that fosters the healthy physical and psychological development of infants. The WHO under scores the significance of exclusive breastfeeding for the first 6 months of a baby's life to ensure their optimal growth and development (14,15).

Table 5: Distribution of mothers' characteristics of breastfeeding their babies during the COVID-19 pandemic period

Feature		n	%
Breastfeeding during the COVID-19 infection	Yes	20	30.30
	No	46	69.70
Anxiety during breastfeeding during COVID-19 infection	Yes	20	28.79
	No	46	71.21
Duration of not breastfeeding during COVID-19 infection	1 day	10	15.15
	6 days	12	18.18
	14 days	14	22.72
	15 days	7	10.61
	20 days	2	3.03
	21 days	1	1.52
Breastfeeding information during COVID-19 infection	Yes	28	42,4
	No	38	57.6
Where is the information from?	Health workers	32	86.5
	TV	1	2.7
	Internet	2	5.41
	Social media	2	5.41
Having trouble breastfeeding after quarantine	No	33	82.5
	Yes	7	17.5
If yes, the problem	My baby was hospitalized due to COVID-19	2	28.57
	My baby was also in intensive care, my milk decreased, he started not to breastfeed.	2	28.57
	He got used to the bottle at the hospital, he didn't want to breastfeed.	1	25.0
	Refused the breast	2	28.57

Table 6: Distribution of characteristics of mothers regarding feeding their infants during COVID 19 infection

Feature		n	%
Baby's diet*	Breast-feeding	19	48.7
	Formula	4	10.3
	Expressed breast milk + formula	16	41.0
Feeding tool*	Spoon	7	16.7
	Injector	20	52.8
	Bottle	9	22.2
	I breastfed	3	8.3

*Mothers gave more than one answer.

Despite the well-established benefits of breast milk, uncertainties arising during the pandemic may lead mothers to encounter various concerns. Throughout the pandemic, uncertainties surrounding the transmission routes of the COVID-19 virus, apprehensions about breastfeeding, disruptions in breastfeeding support, health education, and healthcare services are believed to have contributed to challenges in this process for mothers (16).

COVID-19 infection poses heightened risks during critical periods of women's lives, such as pregnancy, childbirth, and the postpartum period. It was observed that 87.86% of mothers did not contract COVID-19, while 12.14% did. Among the 88 mothers who were infected, 76.13% contracted the virus after childbirth, and 23.87% during pregnancy. In a study investigating anxiety and depression induced by COVID-19 in pregnant women, 137 participants were examined, with 44.5% testing positive for COVID-19 (17). The relatively low incidence of COVID-19 infection among mothers in the study is presumed to be influenced by their heightened concerns for safeguarding their own and their infants' health during the pandemic, likely leading them to adhere to lockdown measures, hygiene practices, and social distancing guidelines.

The research revealed that 20.45% of mothers diagnosed with COVID-19 required hospitalization. In a study conducted by Pereira et al. (2020) involving 22 mothers, 11 of them (50%) displayed symptoms, with 4 patients receiving COVID-19 treatment before delivery and an additional 4 receiving treatment postpartum (18). Another study conducted in Turkey reported that 8.2% of pregnant women diagnosed with COVID-19 received hospital treatment, while 91.8% underwent home treatment (17). Pregnancy, being a physiological state, heightens susceptibility to respiratory complications from viral infections. Physiological alterations in the immune and cardiopulmonary systems during pregnancy increase the risk of developing severe diseases upon contracting respiratory viruses. A study examining 1918 cases during the influenza pandemic documented a mortality rate of 2%–6% in the general population, contrasting with a 37% mortality rate among pregnant women (19). Increased diaphragm height, elevated oxygen consumption, and respiratory mucosa edema render pregnant women vulnerable to hypoxia (19,20). Despite ongoing research, there is currently no specific treatment established as effective and reliable for COVID-19 infection (21,22).

The research discovered that 69.70% of mothers who contracted COVID-19 post-pregnancy ceased breastfeeding. The approach to managing breastfeeding varied at the onset of the COVID-19 pandemic. While some publications advocated for breastfeeding during this period (23,24), others advised against it (25,26). As the pandemic evolved, updated perspectives emerged based on investigations into disease management and transmission routes. Initially, prevailing opinions endorsed separation of mother and baby during breastfeeding, but later, support for breastfeeding was recommended (27,28). While studies have investigated transmission routes of COVID-19 in infected newborns, none have demonstrated transmission through breastfeeding (29, 30,31). Differences in breastfeeding practices during the

pandemic are believed to stem from the uncertainty of this period and the novelty of the COVID-19 virus. Among mothers who continued breastfeeding during the quarantine period, 28.79% expressed anxiety while breastfeeding. The pandemic has induced parental anxiety concerning breastfeeding and breast milk (32,33). Pregnancy and the postpartum period are emotionally charged periods characterized by heightened emotions. Pregnant and postpartum women experience increased anxiety during the pandemic as they are concerned not only about their own health but also about the well-being of their infants, whom they are responsible for nurturing, breastfeeding, and safeguarding (34). Studies have indicated an increased likelihood of depressive symptoms and anxiety among women during pregnancy and the postpartum period amidst COVID-19 (35,36). The rapid advancement of the COVID-19 pandemic has introduced uncertainties in pregnancy and breastfeeding, potentially contributing to the anxiety experienced by breastfeeding mothers.

During the COVID-19 pandemic, a study revealed that 13.0% of mothers encountered breastfeeding-related issues, and all mothers facing problems hesitated to seek hospital assistance. Among those expressing hesitation, 82.90% cited concerns about contracting COVID-19 as the primary reason, reflecting a trend observed in other studies where individuals deferred healthcare facility visits and postponed appointments due to the pandemic (37,38,39,40,41,42). Nazik et al. (2020) investigated the pandemic's impact on prenatal care services among pregnant women, finding a decrease in prenatal care visits compared to the pre-pandemic period, with over half receiving fewer than four visits (38). Yıldız et al. (2021) conducted a retrospective cross-sectional study, noting fewer prenatal visits during 2020 compared to previous years (39). Wu et al. (2020) reported women's apprehensions about hospital visits during the pandemic, with over half canceling or postponing appointments (40). The implementation of lockdown measures and concerns about contracting the virus have disrupted routine healthcare check-ups.

Following the quarantine period, 82.50% of mothers reported no breastfeeding-related issues, while 17.50% reported encountering problems. These issues included the baby's hospitalization due to COVID-19 infection and a reduction in the mother's milk supply, leading to difficulties in latching or refusal to breastfeed. While there is no evidence of COVID-19 transmission through breastfeeding (7), limited evidence exists regarding its safety in infants of suspected or confirmed COVID-19 mothers due to potential horizontal transmission. Furthermore, breastfeeding is not recommended for mothers undergoing ongoing treatment, as it remains unclear whether antiviral drugs pass into breast milk (20). It has been recommended that if subsequent COVID-19 tests of suspected or confirmed COVID-19 mothers yield negative results, breastfeeding can be resumed (26). Issues such as a decreased milk supply and breastfeeding difficulties in infants of suspected or confirmed COVID-19 mothers may stem from disruptions in breastfeeding due to the pandemic.

CONCLUSION

In conclusion, this study sheds light on the multifaceted challenges faced by mothers with infants aged 0–24 months regarding breastfeeding during the COVID-19 pandemic. The findings underscore the prevalence of breastfeeding-related issues among mothers, including concerns about contracting COVID-19 and a lack of access to adequate information and support. Moreover, the study highlights the impact of the pandemic on maternal healthcare-seeking behavior, with a significant proportion of mothers hesitating to seek hospital assistance when encountering breastfeeding problems. Notably, the postquarantine period presents continued challenges for mothers, with issues such as decreased maternal milk supply and difficulties in breastfeeding initiation observed. These findings emphasize the urgent need for comprehensive support mechanisms and education programs tailored to address the unique needs of breastfeeding mothers during public health crises like the COVID-19 pandemic, ensuring the optimal health and well-being of both mothers and infants.

Ethics Committee Approval: This study was approved by the ethics committee of Zonguldak Bülent Ecevit University (BEU) Human Research Ethics Committee (25.11.2021/105435).

Informed Consent: Written consent was obtained from the participants.

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REFERENCES

1. World Health Organization-World Health Organization (WHO-WHO). Rolling updates on coronavirus disease (COVID-19). (Access Date: June 27, 2020). Access Address: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen
2. Usen S. "Mandatory" working from home during the COVID-19 Pandemic: implications for work and private life. İ.Ü. Faculty of Economics Human Resources Research Center: 2020, Istanbul. (Access Date: March 27, 2022). Access address: https://cdn.istanbul.edu.tr/FileHandler2.ashx?f=ozet.-inkam.-evdencalisma.pdf
3. Güler M, Nalbant F. Problems and solution suggestions that the "working from home" application can create on employees. Journal of Human and Social Sciences Research 2022;11(1):530-549.
4. Centers for Disease Control and Prevention (CDCP). Coronavirus Disease 2019 in Children. (Access Date: 21.03.2020). Access: https://www.cdc.gov/coronavirus/2019- ncov/prepare/pregnancy-breastfeeding.

5. Okcay G, Keskindermirci G. Breastmilk and COVID-19. JIst FacultyMed. Published online March 23, 2020. (Access date: 20.4.2020). Access Address: http://iupress.istanbul.edu.tr/ en/ journal/jmed/article/breastmilk-and-covid-19
6. Karabayır N, Sapmaz S, Gökçay G. COVID-19 and breastfeeding. Children's Magazine 2020;2(2):72-75,
7. Chen H, Guo J, Wang C, Luo F, Yu X, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: A retrospective review of medical records. Lancet 2020;395(10226):809– 815.
8. Centers for Disease Control and Prevention (CDCP). Coronavirus Disease Centers For Disease Control And Prevention Coronavirus Disease 2019 Stressand Coping. (Access date: 09.05.2020). Access Address: https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/managing-stressanxiety.html?
9. World Health Organization. (2020), Coronavirus disease (COVID-19) advice for the public, (Access Date: 13.06.2020). Access: https:// www.cdc.gov/coronavirus/2019- ncov/needextra-precautions/ people- at-higher-risk.html.
10. De Rose DU, Piersigilli F, Ronchetti MP, Santisi A, Bersani I, Dotta A, et al. & Novel corona virus disease (COVID-19) in newborns and infants: What we know so far. Ital J Pediatr 2020;1-8 46:56.
11. Wang SS, Zhou X, Lin XG, Liu YY, Wu JL, Sharifu LM, et al. Experience of Clinical Management For pregnant women and newborns with novel coronavirus pneumonia in Tongjihospital. China Curr Med Sci 2020;40(2):285–9.
12. Works HC. Old and New Approaches to COVID-19 Disease Transmission. Covid-19 Pandemic 18 Months Evaluation Report, 29. (Access date: 09.03.2022). Access Address: https://d1wqtxts1xzle7.cloudfront.net/79057551/COVID19_ Pandemisi_18_Ay_Degerleme_Raporu
13. Turken M, Kose S. Covid-19 transmission routes and prevention. Tepecik Training and Research Hospital Journal 2020;30: 36-42.
14. World Health Organization (WHO-WHO). Global strategy for infant and young child feeding. World Health Organization, 2003. ISBN 92 4 156221 8 pp 5-10 (Accessed on 27.06.2022).
15. World Health Organization. Infant and young feeding: Model chapter for text boxing for medical students and allied health professionals. World Health Organization, 2009. ISBN 978 92 4 159749 4 pp 5-10 6-9 (Accessed on 27.06.2022). Access Address: https://apps.who.int/iris/bitstream/handle/10665/44117/9789241597494_eng.pdf?sequence=1&isAllowed=y
16. Özdemir Ö, Ayşegül PALA. Diagnosis, treatment and prevention of Covid-19 infection in children. Journal of Biotechnology and Strategic Health Research2020; 4:14-21.
17. Karaşın Y, Ateş M, Aşcı S. Comparison of anxiety and depression levels of pregnant women according to their Covid-19 status. Journal of Academic Perspective on Social Studies 2022;1(1):11-18.
18. Pereira A, Cruz-Melguizo S, Adrien M, Fuentes L, Marin E, Forti A et al. Breastfeeding motherswith COVID-19 infection: A case series. International Breastfeeding Journal 2020;15(1):1-8.
19. Gottfredsson, M. The Spanish flu in Iceland 1918. Lessons in medicine and history. Laeknabladid 2008;94(11):737-745.
20. Ashokka B, Loh MH, Tan CH, Su LL, Young BE, Lye DC, et al. Care of the Ppegnant woman with COVID-19 in labor and delivery: Anesthesia, emergency cesarean delivery, differential diagnosis in the acutely ill parturient, Care of the newborn, and protection of the healthcare personnel. American Journal of Obstetrics and Gynecology 2020; (1):66-74.
21. Mutlu O, Uygun İ, Erden F. Drugs used in the treatment of Coronavirus Disease (COVID-19). Kocaeli University Journal of Health Sciences 2020; 6(3):167-173.
22. TR. Ministry of Health. COVID-19 (SARS-CoV2 Infection) Guide. (Access Date: 16.07. 2020). Access Address: https://covid19.saglik.gov.tr/TR-66301/covid-19-rehberi.html
23. Gökçay G, Keskindermirci G. Breast milk and COVID-19. J Ist Faculty Med 2020; 83(3):286-90.
24. World Health Organization (WHO-WHO). "Corona virus Disease (COVID-19) Pandemic". (Access date: 09.12.2020). Access address:
25. Davanzo R, Moro G, Sandri F, Agosti M, Moretti C, Mosca F. Breastfeeding and coronavirus disease-2019: Ad interim indications of the Italian Society of Neonatology endorsed by the Union of European Neonatal & Perinatal Societies. Maternal &Child Nutrition 2020; 16(3):e13010.
26. Wang L, Shi Y, Xiao T, Fu J, Feng X, Mu D, Zhou W. Chinese expert consensus on the perinatal and neonatal management for the prevention and control of the 2019 novel coronavirus infection. Annals of Translational Medicine 2020; 8(3):234-9.
27. Taşlar N, Doğan R.A, Hancıoğlu Aytaç S. The importance of breastfeeding in the pandemic process. Unika Journal of Health Sciences 2021; 1(3):180-189.
28. Stuebe A. Should infants be separated from mothers with COVID-19? First, do no harm. Breastfeed Med 2020; 15(5):1-2.
29. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z. Epidemiology of COVID-19 among children in Chinai. Pediatrics 2020; 145:e20200702.
30. Peng S, Zhu H, Yang L, Cao L, Huang X, Dynes M, et al. A study of breastfeeding practices, SARS-CoV-2 and its antibodies in the breast milk of mothers confirmed with COVID-19. The Lancet Regional Health-Western Pacific 2020; 4:100045.
31. Douedi S, Miskoff J. Novel coronavirus 2019 (COVID-19): A case report and review of treatments. Medicine 2020; 99(19):1-4.
32. Nalbantoğlu AN, Nalbantoğlu B, Gökçay G. Knowledge and attitudes of mothers about breastfeeding and breast milk in the course of Covid-19 infection. Namık Kemal Medical Journal 2020; 8(3):314-320.
33. Kaner G. The importance of breastfeeding during the COVID-19 pandemic. Izmir Katip Celebi University Faculty of Health Sciences Journal 2020; 5(2):153-158.
34. Cheema R, Partridge E, Kair LR, Kara M, Riordon KM, Silva AI. et al. Protecting breastfeeding during the COVID-19 pandemic. American Journal of Perinatology Am J Perinatol 2023; 40(03):260-266. doi https://doi.org/10.1055/s-0040-1714277.
35. Ceulemans M, Hompes T, Foulon V. Mental health status of pregnant and breastfeeding women during the COVID-19 pandemic: A call for action. International Journal of Gynecology Obstetrics 2020; 151(1):146-147.
36. Berthelot N, Lemieux R, Garon-Bissonnette J, Drouin-Maziade C, Martel É, Maziade M Uptrend in distress and psychiatric symptomatology inpregnant women during the COVID-19 pandemic. Acta Obstet Gynecol Scand 2020; 99:848-55.
37. Du L, Gu YB, Cui MQ, Li WX, Wang J, Zhu LP,et al. Investigation on demands for antenatal care services among 2002 pregnant women during the epidemic of COVID-19 in Shanghai. Zhonghua fu Chan ke za zhi2020;55(3):160–5.

38. Nazik F, Yüksekol Ö D, Baltacı N, Ulucan M. Pregnant women receiving prenatal care and the Impact of the COVID-19 Pandemic. TOGU Journal of Health Sciences 2022; 2(2):111-122.
39. Yıldız Y, Gurlek B, Yıldız İE, Aydın T, Kanburoglu MK, Yılmaz B. The effects of Coronavirus disease-2019 (COVID-19) pandemic onroutine antenatal care visits and complications of pregnancy. Revista da Associação Medica Brasileira2021; 67(6):833-838.
40. Wu H, Sun W, Huang X. Online antenatal care during the COVID-19 pandemic: opportunities and challenges. Journal of Medical Internet Research 2020; 22(7):e19916.
41. Latha V, Devi C R. Antenatal care on pregnant mothers during COVID-19 pandemic. TNNMC Journal of Obstetrics and Gynaecological Nursing 2021; 9(1):39- 46.
42. Aydın R, Kızılkaya T, Aytaç SH, Taşlar N. In the COVID-19 pandemic; Social support needs of women during pregnancy, delivery and postpartum period and midwifery approaches. Electronic Turkish Studies 2020; 15(4):679-90.

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RESEARCH ARTICLE

Knowledge Levels of Mothers Regarding Baby Feeding: A Single-Center Experience*

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ABSTRACT

Objective: The acquaintance period with complementary foods is an essential period for infants in terms of the determination of both their development and short- and long-term health conditions. The method of introduction of complementary foods to the infant, the order in which they are introduced, and the repetitive introduction of foods to the infant are vital for determining the eating behavior and food preferences.

Methods: We designed as a single-center, cross sectional, descriptive study. Written and verbal consent was obtained from the mothers, and face-to-face interviews were conducted with the family by the doctors involved in the study. The survey comprised 33 open-ended and closed-ended questions that evaluated the experiences of mothers regarding breastfeeding and complementary feeding.

Results: The mothers of 100 infants presenting to the pediatric emergency department participated in the questionnaire survey. The mean age of the infants was 10.48 ± 6.37 months, and 52% of them were boys. Mothers with an educational level higher than elementary school started breastfeeding after waiting for a longer time (p = 0.03). Mothers with elementary school and secondary school graduate education levels exclusively breastfed their infants for a period over 10 months significantly higher than mothers with undergraduate and postgraduate education level (p = 0.0072, RR = 0.44). Among the participants, 53.1% responded that they used formula milk in baby nutrition.

Conclusions: Mothers' knowledge levels regarding the duration of exclusive breastfeeding and the timing of transitioning to complementary feeding were insufficient and inversely proportional to their education level. Moreover, the lack of education on the initiation of formula milk, except for medical indications, in our country was striking. Therefore, all physicians, especially pediatricians, should allocate time for explaining the importance of breastfeeding, timing, and diversity of complementary feeding and seek support from the media.

Keywords: Breastfeeding, complementary feeding, feeding knowledge

INTRODUCTION

The acquaintance period with complementary foods is a vital period for infants in terms of the determination of both their development and short- and long-term health conditions. Healthy eating behaviors during infancy exert a positive effect on brain development and cognitive functions as well as enable reducing the morbidity and mortality caused by infections (1, 2). The method of introduction of complementary foods to the infant, the order in which they are introduced, and the repetitive introduction of foods to the infant are important for determining the eating behavior and food preferences (3–6).

The World Health Organization (WHO) recommends that infants should be exclusively breastfed in the first 6 months of life, and complementary foods should be introduced to them after this period (7, 8). The European Food Safety Authority (EFSA) and the European Society for Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) support the WHO's recommendation of exclusive breastfeeding for the first 6 months as well as suggest that introducing complementary foods to infants from 4 to 6 months of age is a suitable approach (9–11). Recommendations for the timing of introducing complementary foods to infants vary between countries and also depending on the frequency of their breastfeeding with breast milk or formula milk. Studies have shown that parents introduced complementary feeding to their children earlier than the recommended time in some countries, such as Germany and the United Kingdom (12–14). Because of these different practices, information regarding the

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timing of introducing complementary foods varies substantially. Defining the feeding habits of infants considering the local characteristics provides an advantage in the followup of a healthy child. We conducted this study to investigate the experiences and knowledge levels of mothers regarding the nutrition of infants aged 1–24 months who were presented to our pediatric emergency department using survey questions prepared for this study.

MATERIALS AND METHODS

This single-center, cross sectional, descriptive study included mothers who had infants aged 1–24 months presenting to the pediatric emergency department of Şişli Hamidiye Etfal Training and Research Hospital between March 15, 2019, and March 15, 2020, and accepted to answer the questions. Written and verbal consent was obtained from the mothers, and face-to-face interviews were conducted with the family by the doctors involved in this study. The survey consisted of 33 open-ended and closed-ended questions that evaluated the experiences of mothers regarding breastfeeding and complementary feeding. Demographic data, including the age of the infant; mode of delivery; the reason for cesarean section, in case the baby was delivered through cesarean section; the age, education level, and occupation of the mother; the economic status of the family according to monthly income; number of children; and birth order of the infant in the family, were recorded. Based on the recommendations of the WHO and the United Nations International Children's Emergency Fund (UNICEF), the timing of introducing breast milk, formula milk, and complementary foods to infants; the reasons for introducing formula milk; and the methods of administration and introduction times of food as complementary nutrients were evaluated (15). We also analyzed the relationship between the education levels of mothers and feeding habits (duration of exclusive breastfeeding, timing of introducing complementary foods, and variety of foods provided during the introduction of complementary foods) and whether their infants' nutrition was sufficient.

Statistical analysis of the data was conducted using the IBM SPSS for Windows Version 21.0 package program. Descriptive statistics for the data were expressed as mean, standard deviation, and frequency. The distribution of data was evaluated using the Kolmogorov–Smirnov test. Independent samples t-test and Mann–Whitney U test were used for analyzing quantitative data. The ratios in the groups were compared using the chi-square test. When the conditions of the chi-square test were not met, Fisher's exact test was used. A p value of <0.05 was considered statistically significant. The study was approved by the University **of** Health Sciences, Şişli Hamidiye Etfal Training and Research Hospital Ethics Committee (Decision Date/Number: 20.08.2019-2466).

RESULTS

The mothers of 100 infants presenting to the pediatric emergency department participated in the questionnaire survey. Of the infants, 48 (48%) were girls, and 52 (52%) were boys; the mean age was 10.48 ± 6.37 months. Table 1 shows the sociodemographic characteristics of the families. Regarding the method of delivery, 36 infants (36%) were born through normal vaginal delivery, and 64 infants (64%) were born via cesarean section due to a medical indication.

Table 1: Sociodemographic characteristics of the families

Sociodemographic characteristics	n (%)
Maternal age	
<20 years	6 (6)
20-24	16 (16)
25-30	31 (31)
30-35	28 (28)
35-40	15 (15)
>40 years	4 (4)
Maternal age at the first delivery	
<20 years	12 (12)
20-24	42 (42)
25-30	32 (32)
30-35	11 (11)
35-40	3 (3)
The number of children at home	
1	42 (42)
2	27 (27)
3	22 (22)
>3	9 (9)
Maternal education level	5 (5)
Illiterate	32 (32)
Elementary school High school	28 (28)
University	33 (33)
Postgraduate or doctorate	2 (2)
Family monthly income	
Low	23 (24.2)
Middle	63 (66.3)
High	9 (9.5)
Does mother work?	
Yes	32 (32.7)
No	66 (67.3)

The question regarding the timing of breastfeeding of the infants was answered by 63 mothers (63%), of whom 40 (63.5%) and 23 (36.5%) mothers mentioned that they started breastfeeding their babies within the first hour after birth and at least 1 h after birth, respectively. Furthermore, regarding the relationship between breastfeeding and mothers' educational level, mothers with an educational level higher than elementary school started breastfeeding after waiting for a longer time (n = 19, p = 0.03). Water was also provided to 26 infants (26%) during exclusive breastfeeding. The question regarding the duration of exclusive breastfeeding of the infants was answered by 84 mothers (84%), and the question regarding the total duration of breastfeeding was answered by 87 mothers (87%). Breastfeeding charts prepared according to the answers to these two questions are depicted in Figure 1. Mothers with undergraduate and postgraduate education level exclusively breastfed their babies at most for 4–6 months significantly higher than mothers with lower education level and then started complementary feeding appropriately (n = 14, p = 0.0072, RR = 3.5). Mothers with elementary school and secondary school graduate education levels (n = 21) exclusively

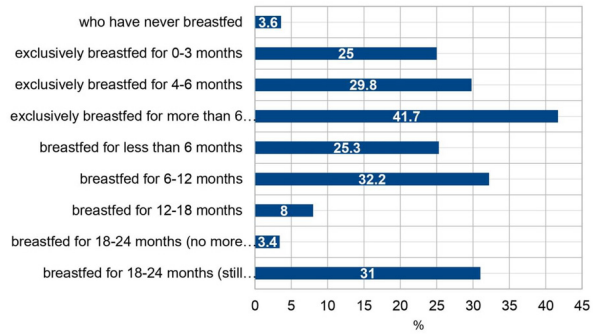

Figure 1: Feeding charts of infants regarding breastfeeding.

breastfed their infants for a period over 10 months significantly higher than mothers with undergraduate and postgraduate education levels (n = 4, p = 0.0072, RR = 0.44). We also found that 70 mothers (70%) breastfed exclusively, 15 mothers (15%) used bottle-feeding, and the remaining 15 mothers (15%) used a combination of both methods.

Regarding the distribution of the total duration of breastfeeding according to mothers' education levels, no significant difference was observed between the breastfeeding duration and mothers' education levels (p > 0.05).

The question "Do you give formula milk?" was answered with "yes" by 52 mothers (53.1%). Formula milk was introduced at the very most within the first month (n = 31/62, 49.9%). Formula milk was administered to 53 of 58 infants (91.4%) through a bottle. Formula milk was recommended in 30 of 61 infants (49.2%) by a doctor due to a medical indication. This answer was followed by answers related to the decision of the mother herself to start formula milk considering that her milk was insufficient based on a deduction from social media and written and visual press (n = 17/61, 27.9%) and to start formula milk upon the comment of people around her that her milk was inadequate (n = 3/61, 4.9%).

Answers to questions related to complementary feeding are presented in Table 2, and information regarding the most common months when complementary foods were started is illustrated in Figure 2.

We investigated the relationship between the educational levels of mothers and the diversity of foods introduced when starting complementary feeding. Results showed that mothers with high school or higher education level (n = 32) started complementary feeding with a higher proportion of a single variety of foods than mothers with elementary school education level or only literate (n = 18); however, this difference was not statistically significant (p > 0.05). Mothers with high school or lower education level (n = 30) introduced complementary feeding before the completion of the 6th month, and mothers with university or higher education level (n = 16) primarily started complementary feeding from the 6th month onward. This difference showed a borderline statistical significance (p = 0.085, RR = 1.6). Finally, for the question "whether their babies were adequately fed or not," 66 mothers (71.7%) answered "adequately fed."

Table 2: The answers given to the questions related to complementary feeding

Question	n (%)
When did you start complementary feeding?	
4-6 month	39 (47.6)
6-9 month	36 (43.9)
0-3 month	5 (6.1)
≥ 10 month	2 (2.4)
Which food did you start complementary feeding with?	
With multiple types of food	26 (34.2)
Fruit or vegetable puree	19 (25)
Yogurt	15 (19.7)
Soup	8 (10.5)
Fruit or fruit juice	5 (6.6)
Pudding	3 (3.9)
Whose recommendation did you start complementary feeding with?	
Doctor	44 (56.4)
I decided after research	29 (37.2)
People around me (relative, spouse, mother, mother-in-law)	5 (6.4)

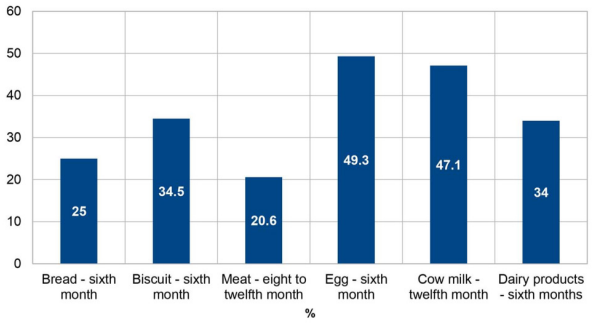

Figure 2: The most common months when complementary foods were started.

DISCUSSION

The rate of cesarean section due to a medical indication among deliveries was 64% in our study, which was consistent with the national rate of cesarean section deliveries in our country (52%) but considerably higher than the global cesarean rate (21%) (16, 17). The mode of delivery through cesarean section exerts a negative effect on breastfeeding and an indirect effect on the use of formula milk and the timing of transitioning to complementary feeding (18).

According to the "Global Strategy for Infant and Young Child Feeding" approved by the WHO and UNICEF in 2002, breastfeeding should be started within the first hour after birth, exclusive breastfeeding should be performed for the first 6 months, transitioning to complementary feeding should be done from the age of 6 months, and breastfeeding must be continued together with complementary feeding for up to 2 years or more (19, 20).

The educational levels of mothers exert a positive effect on acquiring correct feeding behaviors and accessing information and utilizing it properly. Sisko et al. reported that with an increase in educational level, there was an increase in the rates of exclusive proper breastfeeding to the timing also recommended by the WHO and UNICEF (21). In our study also, as the educational levels of mothers increased, the timing of exclusive breastfeeding and transitioning to complementary feeding was more compatible with the recommendations of guidelines.

The income level, breastfeeding duration, and the timing of transitioning to complementary foods also have an association. The rates of breastfeeding in high-income countries are higher than those in middle- and low-income countries (22). Economic difficulties also impact the quality and diversity of food entering the household, and this condition indirectly determines children's eating behaviors. According to our survey results, approximately 25% of the families answering the questions had a low-income level.

The UNICEF's 2019 report on global children has stated that the rate of babies breastfed within the first hour after delivery was 44%; in our study, this rate was 63.5%. The responses regarding early breastfeeding were consistent with the findings of the 2018 Turkey Demographic and Health Survey (TNSA). However, according to the TNSA data, although the timing of the initiation of breastfeeding among uneducated mothers or mothers not graduated from elementary school was longer than that of mothers with higher education levels, our study showed that mothers with lower education levels started breastfeeding earlier after birth (16).

According to the UNICEF data, 20% of babies in high-income countries and 4% of babies in middle- and low-income countries are not breastfed at all (23). Our study revealed an even lower percentage of babies who were not breastfed (3.4%). According to the National Nutrition and Health Survey conducted by Duan et al. in China in 2013, the rate of exclusive breastfeeding of infants aged <6 months and the rate of implementation of complementary feeding with a minimally acceptable diet among children aged 6–23 months were 18.6% and 25.1%, respectively (24). Our study also showed a rate of 29.8% for exclusive breastfeeding for the first 6 months. This result shows that exclusive breastfeeding for the first 6 months is appropriately supported in our country. Nevertheless, according to our survey, exclusive breastfeeding of 41.7% of babies for more than 6 months still indicates the presence of deficiency in complementary feeding. Furthermore, the delay in transitioning to complementary feeding may be associated with our country's middle-to-low-income level. As income levels decrease, access to food becomes more challenging, and mothers believe that they can compensate for this deficiency by breastfeeding for longer periods. Because exclusive breastfeeding for more than 6 months increases the risk of the incidence of micronutrient deficiencies, institutions performing healthy child monitoring should focus on educating families regarding complementary feeding (25).

According to data from Turkey, the rate of bottle-feeding for infants aged <2 months was 31%, which increased to 60% for infants aged 9–11 months (16). When we examined babies fed with breast milk or formula milk separately with respect to bottle-feeding in our study, we observed that formula milk was administered by bottle-feeding at much higher rates. Bottle-feeding with formula milk exerts negative effects such as rapid weight gain in infants and a tendency to develop obesity in later years of life, making them more susceptible to infections such as diarrhea (26). In our study, 53.1% of mothers mentioned that they used formula milk in infant feeding. Although it was observed that the majority of them started formula milk with the recommendation of a doctor due to a medical indication, approximately one-third of mothers were influenced by written and visual press and social media about deciding to start formula milk, and this rate indicates the considerable impact of media on feeding. Because formula milk advertisements are continued to be published widely even in countries adopting the International Code of Marketing Breastmilk Substitutes (The Code of Formula Milk), stricter measures should be implemented worldwide to prevent the publishing of advertisements affecting the usage of formula milk (21, 27).

Complementary feeding is defined as nutrition provided with liquid or solid foods together with breast milk or formula milk when breastfeeding or formula milk alone cannot meet the nutritional requirements of infants (28). Although there are internationally accepted standard approaches, behaviors during the transitioning to complementary feeding vary based on personal factors similar to that in breastfeeding; moreover, these behaviors are influenced by sociocultural factors such as beliefs and general habits of the community. Furthermore, because early childhood feeding behaviors exert an impact on food choices in later years of life, establishing positive eating habits during this period results in long-term effects (29, 30). There are some differences between guidelines concerning the timing of introducing complementary feeding. In our study, we observed that the majority of mothers (47.6%) introduced complementary foods to their infants between 4 and 6 months of age. This timing was consistent with the recommendations of the American Academy of Pediatrics, ESPGHAN, and EFSA (31, 32). According to the TNSA 2018 data, the most common foods provided to infants aged 6–23 months were dairy products and fruit–vegetable purees. Consistent with these data, we also observed in our study that mothers initiating complementary feeding with a single type of food started this transition by providing their babies fruit puree, vegetable puree, and yogurt. However, in fact, one-third of the participating mothers started complementary feeding with more than one type of food during the transition process.

As the aim of our study was to investigate mothers' experiences regarding complementary feeding, the absence of questions evaluating their general knowledge level regarding nutrition can be considered a limitation of our study. Moreover, because our hospital was declared as a pandemic hospital after the first COVID-19 cases in our country on March 11, 2020, and most cases presented to our pediatric emergency department were

suspected COVID-19 cases, the present survey was conducted on a limited number of mothers and terminated with 100 mothers. Therefore, extrapolating the experiences of these 100 mothers regarding complementary feeding to the general population might not be correct. More comprehensive and multicentric survey studies are required to ensure more reliable results.

CONCLUSIONS

Mothers' knowledge levels regarding the duration of exclusive breastfeeding and the timing of transitioning to complementary feeding were insufficient and inversely proportional to their education level. Moreover, the lack of education on the initiation of formula milk, except for medical indications, as well as the still-continuing impact of written and visual press and social media on this subject in our country, was striking. Therefore, all physicians, especially pediatricians, dealing with children and mothers planning to have children should allocate time for explaining the importance of breastfeeding, timing, and diversity of complementary feeding and seek support from the media.

Ethics Committee Approval: This study was approved by the ethics committee of the University of Health Sciences, Şişli Hamidiye Etfal Training and Research Hospital (Decision Date/Number: 20.08.2019-2466).

Informed Consent: Written and verbal consent was obtained from the participants.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- N.U., E.E.A.; Data Acquisition- E.E.A., H.Y.; Data Analysis/Interpretation- E.E.A., N.U.; Drafting Manuscript- E.E.A., H.Y., N.U.; Critical Revision of Manuscript- N.U.; Final Approval and Accountability- E.E.A., N.U., H.Y.

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REFERENCES

1. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, De Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet 2013;382(9890):427–51.
2. Black MM, Walker SP, Fernald LCH, Andersen CT, DiGirolamo AM, Lu C, et al. Early childhood development coming of age: science through the life course. Lancet 2017;389(10064):77–90.
3. Nicklaus S. The role of food experiences during early childhood in food pleasure learning. Appetite 2016;104:3–9.
4. Nicklaus S. Children's acceptance of new foods at weaning. Role of practices of weaning and of food sensory properties. Appetite 2011;57(3):812–5.
5. Maier-Nöth A, Schaal B, Leathwood P, Issanchou S. The lasting influences of early food-related variety experience: A longitudinal study of vegetable acceptance from 5 months to 6 years in two populations. PLoS One 2016;11(3):1–17.
6. Switkowski KM, Gingras V, Rifas-Shiman SL, Oken E. Patterns of complementary feeding behaviors predict diet quality in early childhood. Nutrients 2020;12(3):1–13.
7. Victora CG, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. Lancet 2016;387(10017):475–90.
8. World Health Organization. Report of the expert consultation of the optimal duration of exclusive breastfeeding, Geneva, Switzerland, 28-30 March 2001. World Health Organization. Avaliable from URL: https://apps.who.int/iris/handle/10665/67219
9. Agostoni C, Decsi T, Fewtrell M, Goulet O, Kolacek S, Koletzko B, et al. Complementary feeding: a commentary by the ESPGHAN Committee on Nutrition. J Pediatr Gastroenterol Nutr. 2008;46(1):99-110.
10. Fewtrell M, Bronsky J, Campoy C, Domellöf M, Embleton N, Mis NF, et al. Complementary feeding: A position paper by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) committee on nutrition. J Pediatr Gastroenterol Nutr 2017;64(1):119–32.
11. Castenmiller J, de Henauw S, Hirsch-Ernst KI, Kearney J, Knutsen HK, Maciuk A, et al. Appropriate age range for introduction of complementary feeding into an infant's diet. EFSA J. 2019:17(9):e05780
12. Alder EM, Williams FLR, Anderson AS, Forsyth S, Florey C du V, van der Velde P. What influences the timing of the introduction of solid food to infants? Br J Nutr 2004;92(3):527–31.
13. Costantini C, Harris G, Reddy V, Akehurst L, Fasulo A. Introducing Complementary Foods to Infants: Does Age Really Matter? A Look at Feeding Practices in Two European Communities: British and Italian. Child Care Pract 2019;25(3):326–41.
14. Foterek K, Hilbig A, Alexy U. Breast-feeding and weaning practices in the DONALD study: Age and time trends. J Pediatr Gastroenterol Nutr 2014;58(3):361–7.
15. World Health Organization. Infant and young child feeding. World Health Organization Avaliable from URL: https://www.who.int/news-room/fact-sheets/detail/infant-and-young-child-feeding
16. Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü. 2018 Türkiye Nüfus ve Sağlık Araştırması. Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü, T.C. Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı ve TÜBİTAK; 2019 Yayın No: NEE-HÜ.19.01
17. World Health Organization. Caesarean section rates continue to rise, amid growing inequalities in access. World Health Organization Avaliable from URL: https://www.who.int/news/item/16-06-2021caesarean-section-rates-continue-to-rise-amid-growing-inequalities-in-access
18. Li L, Wan W, Zhu C. Breastfeeding after a cesarean section: A literature review. Midwifery 2021;103:103117.
19. World Health Organization & United Nations Children's Fund (UNICEF). Global Strategy for Infant and Young Child Feeding. World Health Organization 2003. Avaliable from URL: https://apps.who.int/iris/handle/10665/42590
20. World Health Organization. Infant and young child feeding model chapter for textbooks for medical students and allied health professionals. World Health Organization Avaliable from URL: https://apps.who.int/iris/handle/10665/44117

21. Gülümser Şişko S, Bağ O, Kondolot M, Nalbantoğlu B, Gökcay G. Breastfeeding and infant nutrition knowledge, attitude, and practices of parents. Turk Arch Pediatr 2022;57(4):441-447.
22. Victora CG, Bahl R, Barros AJ, et al. Breastfeeding in the 21st century:epidemiology, mechanisms, and lifelong effect. Lancet 2016;387(10017):475-90.
23. UNICEF calls for the narrowing of "breastfeeding gaps" between rich and poor worldwide. WHO. Avaliable from URL: https://www.unicef.org/eca/press-releases/unicef-calls-narrowing-breastfeedinggaps-between-rich-and-poor-worldwide.
24. Duan Y, Yang Z, Lai J, Yu D, Chang S, Pang X, et al. Exclusive breastfeeding rate and complementary feeding indicators in China: A national representative survey in 2013. Nutrients 2018;10(2):1–9.
25. Obbagy JE, English TL, Psota YP, Butte NF, Dewey KG, Fox MK, et al. Complementary feeding and bone health: A systematic review. Am J Clin Nutr 2019;109:872-78.
26. Ventura AK, Mennella JA. An Experimental Approach to Study Individual Differences in Infants' Intake and Satiation Behaviors during Bottle-Feeding. Child Obes 2017;13(1):44-52.
27. Piwoz EG, Huffman SL. The impact of marketing of breast-milk substitutes on WHO-recommended breastfeeding practices. Food Nutr Bull 2015;36(4):373-386.
28. Arikpo D, Edet ES, Chibuzor MT, Odey F, Caldwell DM. Educational interventions for improving primary caregiver complementary feeding practices for children aged 24 months and under. Cochrane Database Syst Rev. 2018;5(5):CD011768.
29. Beauchamp GK, Mennella JA. Early flavor learning and its impact on later feeding behavior. J Pediatr Gastroenterol Nutr 2009;48(1):25-30.
30. Switkowski KM, Gingras V, Rifas-Shiman SL, Oken E. Patterns of complementary feeding behaviors predict diet quality in early childhood. Nutrients 2020;12(3):810.
31. Fewtrell M, Bronsky J, Campoy C, Domellöf M, Embleton N, Fidler Mis N, et al. Complementary Feeding: A Position Paper by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Committee on Nutrition. J Pediatr Gastroenterol Nutr 2017 ;64(1):119-132.
32. EFSA Panel on Nutrition, Novel Foods and Food Allergens (NDA), Castenmiller J, de Henauw S, Hirsch-Ernst K. I., Kearney J., Knutsen H. et al. Appropriate age range for introduction of complementary feeding into an infant's diet. EFSA J. 2019;17(9):e05780.

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CASE REPORT

First Case of Terminal Ileitis Coexisting with Incomplete Kawasaki Disease

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ABSTRACT

Kawasaki disease (KD), also referred to as mucocutaneous lymph node syndrome and infantile polyarteritis nodosa, is characterized by inflammation of small and medium-sized blood vessels across the body. It can manifest in various clinical features among pediatric patients admitted to general pediatric departments with fever, particularly those aged less than 5 years. Despite its relatively benign nature, it is crucial to promptly identify potential complications. We describe the case of a 10-month-old female patient admitted to the general pediatric department due to a 5-day history of fever peaking at 40.5°C, diarrhea, and irritability. Physical examination revealed no conjunctivitis, cervical lymphadenopathy, or rash, but notable irritability and edematous induration on the dorsum of her hands and feet. Initial laboratory investigations showed elevated acute phase reactants, and radiological assessment indicated terminal ileitis. Considering the presentation consistent with incomplete KD, characterized by persistent fever, ill appearance, ileitis, hypoalbuminemia, and elevated acute phase reactants, we pursued further evaluation. Echocardiography revealed ecstatic and prominent coronary artery without dilation of the main coronary arteries. It is important to recognize that not all KD patients will exhibit all typical features, and presentations may vary. While inflammatory changes in multiple systems have been documented in KD, terminal ileitis has not been previously reported in pediatric patients.

Keywords: Incomplete Kawasaki disease, terminal ileitis, persistent fever

INTRODUCTION

Kawasaki disease (KD), initially described by Tomisaku Kawasaki, is also recognized as mucocutaneous lymph node syndrome and infantile polyarteritis nodosa.[1,2] It predominantly affects children aged between 6 months and 5 years and stands as a significant cause of pediatric-acquired heart disease in developing countries. Diagnosis of KD relies on clinical criteria, as there is no specific diagnostic test available. The typical criteria encompass fever persisting for over 5 days, cervical adenopathy, bilateral nonpurulent conjunctival injection, changes in oral mucosa, hand-foot changes, and polymorphic rash. The presence of four out of five clinical criteria confirms the diagnosis.[3] However, some cases may present as "incomplete Kawasaki disease" (IKD), lacking fulfillment of all typical diagnostic criteria. Diagnosis of IKD can be challenging due to the absence or incomplete presentation of classic signs, such as prolonged fever, mucocutaneous changes, extremity changes, cervical lymphadenopathy, and cardiac involvement. Despite not meeting all criteria, patients with IKD remain susceptible to complications like coronary artery abnormalities. Hence, clinical judgment and a high level of suspicion are pivotal for timely diagnosis and initiation of treatment. This report presents an exceptional case of IKD in an 8-month-old girl, initially manifesting with fever and clinical features of ileitis.

CASE REPORT

The patient, a 10-month-old girl, was admitted to the General Pediatrics Clinic at Ege University's Children's Hospital with complaints of fever reaching 40.5°C and irritability persisting for 7 days prior to admission. Additionally, she had been experiencing non-bloody diarrhea, multiple episodes of vomiting, and chills. She had no notable medical or surgical history, was up-to-date on immunizations, and had no known

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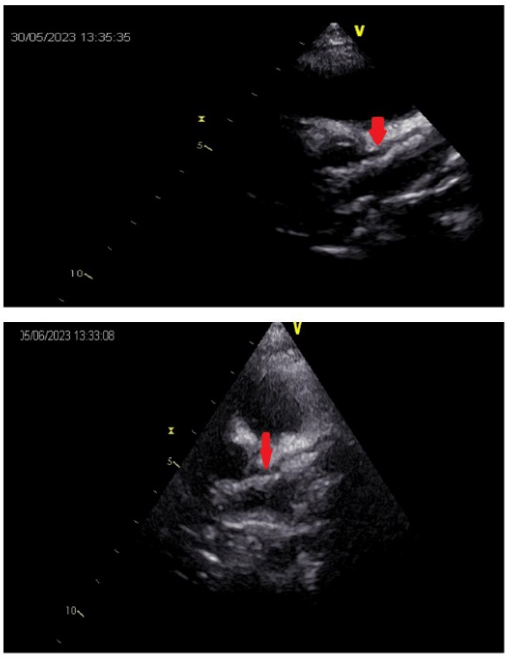
allergies. According to her medical history, she was exclusively breastfed for the first 6 months and was currently receiving supplementary foods alongside breastfeeding. The patient had no known exposure to COVID-19 or diagnosis of the virus. Initially, she was assessed at another hospital with suspicion of acute gastroenteritis and received intravenous hydration for this condition. Upon admission to our hospital, her vital signs were recorded as follows: temperature 38.6°C, heart rate 168 beats per minute, respiratory rate 20 breaths per minute, and blood pressure 96/55 mm Hg. Her height was measured at 72 cm (40.52nd percentile, −0.24 SD), and her weight at 10 kg (83.65 th percentile, 0.98 SD). Physical examination upon admission revealed no conjunctivitis, cervical lymphadenopathy, or rash; however, the patient exhibited notable irritability and edematous induration on the dorsum of her hands and feet. No abnormalities were observed in her lips, tongue, and other mucosal areas. The BCG scar from vaccination in the left deltoid muscle region appeared normal with no signs of hyperemia. Laboratory investigations upon admission showed a white blood cell count (WBC) of 27,400/mm^3 with 86% neutrophils, a platelet count of 461.000/mm^3, a hemoglobin level of 9.2 g/dl with normal mean corpuscular volume, an erythrocyte sedimentation rate of 93 mm/h, a C-reactive protein level of 5.4 mg/dL (normal range <0.5), and an albumin level just within the lower limit (2.7 mg/dl). Microscopic examination of the peripheral blood smear revealed cell ratios consistent with hemogram parameters (80% neutrophils, 15% lymphocytes, 6% eosinophils), with no atypical or blast cells detected. Renal profile, hepatic profile, amylase, and lipase levels were all within normal limits. Based on the preliminary diagnosis of systemic sepsis secondary to suspected invasive gastroenteritis, the patient was isolated, and treatment with intravenous ceftriaxone (100 mg/kg/day), metronidazole (30–40 mg/kg/day divided into three doses), and intravenous fluids was initiated. Urine culture, urine analysis, blood culture, and stool culture were conducted to evaluate the source of infection, all of which yielded negative results. Serologic tests for adenoviruses, mumps, enteroviruses, cytomegalovirus, and Epstein–Barr virus were negative, while testing for other respiratory viruses was not performed. On the ninth day of her illness, the patient's fever, edema in the hands and feet, irritability, and diarrhea worsened, accompanied by dermatitis in the diaper area. This prompted a reassessment of the diagnosis and an expansion of investigations. Abdominal X-ray revealed minimal dilatation in all segments of the intestine and mild enlargement of the intestinal wall. Initial abdominopelvic ultrasonography indicated an 8-mm diameter bowel loop at the terminal ileum level in the lower right quadrant, with increased echogenicity and minimal plastering fluids in the surrounding intermesenteric plans, leading to a radiological diagnosis of terminal ileitis. No hepatomegaly, splenomegaly, abdominal lymphadenopathies, or gallbladder hydrops were observed. Given the systemic features, multisystem inflammatory syndrome in children (MIS-C) was initially considered in the differential diagnosis. However, this diagnosis was ruled out based on negative SARS-CoV-2 PCR results from the patient's nasopharyngeal sample, negative anti-SARS-CoV-2 IgG serology results, and absence of leukopenia, microcytic anemia, thrombocytopenia, elevated liver enzymes, and elevated ferritin levels. The patient's symptoms, including irritation, persistent fever, ill appearance, extremity changes (edema of the palms and soles of the feet), clinic findings of ileitis, and laboratory values such as hypoalbuminemia, normocytic anemia, thrombocytosis, elevated erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP), supported a suspected diagnosis of pediatric systemic vasculitis. Initial echocardiographic measurements of coronary artery dimensions were within normal range according to predicted z scores (SDs from the predicted normal mean) for age and body surface area: left main coronary artery (LMCA) 2.5 mm +1.06 SD, proximal anterior descending coronary artery (LAD) 2 mm +1.46 SD, and proximal right coronary artery (RCA) 2.2 mm +1.81 SD. Furthermore, ectasia and prominent coronary arteries were detected, along with mild pericardial effusion, but without dilatation of the main coronary arteries (Figure 1). Treatment was initiated with intravenous immunoglobulin (IVIG) at a dosage of 2 g/kg and oral aspirin at 75 mg/kg/day. The patient's fever and irritability subsided 48 hours after commencement of treatment. Throughout hospitalization, fever and diarrhea gradually improved. However, on the fourth day post-treatment, she developed sheet-like desquamation in the periungual region of the hands and feet, and her platelet count increased from 461/mm^3 to 678.000/mm^3 without recurrence of symptoms during the follow-up period. Repeat echocardiography on the third day of treatment revealed consistent features. The patient remained clinically stable during follow-up. One week later, aspirin treatment doses were reduced to antiplatelet doses, and the patient was discharged without new symptoms. Three months post-discharge, follow-up echocardiograms indicated normal coronary artery dimensions (LMCA 2.3 mm +2.15 SD, LDA 1.7 mm +1.69 SD, RCA 1.9 mm +1.67 SD), with z scores calculated based on age and body surface area. Previously identified ectasia and prominent coronary arteries had fully resolved, leading to discontinuation of aspirin therapy.

DISCUSSION

KD stands as the primary cause of acquired heart disease among children and affects small and medium-sized vessels through systemic vasculitis. Typically observed in children aged 6 months to 5 years, it can lead to coronary artery aneurysms or ectasia, which in turn may result in myocardial infarction (MI), sudden death, or ischemic heart disease in 15–25% of untreated cases.[4] The case report discussed an 8-month-old girl, the first documented instance in literature, who presented with terminal ileitis associated with IKD, characterized by fever and gastrointestinal involvement (diarrhea, terminal ileitis without identifiable microbial agents), alongside laboratory findings indicating anemia, hypoalbuminemia, and elevated levels of CRP, ESR, and echocardiographic results.

Classical criteria for KD include fever lasting >5 days, unilateral cervical adenopathy, nonpurulent bilateral conjunctivitis, oral mucosal ulceration, hand and foot edema, and a polymorphic rash. Diagnosis typically involves the presence of fever and at



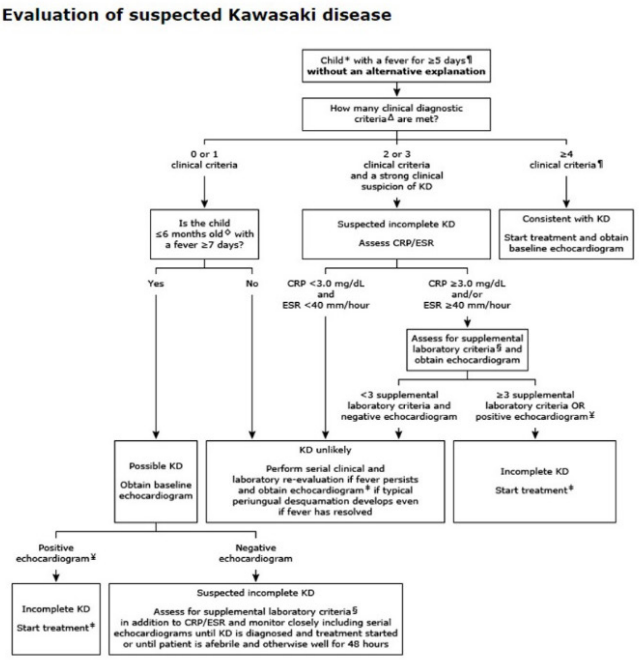
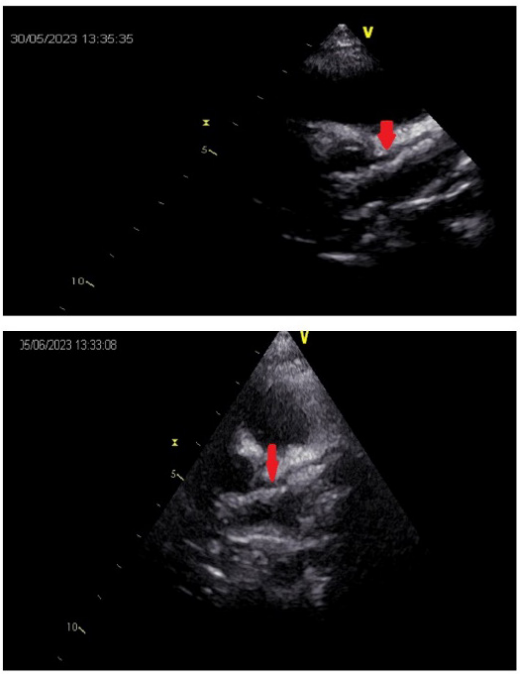


Figure 1: ECHO findings at the time of diagnosis: Left Anterior Descending (LAD) Coronary Artery is shown with an arrow. Proximal coronary artery lumen diameter is normal for the patient's length and weight (body surface area) but is minimal ectasia and prominent without dilation.



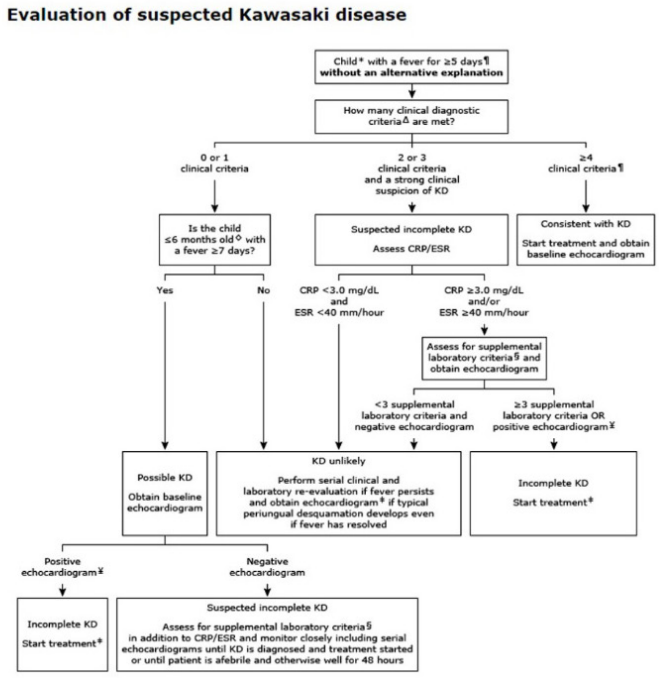


Figure 2: The algorithm for suspected Kawasaki Disease and Incomplet Kawasaki Disease.

least four of these five physical findings without an alternative explanation.[5] However, meeting these classic clinical criteria can sometimes be challenging in pediatric patients, especially among younger children. The American Heart Association has established criteria to define "IKD," which includes children with a fever lasting 5 or more days and fewer than four classical KD clinical characteristics, alongside at least three abnormal laboratory results (ESR ≥ 40, CRP ≥ 3, WBC ≥ 15,000/mm3, albumin ≤ 3.0 g/dL, normocytic anemia for age, elevation of alanine aminotransferase, platelets after 7 days ≥ 450,000/mm3, urine ≥10 WBC/high-power field) (Figure 2).[6,7] The patient described above presented with a combination of diarrhea

and fever, which typically is not associated with classical KD clinical findings. However, the patient experienced a wide array of symptoms in the days leading up to the diagnosis, including irritability, vomiting, decreased appetite, cough, diarrhea, rhinorrhea, weakness, abdominal pain, and arthralgia or arthritis, as reported in various studies and case reports on KD and IKD.[6,7] Gastrointestinal complaints during KD occur in approximately one-third of patients. In addition to severe systemic inflammation findings, gastrointestinal symptoms and involvement, notably diarrhea, abdominal pain, vomiting, and other conditions such as ischemic colitis, intussusception, hepatic necrosis, splenic infarct, intestinal pseudoobstruction, colitis, and colon edema, have been documented in the literature.[5] A study by Baker et al identified disease-related gastrointestinal symptoms in KD patients, such as diarrhea, vomiting, abdominal pain, jaundice, cholangitis, elevated liver enzyme levels, and gallbladder hydrops, occurring 10 days before diagnosis and present in 61% of subjects.[7]

Despite the common occurrence of gastrointestinal involvement in KD, affected terminal ileum has not previously been reported in association with the disease. Terminal ileitis refers to inflammation of the terminal end of the small bowel and is diagnosed based on histological evidence of inflammation on mucosal biopsies, often attributed to inflammatory changes and vasculitis affecting bowel vessels. Clinical manifestation of terminal ileitis include abdominal pain, with or without diarrhea, chronic bowel obstruction symptoms, and gastrointestinal bleeding. Various etiologies for terminal ileitis exist, including inflammatory bowel diseases (such as Crohn's disease), nonsteroidal anti-inflammatory drugs, intestinal ischemia, eosinophilic enteritis, neoplasms (such as lymphoma), spondyloarthropathies, and infectious agents like Mycobacterium tuberculosis, Yersinia, Salmonella, Clostridium difficile, Cytomegalovirus, and SARS-CoV-2 infection/MIS-C (multisystem inflammatory syndrome in children). Vasculitis has also been identified as a cause of terminal ileitis.[8,9] To the best of our knowledge, this case represents the first instance of KD associated with isolated terminal ileitis in children. The absence of other identified etiological factors through serologic and other laboratory tests, coupled with the persistence of fever and significant features of IKD, led to suspicion that terminal ileitis was an unexpected initial presentation of KD.

CONCLUSION

Terminal ileitis linked with IKD has not been documented in existing literature. A thorough medical history and comprehensive physical examination remain paramount for accurate diagnosis. IKD should be contemplated in the differential diagnosis for children exhibiting fever, hand/foot edema, presentation of ileitis, and unexplained elevation in inflammatory markers.

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REFERENCES

1. Son MB, Newburger JW. Kawasaki disease. In: Kliegman RM, Stanton BF, Geme JWSt III, Schor NF, Behrman RE, eds. Nelson Textbook of Pediatrics, 19th edition. Philadelphia, Pa, USA: Elsevier; 2011. pp. 862-5.
2. Takahashi K, Oharaseki T, Yokouchi Y. Pathogenesis of Kawasaki Disease. Clin Exp Immunol. 2011;164:20-2.
3. Burns JC, Mason WH, Glode MP, et al. Clinical and epidemiologic characteristics of patients referred for evaluation of possible Kawasaki disease. United States Multicenter Kawasaki Disease Study Group. J Pediatr. 1991;118:680-6.
4. Kato H, Sugimura T, Akagi T, et al. Long-term consequences of Kawasaki disease. A 10- to 21-year follow-up study of 594 patients. Circulation. 1996;94: 1379–1385.
5. Anderson BL, Guiot AB, Timm NL. An atypical presentation of atypical Kawasaki disease. Pediatr Emerg Care. 2014;30:491–492.
6. Newburger JW, Takahasi M, Gerber MA, et al. Diagnosis, treatment and long-term management of Kawasaki disease: a statement for health professionals from the Committee of Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. *Circulation*. 2004;110:2747–2771.
7. McCrindle BW, Rowley AH, Newburger JW, et al. Diagnosis, Treatment, and Long-Term Management of Kawasaki Disease: A Scientific Statement for Health Professionals from the American Heart Association. Circulation. 2017;135:e927.
8. Kim DH, Cheon JH. Intestinal Behcet's Disease: A True Inflammatory Bowel Disease or Merely an Intestinal Complication of Systemic Vasculitis? Yonsei Med J. 2016;57:22–32.
9. Periyakaruppan M, Kumar S, Kandasamy S, et al. COVID abdomen: SARS-CoV-2 infection presenting as 'acute abdomen' in a child. Crit Care Emerg Med. 2021;88:299–300.

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REVIEW ARTICLE

Enhancing Healthcare Provider Awareness and Early Detection of Adolescent Eating Disorder

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ABSTRACT

Eating disorders are mental health conditions characterized by abnormal eating or weight control behaviors, which can result in severe health complications and hinder overall wellbeing or social functioning. These disorders are acknowledged to stem from a combination of individual, genetic, and environmental factors, alongside societal pressure to maintain a thin physique. Research indicates that some young individuals with eating disorders may postpone seeking specialized care by concealing their symptoms due to a lack of awareness among healthcare providers and feelings of shame or stigma. Screening measures have been devised to mitigate the risk of underdiagnosing and inadequately treating eating disorders. Nevertheless, the prevalence of these disorders has doubled in recent years. Consequently, it is crucial to enhance healthcare providers' awareness of this issue, implement screening protocols in high-risk populations, and conduct annual assessments of adolescents' eating behaviors, body image perception, exercise habits, as part of psychosocial evaluations, alongside measurements of weight, height, and body mass index measurements during physical examinations, to facilitate early identification and intervention for adolescent eating disorders.

Keywords: Adolescent, eating disorders, anorexia nervosa, bulimia nervosa, avoidant/restrictive food intake disorder

INTRODUCTION

Eating disorders are psychiatric disorders characterized by aberrant eating or weight control behaviors, resulting in significant health complications (1). The most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR), published by the American Psychiatric Association , categorizes eating disorders into various subtypes, including anorexia nervosa, avoidant/restrictive food intake disorder, binge eating disorder, bulimia nervosa, other specified feeding and eating disorders, unspecified feeding and eating disorders, pica, and rumination disorder (2). Among the most perilous mental health challenges, eating disorders are linked to premature mortality spanning 10–20 years (3). Notably, some children and adolescents with eating disorders may conceal primary symptoms, delaying the pursuit of specialized care due to feelings of shame or stigma (4). Given the risk of underdiagnosis and inadequate treatment of eating disorders, it is imperative to comprehend the scale of eating disorders through an epidemiological lens and ascertain their prevalence in vulnerable populations. Strategizing and executing interventions for prevention, detection, and management of eating disorders are vital for addressing this escalating public health concern.

Epidemiology

The estimated lifetime occurrence of eating disorders is around 8% among females and 2% among males (5). The most prevalent eating disorders, listed in descending order, encompass other specified feeding and eating disorders, binge eating disorder, bulimia nervosa, and anorexia nervosa. An extensive examination of 94 studies on eating disorders published from 2000 to 2018 revealed a heightened incidence of these disorders in adolescents and young adults, with the point prevalence of all eating disorders doubling (5). A global study examining the lifetime occurrence of eating disorders among adolescents reported the following percentages: anorexia nervosa ranged from 0.8% to 6.3% among females and 0.1%–0.3% among males, bulimia nervosa from 0.8% to 2.6% among females and 0.1%–0.2% among males, binge eating disorder from 0.6% to 6.1% among females and 0.3%–0.7% among males, other specified feeding or eating disorders from

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0.6%–11.5% among females and 0.2%–0.3% among males, and unspecified feeding or eating disorders from 0.2%–4.7% among females and 0%–1.6% among males (6).

Given that eating disorders and symptoms peak during middle and late adolescence, understanding the prevalence of disordered eating among adolescents is vital (7). It is important to differentiate between disordered eating and eating disorders. Not every child or adolescent displaying disordered eating behaviors receives an eating disorder diagnosis. However, disordered eating during this phase can escalate to eating disorders in early adulthood. A systematic review and meta-analysis examining the global prevalence of disordered eating in children and adolescents revealed an overall prevalence of 22%, with higher rates observed among girls, adolescents in late puberty, and those with a higher body mass index (8).

Etiology

Eating disorders emerge through a multifaceted interaction of risk elements, encompassing individual, genetic, and environmental factors, alongside societal pressures emphasizing thinness (9). While genetic predispositions appear significant in anorexia nervosa, they also play a role in bulimia nervosa and binge eating disorder (10).

The origin of eating disorders may be linked to nonspecific risk factors like exposure to physical and/or sexual trauma, problematic parenting, and concurrent psychiatric conditions (11). Research indicates that individuals with eating disorders are roughly two to four times more prone to experience abuse, varying depending on the type of abuse, compared to healthy individuals (11). Nevertheless, the precise involvement of abuse as a predisposing vulnerability to eating disorders or its contribution to their initiation or worsening, remains unclear. The perpetuation of an eating disorder in an individual depends on factors such as conditioned learning, habit formation, and physiological and neurobiological complications arising from starvation or overeating behaviors (9).

Screening

Screening for eating disorders is crucial to enable early detection, aiming to prevent their oversight and persistence into later life stages (12).This screening should target individuals with a history of adverse childhood experiences and trauma, young adults, females, transgender individuals, athletes, and those exhibiting symptoms and signs indicative of eating disorders (such as rapid weight loss, bradycardia, amenorrhea, and preoccupation with food and appearance), as well as individuals with anxiety disorders, depressive disorders, and perfectionistic tendencies (12,13).

There is insufficient evidence to advocate for screening for eating disorders in individuals with a normal or high body mass index who lacks symptoms or signs of an eating disorder (13). Clinicians can conduct screening for eating disorders by inquiring whether the patient or their family has concerns regarding the patient's weight, body shape, body image, or eating behaviors. Utilizing screening tests can aid in identifying patients who warrant further evaluation (14). Table 1 outlines commonly utilized screening methods for diagnosing eating disorders (9).

Table 1: Screening methods used in eating disorder diagnosis

1.Sick Control One stone* Fat Food (SCOFF) *One stone 6,35 kg
2. Eating Disorder Screen for Primary Care (ESP)
3. Eating Attitudes Test (EAT)
4. Ch-EAT
5. Primary Care Evaluation of Mental Disorders Patient Health Questionnaire

*One stone: 6.35 kg

The SCOFF (Sick, Control, One, Fat, Food) questionnaire, comprising five questions, is widely employed as a screening tool for eating disorders (15). Clinicians administer the SCOFF questionnaire, which includes the following inquiries (16):

1. Do you induce vomiting because you feel uncomfortably full (S-sick)?
2. Do you fear losing control over your eating habits (C-control)?
3. Have you experienced a weight loss of more than one stone (6.35 kg) within a 3-month period (One stone)?
4. Do you perceive yourself as overweight despite others suggesting you are underweight (F-fat)?
5. Would you say that food significantly dominates your life (F-food)?

A test result is deemed positive if there are two or more affirmative responses. A positive outcome warrants further evaluation to establish or rule out a diagnosis (17).

Another screening tool is the Eating Disorder Screen for Primary Care (ESP) (18), which comprises a five-item questionnaire:

1. Are you content with your eating habits? (An answer of "No" is considered abnormal.)
2. Do you consume food in secret? (An affirmative response is deemed abnormal.)
3. Does your impact your self-perception? (An affirmative response is considered abnormal.)
4. Has any member of your family ever suffered from an eating disorder? (An affirmative response is deemed abnormal.)
5. Have you ever experienced or are currently experiencing an eating disorder? (An affirmative response is considered abnormal. A positive outcome is indicated by two or more "abnormal" responses.

The Eating Attitudes Test (EAT) is a highly dependable self-report tool used to screen for eating disorders. Its short version,

the EAT-26, has been translated into numerous languages, validated across clinical and non-clinical populations, and employed in studies involving adolescents and adults globally. However, it is important recognize that low scores on the EAT-26 should not necessarily exclude the possibility of an eating disorder, as individuals may deny or downplay their symptoms (19). Additionally, the Ch-EAT serves as a simplified version intended for children aged 8-13 (20).

The Primary Care Evaluation of Mental Disorders Patient Health Questionnaire aids in diagnosing bulimia nervosa, binge eating disorder, and other mental health conditions. Its eating disorder module consists of eight items and is tailored specifically for primary care environments (21).

Given this information, it is imperative to conduct annual assessments on all adolescents to appraise their eating behaviors, body image perception, exercise habits, as part of a psychosocial evaluation. Furthermore, incorporating weight, height, and body mass index measurements into physical examinations is crucial. This comprehensive approach may facilitate early detection and treatment of eating disorders, ultimately aiding in their prevention.

Anorexia Nervosa

Anorexia nervosa (AN) presents a formidable challenge as an eating disorder, often marked by recurrent relapses (22). Diagnosis follows the criteria outlined in the DSM-5, which include notably low body weight due to restricted energy intake, an intense fear of weight gain, persistent behaviors aimed at preventing weight gain, and disturbances in the perception of body weight or shape. Notably, individuals with AN may fail to acknowledge the seriousness of their low body weight (2). The disorder manifests in two subtypes: the restrictive type and the binge eating/purging type (9).

Restrictive type: Individuals achieve weight loss primarily through dieting, fasting, and/or excessive exercise over the preceding 3 months, without engaging in binge eating or purging episodes (9).

Binge eating/Purging type: Conversely, the binge eating/purging subtype entails repeated instances of excessive eating followed by purging behaviors, such as self-induced vomiting, misuse of laxatives, diuretics, or enemas over the same period (9).

Assessment of AN severity is typically based on the body mass index (BMI), although it may be adjusted based on clinical symptoms, level of functional impairment, and the need for supervision (9).

Mild: BMI ≥ 17 kg/m²

Moderate: BMI 16–16.99 kg/m²

Severe: BMI 15–15.99 kg/m²

Extreme: BMI < 15 kg/m²

Epidemiology: AN exhibits significantly higher prevalence rates among females compared to males (9). The lifetime prevalence in the general population is roughly 12 times higher in females than in males (1.42% in females and 0.12% in males) (23). A recent global study examining the lifetime prevalence of eating disorders found AN present in 0.8%–6.3% of females and 0.1%–0.3% of males among adolescents (7). Moreover, the frequency of AN in males appears to elevate compared to adults.

Etiology and Neurobiology: AN is characterized by a multifaceted etiology influenced genetic and environmental factors. Genetic investigations, such as Genom-Wide Association Studies (GWAS), have revealed that genetic variants contribute to approximately 20% of AN cases (24). In a GWAS encompassing more than 16,000 cases from 17 countries, 8 loci on chromosomes 1, 3, 10, and 11 containing genes were confidently identified (25). AN exhibits a genetic predisposition that can heighten susceptibility to various psychiatric disorders, including anxiety disorders, obsessive-compulsive disorder, major depression, substance use disorders, and bulimia nervosa (26, 27). Moreover, sociocultural pressures emphasizing thinness, heightened concerns regarding body image, weight, dieting, exercise, and a family history of eating and weight control behaviors are recognized as risk factors for AN (28). Childhood maltreatment and abuse are strongly linked to psychiatric issues that contribute to the onset of AN. Additionally, low BMI and dieting behaviors are significant triggers for AN onset, with excessive exercise preceding dieting behaviors being a well-documented symptom (29). Gastrointestinal complications, such as early satiety, gastroparesis, gastrointestinal reflux, and constipation, arise due to the gradual compulsive nature of restrictive eating behaviors, the formation of abnormal eating habits, and alterations in hormones and neuropeptides, all of which contribute to the persistence of AN (30).

Numerous studies have provided evidence indicating alterations in both the structure and function of the brain in individuals with AN (31). Functional magnetic resonance imaging (MRI) studies suggest that abnormal functioning in various brain regions may play a role in the initiation or perpetuation of AN (31). Individuals with AN often exhibit deficiencies in dopaminergic functions associated with eating behavior, motivation, and reward, as well as serotoninergic functions linked to mood regulation, impulse control, and obsessive behaviors (31).

Medical Complications: AN can result in complications impacting almost all bodily systems due to weight loss and malnutrition. Nevertheless, with prompt and efficient treatment, many of these complications can be reversed (32). The medical ramifications induced by AN are detailed in Table 2 (9,32-35).

Avoidant/Restrictive Food Intake Disorder (ARFID)

ARFID is diagnosed according to DSM-5 criteria due to inadequate nutrition and/or energy intake stemming from limitations in the quantity or types of foods consumed. Negative experiences associated with food intake, such as choking, vomiting, or abdominal discomfort, along with aversions and revulsion toward sensory aspects of food, are the primary triggers for this disorder. ARFID manifests

Table 2: Medical complications of AN

Constitution/Physical	Cachexia, Low Body Mass Index, Growth Retardation, Hypothermia
Cardiovascular	Myocardial Atrophy, Mitral Valve Prolapse, Pericardial Effusion, Myocardial Fibrosis/Scar, Hypotension,Bradycardia, Increased PR Interval, First-Degree Heart Block, Long QT Syndrome, ST-T Wave Abnormalities in Electrocardiogram (EKG) Changes, Malignant Arrhythmia, Sudden Cardiac Death
Gynecological and Reproductive	Loss of Libido, Amenorrhea, Unplanned Pregnancy, Newborn Complications
Endocrine	Osteoporosis and Pathological Stress Fractures, Euthyroid Sick Syndrome, Hypercortisolism, Hypoglycemia, Neurogenic Diabetes Insipidus, Poor Diabetes Control
Gastrointestinal	Gastroparesis, Early Satiety, Gastric Distension, Gastric Perforation, Increased Colonic Transit Time, Constipation, Hepatitis, Superior Mesenteric Artery Syndrome, Diarrhea
Renal and Electrolyte	Glomerular Filtration Rate Reduction, Kidney Stones, Impaired Urine Concentration, Dehydration,Hypokalemia, Hypomagnesemia, Nephropathy
Pulmonary	Reduced lung capacity due to pulmonary muscle loss, respiratory failure, spontaneous pneumothorax and pneumomediastinum, peripheral lung unit expansion without alveolar septal damage, weakness of pharyngeal muscles, and coordination disorder leading to cough and aspiration pneumonia.
Hematologic	Anemia (Normocytic, Microcytic, Macrocytic), Leukopenia, Thrombocytopenia
Neurological	Cerebral Atrophy, Dilated Ventricles, Cognitive Impairment, Peripheral Neuropathy, Seizures
Dermatological	Xerosis (dry skin), lanugo hairs (fine, downy, dark-colored hairs), telogen effluvium (hair shedding), Acne, Carotenoderma (yellowing), Scars from self-harm behaviors (cuts and burns)
Muscular	Muscular atrophy, Pain in the muscles during activities such as climbing stairs, sitting and standing exercises, fatigue, slowing of movements, shortness of breath, and a decrease in muscle mass due to structural and functional changes in the muscles.
Vitamins and trace elements	Zinc, vitamin D, copper, selenium, vitamin B1, vitamin B12, vitamin B9 deficiency
Refeeding syndrome	It manifests with electrolyte imbalances, including hypophosphatemia (the most critical diagnostic marker), hypokalemia, hyponatremia, hypomagnesemia, fluid retention, vitamin deficiencies, and metabolic acidosis.

as growth impairment, failure to achieve expected weight gain, and the need for additional enteral feeding or oral nutritional supplementation, accompanied by disruptions in psychosocial functioning. Importantly, ARFID is not linked to a general medical condition or another psychiatric disorder, nor is it a consequence of food scarcity or culturally accepted practices (2). Given its recent delineation and diverse clinical manifestations, data on the prevalence, comorbidities, and trajectory of the disorder are limited. Nevertheless, it is noteworthy that ARFID exhibits a higher prevalence among males than females, distinguishing it from AN, bulimia nervosa, or binge eating disorder (36).

Etiology and Neurobiology: There is relatively limited information available regarding the underlying causes and neurobiology of ARFID. Gaining insight into the psychobiology of appetite and the role of food avoidance may offer understanding into its biological underpinnings (36). Unlike other eating disorders, the avoidance or restriction of food in ARFID is not driven by concerns related to weight or body shape. While individuals with AN typically avoid high-calorie, energy-dense foods due to fears of gaining weight, those with ARFID often display a preference of a restricted range of processed, calorie-dense, energy-dense foods. This preference leads to deficiencies in calorie and/or micronutrient intake, with the disorder being more severe than typical selective eating observed in children. Patients with ARFID often present as underweight, although the disorder can manifest at any weight (37). Research indicates that individuals with ARFID commonly experience psychiatric comorbidities, such as anxiety disorders, panic disorder, attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorder, mood disorders, and pica (36). Anxiety disorders are the most prevalent psychiatric comorbidities, with generalized anxiety disorder being the most commonly observed (37).

Medical Complications: Individuals with ARFID who have low weight are susceptible to medical complications associated with malnutrition, akin to those observed in individuals with AN. These complications may include cardiac, endocrine, and gastrointestinal issues (38). Such condition can result in impediments in growth and development, vomiting, and significant electrolyte imbalances.

Binge Eating Disorder (BED)

As per the diagnostic criteria outlined in the DSM-5, BED should be considered when there are recurrent episodes of excessive eating within a specific timeframe (e.g., 2 hours). These episodes entail consuming a larger quantity of food than is typical for most individuals under comparable circumstances within a similar timeframe, accompanied by a sense of loss of control over eating. The diagnosis of BED may be established when at least three of the following conditions are met during these episodes: eating more rapidly than usual, eating until uncomfortably full, consuming large amounts of food when not physically hungry, eating alone due to embarrassment over the amount consumed, and experiencing feelings of disgust,

depression, or guilt after overeating. Binge eating episodes in BED occur, on average, at least once a week for a duration of 3 months, with the severity of the disorder determined by the frequency of weekly binge eating episodes (Mild: 1–3 times, Moderate: 4–7 times, Severe: 8–13 times, Extreme: more than 14 episodes per week). Unlike AN and bulimia nervosa, BED typically does not involve compensatory behaviors such as purging, fasting, or excessive exercise (2).

Epidemiology: BED is more prevalent in females, with rates two to three times higher than in males (23,39). The lifetime prevalence of BED stands at 2.8% among women and 1% among men (5). Recent studies examining the lifetime prevalence of eating disorders among adolescents found BED to occur in 0.6%–6.1% of females and 0.3%–0.7% of males (6). While the prevalence of BED is typically highest in obese individuals, it can also manifest in those with normal weight. Rates of BED are notably elevated in individuals classified with Class III obesity (BMI ≥40 kg/m^2), being approximately ten times higher compared to those with Class I obesity (BMI = 30–34.9 kg/m^2) (39).

Etiology and Neurobiology: Genetic factors contribute to the development of BED, with twin studies estimating that genetic factors account for 39%–45% of the phenotypic variation (27). Alongside genetic influences, childhood maltreatment and abuse, which are linked to psychiatric problems, can contribute to the onset of BED. Neuroimaging studies utilizing cranial MRI in individuals with BED have identified structural and functional alterations in the brain (40).

Medical Complications: Individuals diagnosed with BED often experience psychosocial impairment, characterized by symptoms such as anger, dysphoria, difficulties in emotion regulation, and heightened impulsivity (41). Moreover, those with BED frequently report comorbid conditions such as unipolar major depression (66%), any anxiety disorder (59%), any personality or behavior disorder (56%), alcohol use disorder (52%), and post-traumatic stress disorder (32%), with frequencies surpassing those observed in the general population for each comorbid condition (42). Additionally, individuals with BED commonly encounter general medical issues such as musculoskeletal disorders, asthma and other respiratory ailments, chronic pain, and hypertension, which cannot be fully accounted for by comorbid obesity or psychiatric comorbidity (42).

Bulimia Nervosa

As per the diagnostic criteria outlined in the DSM-5, bulimia nervosa is characterized by recurrent episodes of binge eating and subsequent inappropriate compensatory behaviors aimed at preventing weight gain, occurring at least once a week over a span of 3 months (2). Binge eating involves consuming a larger quantity of food than is typical for most individuals within a similar timeframe and under similar circumstances. During these episodes, individuals experience a sense of loss of control over eating, an inability to halt consumption, and/or an inability to regulate the amount ingested. Inappropriate compensatory behaviors encompass self-induced vomiting, fasting, excessive exercise, and the misuse of laxatives, diuretics, enemas, or other medications to stave off weight gain. These inappropriate compensatory behaviors must occur, on average, at least once a week for a duration of three months. The severity of the disorder is gauged based on the frequency of inappropriate compensatory behaviors:

Mild: 1–3 times per week on average

Moderate: 4–7 times per week on average

Severe: 8–13 times per week on average

Extreme: 14 or more times per week on average

However, the severity level may be adjusted in consideration of other symptoms and the extent of functional impairment (2).

Epidemiology: Research indicates that the lifetime prevalence of bulimia nervosa is notably higher in females than males, with estimates suggesting at least a threefold difference (5, 23, 39). In a global study examining the lifetime prevalence of eating disorders among adolescents, bulimia nervosa was identified in 0.8%-2.6% of females and 0.1%–0.2% of males (6).

Etiology and Neurobiology: The etiology of bulimia nervosa involves contributions from both genetic and environmental factors. Twin studies have revealed that genetic factors account for a phenotypic variation rate ranging from 28% to 83% (27). Sociocultural pressures promoting thinness, heightened concerns regarding body image and weight, engagement in diet and exercise, and a family history of eating and weight control behaviors are recognized as risk factors for bulimia nervosa (28). Moreover, childhood maltreatment and abuse, linked with psychiatric conditions, can also contribute to the development of bulimia nervosa. MRI studies have identified changes in brain structure and function in individuals with bulimia nervosa (43). These studies have highlighted changes in brain structure, particularly in frontal and temporoparietal areas, among individuals with bulimia nervosa. Additionally, alterations in hormones and neuropeptides such as ghrelin, leptin, and agouti-related peptide, are believed to play a role in the pathogenesis of the disorder (30).

Medical Complications: Individuals diagnosed with bulimia nervosa should undergo evaluation for various medical complications resulting from inappropriate compensatory behaviors. These complications encompass dehydration, hypokalemia, electrocardiogram abnormalities, menstrual irregularities, esophagitis, Mallory-Weiss syndrome, gastric dilation, ipeca-induced cardiomyopathy, other myopathic disorders, mitral valve prolapse, cardiac conduction abnormalities, swelling of salivary glands, and the risk of enamel erosion on teeth (44).

Pica

Pica is a feeding disorder characterized by the repetitive consumption of non-nutritive, non-food substances, such as cloth, dirt, gum, hair, metal, paint, paper, or soap persisting for at least 1 month. This eating behavior is deemed inappropriate for the individual's developmental stage, lacks cultural support, and is socially abnormal. It is essential to distinguish pica from non-suicidal self-injury behaviors, where potentially harmful objects like batteries, knives, or needles are ingested (2).

Etiology and Neurobiology: Factors such as neglect, developmental delays, heightened stress levels, and varying levels of anxiety contribute to the onset of pica (45).

Medical Complications: Pica is linked with a heightened prevalence of eating disorder pathology, encompassing body dissatisfaction, fear of weight gain, food restriction, and behaviors like excessive eating or purging. Moreover, individuals exhibiting pronounced pica symptoms are more prone to displaying symptoms associated with ARFID (46).

Rumination Disorder

Rumination disorder is a functional condition characterized by the involuntary regurgitation of recently ingested food following most meals. The regurgitated material is either expelled or swallowed again. This disorder involves the effortless and repetitive expulsion of recently eaten food, which may be chewed again, re-swallowed, or expelled. It persists for a minimum of one month and is not associated with regurgitation stemming from gastroesophageal reflux, postviral gastroparesis, or any other medical condition (2).

Epidemiology: The precise prevalence and incidence rates of rumination disorder remain uncertain (47). In an examination utilizing the Eating Disturbances in Youth Questionnaire (EDY-Q) to evaluate eating disorders in adolescents, rumination disorder's prevalence was reported at 9.7%, while pica disorder was observed in 10%, and the co-occurrence of rumination and pica disorders was noted at 3.1%. With a cutoff score of 4, isolated cases of rumination disorder were detected in 1.7%, isolated pica disorder in 3.8%, and concurrent rumination and pica disorders in 1.1%. Symptoms indicative of ARFID were also found among individuals with rumination disorder and pica disorder (46).

Etiology and Neurobiology: Although the precise cause remains unclear, rumination disorder is thought to stem from an unconsciously acquired behavioral issue involving deliberate diaphragmatic relaxation (47).

Complications: Rumination disorder may lead to complications such as esophagitis or weight loss and can also result in distress and functional impairment (47).

Other Specified Feeding or Eating Disorder

The diagnosis of other specified feeding or eating disorder (OSFED) is applied to individuals exhibiting symptoms of an eating disorder that lead to significant distress or impairment in psychosocial functioning but do not fulfill criteria for a specific eating disorder (2). Silen et al. identified instances of OSFED among adolescents, with prevalence rates ranging from 0.6% to 11.5% in females and 0.2% to 0.3% in males (6).

Atypical Anorexia Nervosa: Atypical AN are mirrors all criteria for AN except for a BMI falling between 18.5 kg/m² and <25 kg/m². In a randomized study employing meal-based treatment for weight restoration in hospitalized patients, it was observed that individuals with atypical anorexia nervosa displayed higher levels of eating disorder psychopathology compared to those with AN. Additionally, they exhibited lower heart rates, more substantial weight loss, and lower serum phosphate levels. Medical risk in both atypical AN and AN was associated with recent rates of weight loss and the duration of loss (48).

Low-Frequency and/or Limited Duration bulimia nervosa: This classification applies when there are occurrences of binge eating and inappropriate compensatory behaviors characteristic of bulimia nervosa, but these episodes happen less frequently than once a week and/or persist for fewer than 3 months (2).

Low-Frequency and/or Limited Duration BED: This designation is assigned when an individual meets all criteria for BED except for the frequency, which happens less often than once a week and/or continues for less than 3 months (2).

Purging Disorder: Purging disorder is diagnosed when there is no binge eating, but inappropriate compensatory behaviors like self-induced vomiting, misuse of laxatives, enemas, or diuretics are employed to alter body weight and shape (2).

Night Eating Syndrome: Night eating syndrome is identified when episodes of eating occur after waking from sleep or involve excessive eating after the evening meal, and these cannot be accounted for by changes in the sleep–wake cycle, medication effects, other eating disorders, substance use disorders, or general medical conditions (2)

Unspecified Feeding or Eating Disorder

The diagnosis of unspecified feeding or eating disorder (UFED) applies to individuals exhibiting symptoms of an eating disorder that result in significant distress or impairment in psychosocial functioning but do not fulfill all the criteria for a specific eating disorder (2). This diagnosis utilized when there is insufficient information to specify the reasons for not meeting all criteria for a particular eating disorder, particularly in situations such as emergency settings where there may be inadequate information for a definitive diagnosis. Silen et al. identified instances of UFED among adolescents, with prevalence rates ranging from 0.2% to 4.7% in females and from 0% to 1.6% in males (6).

CONCLUSION AND RECOMMENDATIONS

Eating disorders encompass a range of mental health conditions that pose significant risks to physical health and disrupt psychosocial functioning. Recent research indicates a doubling in the prevalence of these disorders. Disordered eating patterns during adolescence heighten the likelihood of developing eating disorders that persist into adulthood. Healthcare providers' lack of awareness about eating disorders, coupled with individuals' tendency to conceal symptoms due to shame or stigma, can result in inadequate diagnosis through screening tests and hinder effective treatment. Factors contributing to the development of eating disorders include societal pressures regarding body image, experiences of childhood maltreatment and abuse, heightened sensitivity to weight concerns, familial attitudes toward eating and weight control behaviors, dietary restrictions, and exercise practices. Raising awareness about these risk factors is crucial. Adopting

an epidemiological approach is essential for understanding the scope and distribution of eating disorders among at-risk populations, enabling the implementation of targeted interventions. Furthermore, conducting annual evaluations of adolescents, including assessments of eating habits, body image perceptions, exercise routines, and measurements of weight, height, and BMI during psychosocial and physical examinations, is vital for early detection and intervention in eating disorders.

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REFERENCES

1. Treasure J, Duarte TA, Schmidt U. Eating disorders. Lancet. 2020;395(10227):899-911. doi:10.1016/S0140-6736(20)30059-3PubMedGoogle ScholarCrossref
2. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR), Washington, DC 2022.
3. Chesney E, Goodwin GM, Fazel S. Risks of all-cause and suicide mortality in mental disorders: a meta-review. World Psychiatry. 2014;13(2):153-160. doi:10.1002/wps.20128PubMedGoogle ScholarCrossref
4. Forrest LN, Smith AR, Swanson SA. Characteristics of seeking treatment among U.S. adolescents with eating disorders. Int J Eat Disord. 2017;50(7):826-833. doi:10.1002/eat.22702PubMedGoogle ScholarCrossref
5. Galmiche M, Déchelotte P, Lambert G, Tavolacci MP. Prevalance of eating disorders over the 2000-2018 period: a systematic literatüre review. Am J Clin Nutr 2019; 109:1402.
6. Silén Y, Keski-Rahkonen A. Worldwide prevalence of DSM-5 eating disorders among young people. Current opinion in Psychiatry 2022 Nov 1;35(6):362-371. doi: 10.1097/YCO.0000000000000818. Epub 2022 Sep 13.PMID: 36125216
7. Stice E, Marti CN, Rohde P. Prevalence, incidence, impairment, and course of the proposed DSM-5 eating disorder diagnoses in an 8-year prospective community study of young women. J Abnorm Psychol. 2013;122(2):445-457. doi:10.1037/a0030679PubMedGoogle ScholarCrossref
8. López-Gil JF, García-Hermoso A, Smith L, Firth J, Trott M, Mesas AE, et al. Global Proportion of Disordered Eating in Children and AdolescentsA Systematic Review and Meta-analysis JAMA Pediatr. 2023;177(4):363-372. doi:10.1001/jamapediatrics.2022.5848
9. Angela Guarda, MD Eating Disorders: Overview of epidemiology, clinical features and diagnosis UpToDate May 1, 2023
10. Bulik CM, Thornton LM, Root TL, Pietsky EM, Lichtenstein P, Pederson NL. Understanding the relation between anorexia nervosa and bulimia nervosa in a Swedish national twin sample. Biol Psychiatry 2010; 67:71.
11. Molendik ML, Hoek HW, Brewerton TD, Elzinga BM. Childhood maltreatment and eating disorder pathology: a systematic review and dose-response meta-analysis. Psychol Med 2017;47:1402
12. Attia E, Guardo AS. Prevention and Early Identification of Eating Disorders. JAMA 2022; 327:1029.
13. Davidson KW, Barry MJ, Mangione CM, Cabana M, Chelmow D, Coker TM, et al. Screening for Eating Disorders in Adolescents and Adults: US Preventive Services Task Force Recommendation Statement. JAMA 2022; 327:1061.
14. Feltner C, Peat C, Reddy S, Riley S, Berkman N, Middleton JC, et al. Screening for Eating Disorders in Adolescents and Adults: Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA 2022; 327:1068
15. Kutz AM, Marsh AG, Gunderson CG, Maguen S, Masheb RM. Eating Disorder Screening: a Systematic Review and Meta-analysis of Diagnostic Test Characteristics of the SCOFF J Gen Intern Med. 2020;35(3):885-893. doi: 10.1007/s11606-019-05478-6
16. Hill LS, Reid F, Morgan JF, Lacey JH. SCOFF, the development of an eating disorder screening questionnaire. Int J Eat Disord 2010;43:344
17. National Institute for Clinical Excellence. Eating disorders: recognition and treatment. Full guideline. NICE guideline [NG69]. December 2020. https://www.nice.org.uk/guidance/ng69 (Accessed on July 18, 2023).
18. Nagata JM, Golden NH. New US Preventive Services Task Force Recommendations on Screening for Eating Disorders. JAMA Intern Med 2022; 182:471.
19. The Eating Attitudes Test: validation with DSM-IV eating disorder criteria J Pers Assess . 2000 Jun;74(3):489-503. doi: 10.1207/S15327752JPA7403_11
20. Maloney MJ, McGuire JB, Daniels SR. Reliability testing of a children's version of the Eating Attitude Test. J Am Acad Child Adolesc Psychiatry 1988; 27:541.
21. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME- MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. JAMA 1999; 282:1737.
22. Peterson K, Fuller R, Anorexia nervosa in adolescents: an overview. Nursing. 2019 Oct:49(10):24-30. Doi:10.1097/01.NURSE.0000580640.43071.15.
23. Udo T, Grilo CM. Prevalence and Correlates of DSM-5- Defined Eating Disorders in a Nationally Representative Sample of U.S. Adults. Biol Psychiatry 2018;84:345.
24. Duncan L, Yilmaz Z, Gaspar H, Walters R, Goldstein J, Anttila V, et al. Significant Locus and Metabolic Genetic Correlations Revealed in Genome-Wide Association Study of Anorexia Nervosa Am J Psychiatry 2017; 174:850.
25. Watson HJ, Yilmaz Z, Thornton LM, Hübel C, Coleman JRI, Gaspa HA, et al. Genome-wide association study identifies eight risk loci and implicates metabo-psychiatric origins for anorexia nervosa. Nat Genet 2019; 51:1207.
26. Steinhausen HC, Jakopsen H, Helenius D, Munk-Jørgensen P, Strober M. A nation-wide study of the family aggregation and risk factors in anorexia nervosa over three generations. Int J Eat Disord 2015; 48:1.

27. Watson HJ, Palmos AB, Hunjan A, Baker JH, Yilmaz Z, Davies HL. Genetics of eating disorders in the genome-wide era. Psychol Med 2021; 51:2287.
28. Hilbert A, Pike KM, Golsschmidt AB, Wilfley DE, Fairburn CG, Dohm FA, et al. Risk factors across the eating disorders. Psychiatry Res 2014; 220:500.
29. Stice E, Gau JM, Rohde P, Shaw H. Risk factors that predict future onset of each DSM-5 eating disorder: Predictive specificity in high-risk adolescent females. Abnorm Psychol 2017; 126:38
30. Monteleone AM, Castellini G, Volpe U, Ricca V, Lelli L, Monteleone P, et al. Neuroendocrinology and brain imaging of reward in eating disorders: A possible key to the treatment of anorexia nervosa and bulimia nervosa. Prog Neuropsychopharmacol Biol Psychiatry 2018; 80:132.
31. Phillipou A, Rossell SL, Castle DJ. The neurobiology of anorexia nervosa: a systematic review. Aust N Z J Psychiatry 2014; 48:128.
32. Patricia Westmoreland, Mori Krantz, Philip S Mehler. Medical Complications of Anorexia Nervosa and Bulimia Am J Med. 2016 Jan; 129(1):30-7. doi: 10.1016/j.amjmed.2015.06.031. Epub 2015 Jul 10.
33. Hanachi M , Dicembre M , Rives-Lange C, Ropers J, Pauline Bemer P, Jean-Fabien Zazzo JF, et al. Micronutrients Deficiencies in 374 Severely Malnourished Anorexia Nervosa Inpatients Nutrients. 2019 Apr; 11(4): 792. Published online 2019 Apr5. doi: 10.3390/nu11040792
34. Skowrońska A, Sójta K, Strzelecki D. Refeeding syndrome as a treatment complication of anorexia nervosa Psychiatr Pol 2019 Oct 30;53(5):1113-1123. doi: 10.12740/PP/OnlineFirst/90275. Epub 2019 Oct 30.
35. D M McLoughlin , E Spargo, W S Wassif, D J Newham, T J Peters, P L Lantos, et al. Structural and functional changes in skeletal muscle in anorexia nervosa Acta Neuropathol.1998 Jun;95(6):632-40. doi:10.1007/s004010050850.
36. Bourne L, Bryant-Waugh R, Cook J, Mandy W. Avoidant/restrictive food intake disorder: A systematic scoping review of the current literature. Psychiatry Res 2020; 288:112961.
37. Norris ML, Robinson A, Obeid N, Harrison M, Spettigue W, Henderson K. Exploring avoidant/restrictive food intake disorder in eating disordered patients: a descriptive study. Int J Eat Disord 2014; 47:495.
38. Katzman DK, Norris ML, Zucker N. Avoidant Restrictive Food Intake Disorder. Psychiatr Clin North Am 2019; 42:45.
39. Duncan AE, Ziobrowski HN, Nicol G. The Prevalence of Past 12-Month and Lifetime DSM-IV Eating Disorders by BMI Category in US Men and Women. Eur Eat Disord Rev 2017; 25:165.
40. Schäfer A, Vaitl D, Schienle A. Regional gray matter volume abnormalities in bulimia nervosa and binge-eating disorder. Neuroimage 2010; 50:639.
41. Dingemans A, Danner U, Parks M. Emotion Regulation in Binge Eating Disorder: A Review. Nutrients 2017; 9.
42. Udo T, Grilo CM. Psychiatric and medical correlates of DSM-5 eating disorders in a nationally representative sample of adults in the United States. Int J Eat Disord 2019; 52:42.
43. Donnelly B, Touyz S, Hay P, Burton A, Russell J, Caterson I. Neuroimaging in bulimia nervosa and binge eating disorder: a systematic review. J Eat Disord 2018; 6:3.
44. Eating Disorders: Core Interventions in the Treatment of and Management of Anorexia Nervosa, Bulimia Nervosa and Related Eating Disorders. National Institute for Clinical Excellence, Clinical Guideline 9. http://guidance.nice.org.uk (Accessed on December 04, 2023).
45. World Health Organization. International Classification of Diseases 11th Revision. Mental, behavioral or neurodevelopmental disorders. https://icd.who.int/browse11/l-m/en (Accessed on July 21, 2023).
46. Murray HB, Thomas JJ, Hinz A, Munsch S, Hilbert A. Prevalence in primary school youth of pica and rumination behavior: The understudied feeding disorders. Int J Eat Disord. 2018 Aug;51(8):994-998. doi: 10.1002/eat.22898. Epub 2018 Sep 2.
47. Nicholas J. Talley. Rumination Syndrome. Gastroenterol Hepatol (NY). 2011 Feb;7(2):117-118 PMCID:PMC3061016 PMID:21475419
48. Garber AK, Cheng J, Accurso EC, Adams SH, Buckelew SM, Kapphahn CJ et al. Weight Loss and Illness Severity in Adolescents With Atypical Anorexia Nervosa. Pediatrics 2019; 144.

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REVIEW ARTICLE

The Impact of the Covid-19 Pandemic on Child Health

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ABSTRACT

A "pandemic" refers to an extensive outbreak of disease affecting a large population across a wide geographic area. Various factors have been linked to pandemics throughout history. Since March 2019, the onset of the COVID-19 pandemic has had detrimental effects on children's development, nutrition, care, vaccination, safety, mental health, and education. Understanding the impact of the COVID-19 pandemic on children's health is crucial for implementing effective measures. It is essential to ensure the continuity of child health services during extraordinary situations such as pandemics to prevent disruptions in child development. This article aims to investigate the effects of the COVID-19 pandemic on children's health and underscore the preventive measures that need to be implemented.

Keywords: Child, pandemic, COVID-19

INTRODUCTION

The term "pandemic" denotes an epidemic affecting a large population across a widespread area, often transcending national boundaries (1,2). Globalization, economic progress, and societal shifts have led to the emergence and global spread of epidemics caused by novel microbial agents. Unlike historical epidemics primarily driven by military factors, contemporary epidemics propagate through national and international trade, as well as tourism. In 2019, the COVID-19 pandemic joined a roster of significant historical epidemics, including the 1918 Spanish flu, the 1957 Asian flu, the 1968 Hong Kong flu, and the 2009 H1N1 influenza, all of which wrought substantial devastation (3).

The World Health Organization (WHO) announced that by March 16, 2023, there were 760 million confirmed cases of COVID-19, resulting in 6.8 million deaths attributed to the pandemic (4). In comparison to adults, children under 18 years old tend to experience COVID-19 with fewer fatalities and generally mild symptoms, accounting for approximately 8.5% of reported cases (5). However, it is crucial to recognize that while children are less severely affected by COVID-19, it still significantly impacts their health (6,7). Children are affected by the pandemic for various reasons, including the virus's high transmission rate, the socioeconomic repercussions of containment measures, and the setbacks in achieving Sustainable Development Goals (SDGs) due to delays (7). The global community recognizes the COVID-19 pandemic as a crisis concerning the rights of children, impacting their development and long-term well-being. Progress made in enhancing the welfare of children and youth over the past two decades, attributable to the SDGs, faces the risk of regression due to increasing disparities among nations (8). The sudden onset of the COVID-19 pandemic has adversely affected all SDGs, particularly SDG 3 (Ensure healthy lives and promote well-being for all at all ages) and its associated goals: SDG 1 (No poverty), SDG 2 (Zero hunger), SDG 4 (Quality education), SDG 5 (Gender equality), SDG 6 (Clean water and sanitation), SDG 13 (Climate action), SDG 14 (Life below water), SDG 15 (Life on land), and SDG 17 (Partnerships for the goals), hindering the progress toward these objectives (9).

A small portion of child mortality worldwide is attributed to COVID-19-related deaths, while a significant portion is anticipated to result from insufficient access to essential resources such as water, sanitation, shelter, vaccines, health services, and food (8). Instances of severe COVID-19-related illnesses have been documented in children. Various risk factors for severe illness and intensive care admissions among children

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have been identified, including chronic respiratory conditions, obesity, diabetes, and cancer (5). Furthermore, the COVID-19 pandemic has adversely impacted children's nutrition, particularly breastfeeding, as well as their care, safety, mental health, vaccination, and education. Given the global scale of the COVID-19 pandemic, understanding its impact on children's health is crucial for implementing necessary precautions. This review aims to underscore the effects of the COVID-19 pandemic on child health and elucidate the requirements for mitigating these effects.

The impact of COVID-19 on children's nutrition

Following the guidelines of the WHO, exclusive breastfeeding is recommended for the first 6 months, with appropriate complementary feeding starting at 6 months, continued breastfeeding up to at least 2 years of age, and support for breastfeeding during exceptional circumstances such as epidemics (10,11). Concerns arose at the onset of the COVID-19 pandemic regarding the potential transmission of the SARS-CoV-2 virus through breast milk and whether infected mothers could transmit the infection to their infants while breastfeeding (12–14). Reports indicate that lockdowns, confinement measures, and diminished social support in Italy have had adverse effects on breastfeeding, resulting in a decline in exclusive breastfeeding rates (15). In California, the decrease in breastfeeding rates is attributed to the inability to offer in-person breastfeeding counseling due to the pandemic (16). A study conducted in Tekirdağ, Turkey, examined breastfeeding practices among mothers with COVID-19 and those in contact with COVID-19, revealing that 54.5% of contact mothers and 17.6% of ill mothers exclusively breastfed their infants. Additionally, 76.5% of ill mothers considered formula feeding the safest option during the pandemic (17). The importance of breastfeeding and its continuation during the pandemic was underscored in an article by Gökçay and Keskindemirci at the pandemic's onset (13).

There is no evidence to suggest that breast milk transmits COVID-19 to infants (18–20). A study conducted in the USA examined breast milk samples from mothers who tested positive for SARS-CoV-2 via nasopharyngeal swab test before giving birth. Of the 18 mothers tested, only 1 tested positive for SARS-CoV-2 in breast milk, yet the infant who received this milk tested negative for the virus in their nasopharyngeal test, showing no signs of infection (18). Similarly, in a separate study involving 44 breast milk samples from 16 Chinese mothers with confirmed COVID-19, no traces of SARS-CoV-2 were found (19). A comprehensive review of 340 studies also found no evidence of SARS-CoV-2 transmission through breast milk (20).

The WHO advocates for COVID-19-positive mothers to continue breastfeeding, emphasizing the importance of initiating breastfeeding and skin-to-skin contact immediately after birth while adhering to proper mask and hand hygiene protocols (14). Breast milk is well-known for bolstering a newborn's immune system and providing protection against infectious diseases. Therefore, health professionals should continue to promote and support breastfeeding to safeguard the health of both the infant and the mother (18-22).

Poverty, widespread job losses, food insecurity, and the implementation of school closure policies were the primary factors contributing to nutritional inadequacy during the pandemic (23). The global impact of COVID-19 has resulted in the adoption of school closure policies across most nations (24). The United Nations International Children's Emergency Fund (UNICEF) has highlighted that 368.5 million children in 143 countries, who rely on school meals for access to nutritious food, are at risk of malnutrition due to these closures (7). For children living in poverty, schools serve not only as places of learning but also as vital sources of healthy meals. The absence of school meal programs leads to poor nutrition, which in turn affects academic performance and adversely impacts the physical and mental well-being of children (24). To mitigate these effects, it is essential for all countries to implement pandemic protocols such as mask-wearing, hygiene practices, and physical distancing to ensure that schools can remain open.

The impact of COVID-19 on children's care

Restrictions imposed during the pandemic resulted in a substantial decline of 70%–80% in applications for pediatric health services and treatments (25). In the USA, while there was no notable change in initial child health checkups during the early stages of the COVID-19 pandemic, a temporary reduction was observed in subsequent followup visits for older children (26). Despite no significant decrease in admissions for 2-year-olds between 2019 and 2020 at the Gazi University Social Pediatrics Department followup outpatient clinic, there was an overall decrease of 28% in child health followups up visits. This indicates that families did not postpone followupup appointments during the first 2 years of a child's life, which typically include breastfeeding, complementary feeding, and vaccinations. However, they avoided other followups due to concerns about potential infection (6).

During the pandemic, the followup monitoring of children with chronic illnesses has faced disruptions (27,28). Information and communication technologies offer the potential to deliver accessible, high-quality, and cost-effective healthcare services across countries. Telemedicine, utilizing these technologies, can surmount geographical barriers, enhance healthcare accessibility, and address logistical challenges (29). Telemedicine proves valuable, particularly in nonemergency situations, routine healthcare, and psychological service provision. By leveraging remote care, healthcare facilities can optimize resource utilization, enhance care accessibility, extend caregivers' access to diverse medical expertise, and minimize direct exposure to infectious agents (30). Telemedicine is increasingly pivotal in the routine followupmonitoring of children with chronic illnesses. Institutions should receive adequate technical support to enable the provision of telemedicine services.

Globally, the COVID-19 pandemic has triggered socioeconomic challenges, including reductions in parental income, food scarcity, housing issues, and heightened levels of anxiety and stress, contributing to instances of child neglect and abuse. The closure of kindergartens and schools has increased the vulnerability of children to neglect and abuse (6). A study involving 140 American

parents investigating food and physical activity patterns during the pandemic revealed the presence of adaptive positive parenting behaviors, albeit hindered by perceived stress (31). UNICEF has underscored the significance of providing information and support to parents and caregivers regarding safeguarding their own and their children's mental well-being and addressing the topic of the epidemic with children. Accordingly, guidelines have been developed to aid in this aspect (7,24).

The impact of COVID-19 on children's immunization

In just 1 year since the onset of the COVID-19 pandemic, significant efforts have been made to develop vaccines offering protection against the SARS-CoV-2 virus. The WHO has recommended that nations ensure at least 70% of their population is vaccinated, with priority given to fully vaccinating healthcare workers, individuals over 60 years of age, and those who are immunocompromised or have chronic illnesses (32). By July 30, 2023, a total of 13.49 billion doses of COVID-19 vaccine had been administered globally (33). As of April 5, 2023, 89% of healthcare workers, 82% of elderly individuals, and 66% of the general population had completed their primary COVID-19 vaccination series. However, booster dose coverage remains notably low worldwide (34). Although most COVID-19 vaccines have been authorized for individuals aged 18 years and older, mRNA vaccines such as Pfizer-BioNTech BNT162b2 and Moderna mRNA-1273 have received emergency use approval in some countries for children aged 6 months and above. As of March 5, 2023, approximately 2.2 million (13%) children aged 6 months to 4 years, 11.2 million (39%) children aged 5–11 years, and 17.9 million (68%) children and adolescents aged 12–17 years had received their initial dose of COVID-19 vaccine in the USA (35).

Due to efforts to combat the COVID-19 pandemic, routine vaccination services for children have been negatively impacted worldwide, leading to decreased vaccination rates (36–38). Chandir et al. (39) discovered that half of the children in the Pakistani Sindh province were not vaccinated during the COVID-19 pandemic quarantine period. In Lebanon, a study revealed the most significant decline in oral polio and measles vaccination (40). The substantial disruption of routine immunization programs in at least 68 countries has raised concerns about the potential impact on approximately 80 million infants, leaving them vulnerable to infectious diseases such as polio, measles, and diphtheria (37–38). The American Centers for Disease Control and Prevention (CDC) reported that over 61 million measles vaccinations were missed during the COVID-19 pandemic, contributing to measles outbreaks worldwide (41). It is crucial during pandemic situations to ensure that childhood vaccinations are administered promptly and in full (6,36).

The impact of COVID-19 on children's visual and musculoskeletal systems

Amidst the COVID-19 pandemic restrictions and lockdowns, children experienced reduced outdoor activities and increased use of technological devices like tablets and smartphones, leading to constrained daily movements (42,43). A study in Iran involving 585 school-age children during lockdown revealed a smartphone addiction rate of 53.3%, with usage exceeding 6 hours per day. There was a positive correlation between smartphone addiction and discomfort in areas such as shoulders, wrists, back, neck, and eyes (42). Similarly, research in China involving 1,728 students before and 1,733 students after the pandemic indicated a 10.4% increase in myopia rates. It was concluded that decreased outdoor activity and increased digital screen exposure contribute to myopia progression in children and adolescents (43).

To mitigate visual and musculoskeletal issues during the pandemic, parents should recognize the adverse effects of excessive digital screen exposure, assist children in cultivating a healthy relationship with digital devices by setting limits on daily screen time, reduce their own digital device usage as role models, engage in outdoor activities with their children, and involve them in indoor activities such as household chores, music, and art (44).

The impact of COVID-19 on children's mental health

The effects on children's mental well-being vary depending on various vulnerability factors, such as their developmental stage, educational status, presence of special needs, pre-existing mental health conditions, socioeconomic status, and whether they or their parents have been quarantined due to infection or fear of infection.

Social isolation during the pandemic has adversely affected the mental health of children (45–48). Children and adolescents may struggle to cope with the changes brought about by the pandemic and may experience stress. Concerns about infection and the subsequent need for quarantine or social distancing measures further exacerbate these challenges (6). A study conducted in China revealed that out of 1,036 quarantined children aged 6–15 years, 196 experienced anxiety, 112 suffered from depression, and 68 had both conditions (45). A meta-analysis of 23 studies involving 57,927 children and adolescents from China and Turkey indicated that depression affected 29%, anxiety 26%, sleep disorders 44%, and post-traumatic stress symptoms 48%, of the participants. Additionally, depression and anxiety were more prevalent among adolescents and girls compared to children and boys (46). In a study conducted in France, it was revealed that 81% of 1,376 children with physical disabilities experienced adverse effects due to closures, with behavioral problems being notably prevalent, leading to increased parental stress (47). Similarly, findings from research involving 369 children and adolescents in Spain highlighted the detrimental impact of 6 months of closure and school absences on their mental health. This included issues such as sleep disturbances, excessive screen time, and emotional and behavioral difficulties. Children's anxiety regarding their own and their families' health emerged as a risk factor for psychological issues, whereas a supportive family environment served as a protective factor (48). Enhancing children's emotional and behavioral well-being involves engaging in activities together with parents. Parents are advised to limit their children's solitary screen, encourage home-based activities, enjoy recreational activities and reading with their children, listen to their thoughts, discuss upcoming

activities, and inquire about their feelings. A parent-child relationship characterized by harmony and flexibility fosters children's emotional and behavioral development (49).

On a global scale, approximately 10.5 million children have experienced the loss of a parent or caregiver due to COVID-19 (50,51). Children may harbor fears of losing family members or confront the reality of losing loved ones to the pandemic. Addressing grief and loss, especially with children, poses significant challenges. UNICEF advises honesty and the provision of clear, straightforward explanations when communicating with children of all ages. For instance, using phrases like "I have sad news to share with you. Your grandparents have passed away. Their body has stopped working, and we won't see them again" underscores the importance of honest and transparent communication (52).

It is anticipated that the pandemic's long-term repercussions will lead to increased instances of substance abuse, suicide attempts, and psychiatric disorders. Therefore, during visits related to child and adolescent health, it is crucial to consider the multifaceted impacts of the pandemic. To mitigate these effects, parents and children should receive support and counseling on effective coping strategies. Parents can alleviate their children's fears, anxiety, and stress by enhancing communication, engage in recreational activities, participating in physical exercise, and singing together (53).

The impact of COVID-19 on children's education

The adverse effects of school closures encompass several challenges, including parents being compelled to work from home, economic hardships, the shift from work life to childcare responsibilities, potential virus transmission from children to adults, educational setbacks, nutritional deficiencies, and psychological issues (54). UNICEF reported that school closures affected over 1.5 billion children across 188 countries (7). Among the repercussions of school closures is the difficulty faced by economically disadvantaged students in accessing nutritious meals outside of school. Additionally, there has been a surge in negative educational indicators. The transition to digital leaning environments has exacerbated educational disparities (24). While distance education platforms have been adopted in more than two-thirds of countries globally, the adoption rate is merely 30% in low-income countries (7). Peer learning is particularly beneficial for children aged 2–10, as it plays a crucial role in their personality development. However, the disruption caused by isolation and quarantine may lead to the loss of social relationships, adversely impacting children's mental health (24).

School closures and social isolation have had notable repercussions on children's health and lifestyles. Research conducted in Australia, Spain, and China indicates that children often experience depressive symptoms and a diminished sense of life satisfaction. Similarly, studies in Croatia and Italy reveal that children exhibit reduced levels of physical activity and an increased consumption of unhealthy foods (55). Adolescent students in Chicago also report negative impacts of the pandemic on their learning effectiveness and ability to maintain balance in their lives and social interactions (56).

According to the WHO, the extent of children's involvement in transmitting COVID-19 is not yet fully elucidated, and only a few outbreaks linked to children or schools have been reported thus far. Consequently, it is speculated that the spread of COVID-19 within educational settings may be limited (5). In both home and school settings, children are rarely the primary source of secondary transmission, with a higher likelihood of contracting the virus from an adult household member (57). The CDC advocate for the benefits of in-person learning for students and stress the importance of implementing strategies to ensure its continuity (58,59). Vaccination stands out as one such strategy. Encouraging both COVID-19 vaccination and routine vaccinations against other infectious diseases is crucial for preventing illnesses stemming from various infections. Another strategy involves staying at home when feeling unwell. Students and staff exhibiting symptoms such as sore throats, coughs, vomiting, diarrhea, or fever are advised to remain at home. To mitigate the risk of airborne transmission, schools should prioritize ventilation and improve indoor air quality. Additionally, proper hand hygiene practices should be taught and encouraged among students. Those who have been exposed to COVID-19, regardless of vaccination status or prior infection history, should wear a suitable mask when in the presence of others for 10 days following exposure (59).

While the COVID-19 pandemic and associated measures have adverse effects on children and young individuals, their perspectives are often overlooked, and their voices seldom considered. Drawing from the insights of children and young people, the International Society for Social Pediatrics conducted a review examining the impact of COVID-19 and underscored the significance of their involvement in responding to this crisis. Children and young individuals in low-income nations are reporting substantial disruptions to their fundamental needs, including school attendance, access to food, and basic healthcare services. Conversely, those in high-income countries express concerns regarding their inability to attend school and interact with peers and reliance on technology. Policymakers at the local, national, and international levels should engage children and young individuals in the formulation of intervention strategies, with the Committee on the Rights of the Child responsible for reporting on and overseeing their participation (60).

Preventive measures for mitigating COVID-19 effects on children's health

Outlined below are essential steps to minimize the impact of the COVID-19 pandemic on children's health:

- Immediate initiation of breastfeeding and skin-to-skin contact following birth is recommended, while adhering to appropriate mask usage and hand hygiene protocols.

- Healthcare providers should actively promote and offer assistance for breastfeeding, ensuring comprehensive support for both mother and infant.

- Parents should receive guidance on nutrition and care tailored to their child's age during each followup visit.

- Timely and complete administration of all vaccinations is crucial for children's health.

- Parents ought to restrict their children's daily screen time and set an example by decreasing their own usage of digital devices.

- Parents should actively engage in outdoor activities with their children and encourage indoor pursuits like painting, music, games, and household chores.

- It is imperative for every nation to prioritize the continued operation of schools.

- Governments must safeguard the rights of children and adolescents by adopting a child-centered approach.

- Policymakers should involve children and adolescents in the formulation of intervention strategies.

- Countries should bolster local food production and guarantee access to essential resources such as food, clean water, sanitation, shelter, and healthcare services.

CONCLUSION

It is crucial to maintain the provision of child health services even in exceptional circumstances like pandemics. Encouraging the mother–infant bond should for breastfeeding, providing parents with guidance on age-appropriate nutrition and care during followup visit, ensuring timely vaccinations for children, and taking necessary measures to sustain their education are paramount. Additionally, parents and children should receive support and counseling on navigating through the challenges posed by the pandemic. Despite disruptions in various aspects of life during pandemics, it is vital to recognize that child development persists unabated.

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REFERENCES

1. Kelly H. The classical definition of a pandemic is not elusive. Bull World Health Organ. 2011;89(7):540-1.
2. Centers for Disease Control and Prevention. Principles of Epidemiology in Public Health Practice. Available from: https://www.cdc.gov/csels/dsepd/ss1978/ss1978.pdf
3. Ateş E, Aksoy F. Pandemi ve tarihçesi. Set T, editör. Aile Hekimliği ve COVID-19 Pandemisi. 1. Baskı. Ankara: Türkiye Klinikleri; 2020. p.1-4.
4. World Health Organization. Weekly epidemiological update on COVID-19 – 16 March 2023. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---16-march-2023
5. World Health Organization. Coronavirus Disease (COVID-19): Schools. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19-schools
6. Çuhacı Çakır B, Duyan Çamurdan A. COVID-19 pandemi sürecinde çocuk sağlığı izlemi uygulamaları. Çöl N, editör. COVID-19 Pandemi Sürecinde Koruyucu Çocuk Sağlığı Uygulamaları. 1. Baskı. Ankara: Türkiye Klinikleri; 2021. p.1-6.
7. UNICEF. The Impact of COVID-19 on children. Available from: https://www.unicef.org/turkey/en/documents/impact-covid-19-children
8. Kyerematenng R, Oguda L, Asemota O; International Society for Social Pediatrics and Child Health (ISSOP) COVID-19 Working Group. COVID-19 pandemic: health inequities in children and youth. Arch Dis Child. 2022;107(3):297-9.
9. Khetrapal S, Bhatia R.Indian J Med Res. Impact of COVID-19 pandemic on health system & Sustainable Development Goal 3. 2020;151(5):395-9.
10. World Health Organization. Healthy diet. Available from: https://www.who.int/news-room/fact-sheets/detail/healthy-diet
11. World Health Organization. Guiding principles for feeding infants and young children during emergencies. Geneva; 2004. Available from: https://www.who.int/publications/i/item/9241546069
12. Kimberlin DW, Puopolo KM. Breast Milk and COVID-19: What Do We Know? Clin Infect Dis. 2021;72(1):131-2.
13. Gokcay G, Keskindermirci G. Breastmilk and Covid-19. J Ist Faculty Med. 2020;83(3):286-90.
14. World Health Organization. Breastfeeding and COVID-19. Available from: https://www.who.int/news-room/commentaries/detail/breastfeeding-and-covid-19
15. Latorre G, Martinelli D, Guida P, Masi E, De Benedictis R, Maggio L. Impact of COVID-19 pandemic lockdown on exclusive breastfeeding in non-infected mothers. Int Breastfeed J. 2021;16(1):36.
16. Koleilat M, Whaley SE, Clapp C. The Impact of COVID-19 on Breastfeeding Rates in a Low-Income Population. Breastfeed Med. 2022;17(1):33-37.
17. Nalbantoğlu A, Nalbantoğlu B, Gökçay G. Covid-19 Enfeksiyonu Seyrinde Annelerin Emzirme ve Anne Sütü Hakkında Bilgi ve Tutumları. Namık Kemal Tıp Dergisi. 2020;8(3):314-20.
18. Kunjumon B, Wachtel EV, Lumba R, Quan M, Remon J, Louie M, et al. Breast Milk and Breastfeeding of Infants Born to SARS-CoV-2 Positive Mothers: A Prospective Observational Cohort Study. Am J Perinatol. 2021;38(11):1209-16.
19. Peng S, Zhu H, Yang L, Cao L, Huang X, Dynes M, et al. A study of breastfeeding practices, SARS-CoV-2 and its antibodies in the breast milk of mothers confirmed with COVID-19. Lancet Reg Health West Pac. 2020;4:100045.
20. Centeno-Tablante E, Medina-Rivera M, Finkelstein JL, Rayco-Solon P, Garcia-Casal MN, Rogers L, et al. Transmission of SARS-CoV-2 through breast milk and breastfeeding: a living systematic review. Ann N Y Acad Sci. 2021;1484(1):32-54.
21. Karabayır N, Sapmaz S, Gökcay G. COVID-19 ve Anne Sütü ile Beslenme. Çocuk Dergisi. 2020;20(2):72-5.
22. Karabayır N. COVID-19 pandemi sürecinde süt çocuğu beslenmesi ve anne sütü. Çöl N, editör. COVID-19 Pandemi Sürecinde

Koruyucu Çocuk Sağlığı Uygulamaları. 1. Baskı. Ankara: Türkiye Klinikleri; 2021. p.14-9.
23. Zar HJ, Dawa J, Fischer GB, Castro-Rodriguez JA. Challenges of COVID-19 in children in low- and middle-income countries. Paediatr Respir Rev. 2020;35:70-4.
24. Sosyal Pediatri Derneği. COVID salgınında okul çocuğunun sağlığı. Erişim: http://www.sosyalpediatri.org.tr/covid-salgininda-okul-cocugunun-sagligi-96423.html
25. Lubrano R, Villani A, Berrettini S, Caione P, Chiara A, Costantino A, et al. Point of view of the Italians pediatric scientific societies about the pediatric care during the COVID-19 lockdown: what has changed and future prospects for restarting. Ital J Pediatr. 2020;46(1):142.
26. Salas J, Hinyard L, Cappellari A, Sniffen K, Jacobs C, Karius N, et al. Infant, pediatric and adult well visit trends before and during the COVID-19 pandemic: a retrospective cohort study. BMC Health Serv Res. 2022;22(1):328.
27. Pritchard-Jones K, de C V Abib S, Esiashvili N, Kaspers GJL, Rosser J, Van Doorninck JA, et al. The threat of the COVID-19 pandemic on reversing global life-saving gains in the survival of childhood cancer: a call for collaborative action from SIOP, IPSO, PROS, WCC, CCI, St Jude Global, UICC and WHPCA. Ecancermedicalscience. 2021;15:1187.
28. Anjana Bhat. Analysis of the SPARK study COVID-19 parent survey: Early impact of the pandemic on access to services, child/parent mental health, and benefits of online services. Autism Res. 2021;14(11):2454–70.
29. WHO Global Observatory for eHealth. Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth. World Health Organization; 2010. Available from: https://apps.who.int/iris/handle/10665/44497
30. Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. BMC Public Health. 2020;20(1):1193.
31. Angoff HD, Dial LA, State F, Varga AV, Kamath S, Musher-Eizenman D. Impact of stress and decision fatigue on parenting practices related to food and physical activity during COVID-19. Child Care Health Dev. 2022;48(6):911-6.
32. World Health Organization. COVID-19 vaccines. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines
33. World Health Organization. Coronavirus disease (COVID-19) pandemic. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019
34. World Health Organization. From emergency response to long-term COVID-19 disease management: sustaining gains made during the COVID-19 pandemic. Geneva; 2023. Available from: https://www.who.int/publications/i/item/WHO-WHE-SPP-2023.1
35. American Academy of Pediatrics. Children and COVID-19 vaccinations trends. Available from: https://downloads.aap.org/AAP/PDF/Child%20Vaccinations%20Report%20US%20Cumulative%20and%20Weekly%205.3.2023.pdf
36. Mutlu, D, Keskindemirci G, Gökçay EG. COVID-19 pandemi sürecinde çocukluk çağı aşı uygulamaları. Çöl N, editör. COVID-19 Pandemi Sürecinde Koruyucu Çocuk Sağlığı Uygulamaları. 1. Baskı. Ankara: Türkiye Klinikleri; 2021. p.7-13.
37. Dinleyici EC, Borrow R, Safadi MAP, van Damme P, Munoz FM. Vaccines and routine immunization strategies during the COVID-19 pandemic. Hum Vaccin Immunother. 2021;17(2):400-7.
38. Ota MOC, Badur S, Romano-Mazzotti L, Friedland LR. Impact of COVID-19 pandemic on routine immunization. Ann Med. 2021;53(1):2286-97.
39. Chandir S, Siddiqi DA, Mehmood M, Setayesh H, Siddique M, Mirza A, et al. Impact of COVID-19 pandemic response on uptake of routine immunizations in Sindh, Pakistan: An analysis of provincial electronic immunization registry data. Vaccine. 2020;38(45):7146-55.
40. Mansour Z, Arab J, Said R, Rady A, Hamadeh R, Gerbaka B, et al. Impact of COVID-19 pandemic on the utilization of routine immunization services in Lebanon. PLoS One. 2021;16:e0246951.
41. Centers for Disease Control and Prevention. Global measles outbreaks. Available from: https://www.cdc.gov/globalhealth/measles/data/global-measles-outbreaks.html
42. Mokhtarinia HR, Torkamani MH, Farmani O, Biglarian A, Gabel CP. Smartphone addiction in children: patterns of use and musculoskeletal discomfort during the COVID-19 pandemic in Iran. BMC Pediatr. 2022;22(1):681.
43. Wang W, Zhu L, Zheng S, Ji Y, Xiang Y, Lv B, et al. Survey on the Progression of Myopia in Children and Adolescents in Chongqing During COVID-19 Pandemic. Front Public Health. 2021;9:646770.
44. Wong CW, Tsai A, Jonas JB, Ohno-Matsui K, Chen J, Ang M, et al. Digital Screen Time During the COVID-19 Pandemic: Risk for a Further Myopia Boom? Am J Ophthalmol. 2021;223:333-7.
45. Chen F, Zheng D, Liu j, Gong Y, Guan Z, Lou D. Depression and anxiety among adolescents during COVID-19: A cross-sectional study. Brain Behav Immun. 2020;88:36-8.
46. Ma L, Mazidi M, Li K, Li Y, Chen S, Kirwan R, et al. Prevalence of mental health problems among children and adolescents during the COVID-19 pandemic: A systematic review and meta-analysis. J Affect Disord. 2021;293:78-89.
47. Varengue R, Brochard S, Bouvier S, Bailly R, Houx L, Lempereur M, et al. Perceived impact of lockdown on daily life in children with physical disabilities and their families during the COVID-19 pandemic. Child Care Health Dev. 2022;48(6):942-55.
48. Gatell-Carbó A, Alcover-Bloch E, Balaguer-Martínez JV, Pérez-Porcuna T, Esteller-Carceller M, Álvarez-Garcia P, et al. State of child and adolescent mental health during the first wave of the COVID-19 pandemic and at the beginning of the 2020-2021 school year. An Pediatr. 2021;95(5):354-63.
49. Nicolì I, Spinelli M, Lionetti F, Logrieco MG, Fasolo M. Protective and risk activities for emotional and behavioural well-being of children and adolescents during the COVID-19 lockdown. Child Care Health Dev. 2022;48(6):895-900.
50. Centers for Disease Control and Prevention. Global Orphanhood Associated with COVID-19. Available from: https://www.cdc.gov/globalhealth/covid-19/orphanhood/index.html
51. Hillis S, N'konzi JN, Msemburi W, Cluver L, Villaveces A, Flaxman S, et al. Orphanhood and Caregiver Loss Among Children Based on New Global Excess COVID-19 Death Estimates. JAMA Pediatr. 2022;e223157.
52. UNICEF. How parents can support their child through COVID-19 losses. Available from: https://www.unicef.org/coronavirus/how-parents-can-support-their-child-through-covid-19-losses
53. Yılmaz Öztorun Z, Kondolot M. COVID-19 pandemi sürecinde ebeveynlik: çocukların ruh sağlığını koruma, psikolojik dayanıklılığını güçlendirme. Çöl N, editör. COVID-19 Pandemi Sürecinde Koruyucu Çocuk Sağlığı Uygulamaları. 1. Baskı. Ankara: Türkiye Klinikleri; 2021. p.32-6.

54. Viner RM, Russell SJ, Croker H, Packer J, Ward J, Stansfield C, et al. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. Lancet Child Adolesc Health. 2020;4(5):397-404.
55. Rajmil L, Hjern A, Boran P, Gunnlaugsson G, Kraus de Camargo O, Raman S; International Society for Social Pediatrics & Child Health (ISSOP) and International Network for Research on Inequalities in Child Health (INRICH) COVID-19 Working Group. Impact of lockdown and school closure on children's health and well-being during the first wave of COVID-19: a narrative review. BMJ Paediatr Open. 2021;5:e001043.
56. Ezeoke OM, Kanaley MK, Brown DA, Negris OR, Das R, Lombard LS, et al. The impact of COVID-19 on adolescent wellness in Chicago. Child Care Health Dev. 2022;48(6):886-90.
57. Siebach MK, Piedimonte G, Ley SH. COVID-19 in childhood: Transmission, clinical presentation, complications and risk factors. Pediatr Pulmonol. 2021;56(6):1342-56.
58. Centers for Disease Control and Prevention. Schools, Child care, and Colleges. Available from: https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/index.html
59. Centers for Disease Control and Prevention. Operational Guidance for K-12 Schools and Early Care and Education Programs to Support Safe In-Person Learning. Available from: https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-childcare-guidance.html
60. Kyerematen R, Lynch MA, Pinzón-Segura MC, Osei-Bonsu A, Fortmann J, Wood D; International Society for Social Pediatrics (ISSOP) Voices of Children Working Group. What the children tell us: the COVID-19 pandemic and how the world should respond. BMJ Paediatr Open. 2022;6:e001481.

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LETTER TO THE EDITOR

An Unusual Presentation of Pediatric Tuberculosis

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Keywords: Cutaneous tuberculosis, infection, pediatric

Dear Editor,

We were interested in reading Kamer et al.'s original research paper on pediatric tuberculosis in Issue 1 of the *Journal of Child*. The authors mentioned that tuberculosis (TB) is a contagious illness able to potentially affect multiple organs within the body. Below, we present a case of cutaneous TB in a pediatric patient.

A 13-year-old girl with recurrent suppurative skin abscesses was admitted to Şanlıurfa Training and Research Hospital. We learned from her medical history that she had visited several healthcare institutions over eight months due to persistent complaints. Despite abscess drainage and various intravenous (IV) and oral treatments, her clinical condition did not improve. The patient also experienced intermittent fever and weight loss. She had no history of contact with a patient with infectious tuberculosis. During the physical examination, multiple non-tender and fluctuant ulcerative erosive lesions and abscesses were found on both palms and dorsal sides of the hands. A soft abscess measuring 2 × 3 cm was palpable in the left triceps tissue, and crackles were heard in the bilateral upper lung zones. Abdominal assessment revealed a palpable liver 1 cm below the right costal margin. During the examination, soft mobile lymphadenitis with a diameter of approximately 2 × 1 cm was palpated in both axillary regions. The patient did not have any Bacillus Calmette–Guérin (BCG) vaccine scar. Other system examinations were unremarkable. No microbial growth was observed in the abscess cultures obtained from the different hospitals. Blood tests showed normal electrolytes and liver and kidney function, but revealed a white blood cell count of 10,160/mm^3, erythrocyte sedimentation rate of 66/h, and C-reactive protein of 61.5 mg/L. The patient was admitted to the pediatric infectious disease ward and started on empiric therapy with intravenous ampicillin-sulbactam and clindamycin owing to positive acute phase reactants, presence of fever during hospitalization, and suppurative abscesses. Chest computed tomography (CT) revealed hilar lymphadenopathy and left-sided calcifications, thick-walled cavitary lesions measuring 6 × 8 mm in the right apex and 10 × 10 mm in the left apex, and bilateral axillary lymphadenitis (Figures 1 and 2). Upon sputum induction, the patient's sputum samples were tested for acid-resistant bacilli and TB polymerase chain reaction (PCR) and found to be negative. The patient's tuberculin skin test result was positive, measuring 18 mm. She was referred to the dermatology department, where her

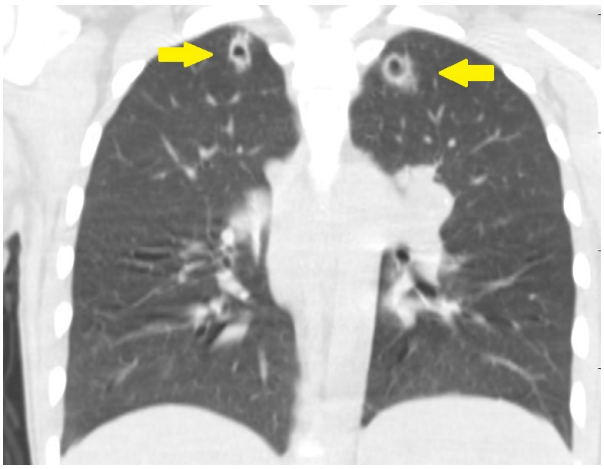

Figure 1: Bilateral apical cavitary lesions – Coronal reformatted images of non enhanced chest CT. Bilateral thick walled cavitary lesions and adjacent ground glass opacity is seen on coronal plane reformated chest CT images.

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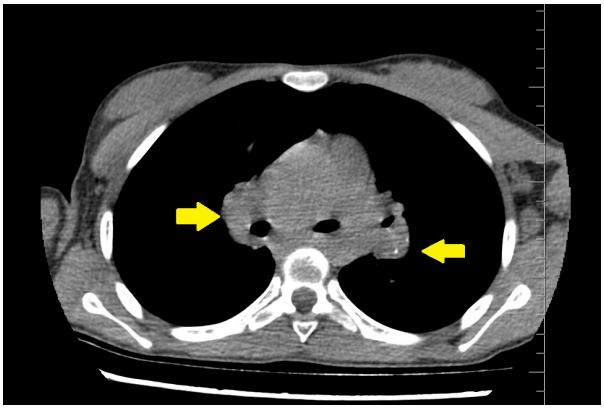

Figure 2: Hilar lymph node enlargement- Non enhanced chest CT. Multiple bilateral hilar lymphadenopathies and left-sided calcifications, consistent with tuberculosis on non-contrast CT scan.

skin lesions were identified as scrofuloderma by an experienced dermatologist, and a biopsy was carried out to obtain samples from the skin abscess on her hand. Acid-resistant bacillus spp. were detected in the biopsy specimen, and the tuberculosis PCR result was positive. No microbial growth was detected in standard blood or abscess cultures. Histopathological analysis indicated granulomatous infection. Serological testing for HIV revealed a negative result. While investigating for involvement of other organs, abdominal ultrasonography detected increased liver size, with cranial magnetic resonance imaging showing no abnormalities. Lymphocyte subgroup analysis, immunoglobulin levels, and vaccine responses were normal, but further immunological analysis could not be conducted owing to hospital conditions. Antibiotic treatment was discontinued and replaced with antituberculosis (anti-TB) treatment consisting of isoniazid (oral: 10 mg/kg/day), rifampin (oral: 15 mg/kg/day), ethambutol (oral: 20 mg/kg/day), and pyrazinamide (oral: 35 mg/kg/day). After receiving anti-TB medication, the patient was clinically improved and then discharged. The patient underwent the standard four-drug anti-TB therapy for two months and then received a combination of isoniazid and rifampin for seven months. The lesions exhibited signs of improvement after two months of anti-Tb treatment. Follow-up lung imaging studies revealed complete resolution of the cavitary lesions during outpatient follow-up.

Tuberculosis can affect any organ, and children are more susceptible to progression after exposure than adults because of their weaker immune systems (1,2). Cutaneous tuberculosis (CTB) expresses only 1-2% of extrapulmonary TB cases (3). The incidence of CTB varies among countries. Studies conducted in India indicate that childhood CTB accounts for 18.7% to 53.9% of general CTB incidences, while it was reported to be 36.3% in Hong Kong and only 6% in Tunisia (4). Cutaneous TB is typically paucibacillary, making it difficult to obtain a positive TB culture from lesions. Therefore, diagnosis is generally based on clinical and histopathological findings. In a study of 103 children diagnosed with CTB, mycobacterial culture positivity was detected in 11 patients (10.6%) (5). Similarly during follow-up, no growth was observed in the mycobacterial culture of our patient. In children, difficulty is had in microbiologically confirming the presence of TB owing to inadequate sampling. A recent study on pediatric patients with various forms of TB found that only 56.45% of cases were confirmed microbiologically by any of those methods (i.e., testing with smear microscopy, culture, and nucleic acid amplification test). The study group had a 30% positive culture test result, likely due to the disease's paucibacillary character in children (6). This could clarify the reason for the negative microbiological results in our patient's sputum samples, despite having cavitary lesions in both lungs, a positive tuberculin skin test, and complete disappearance of the cavitary lesions on outpatient follow-up imaging after receiving anti-TB treatment. CTB can be difficult to diagnose due to its nonspecific clinical features and resemblance to other diseases (3). Its lesions present a wide range of clinical appearances, including maculopapules, suppurative nodules, patches, abscesses, erosions, and ulcers (7). Therefore, CTB should be considered and tested for prompt diagnosis in patients with unusual skin lesions. Patients diagnosed with CTB should be investigated for coexisting pulmonary and extrapulmonary involvements. Treatment plans for cutaneous tuberculosis are based on clinical observations and the experience of medical professionals, with the goal being full recovery from the lesions (8). While some experts recommend a standard four-drug therapy for two months followed by two-drug therapy for seven months in treating scrofuloderma, others have suggested a total duration therapy of six months as being sufficient for cutaneous tuberculosis (2,3,8).

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REFERENCES

1. Kamer İ, Sütçü M, Manolya AC, Erol OB, Törün SH, Salman N, Somer A. Pediyatrik tüberküloz: Bir üniversite hastanesinin beş yıllık deneyimi. Çocuk Dergisi. 2017 Jan 4;17(2):43-52.
2. Mannava AS, Wesley Garapati CA, Ganguly S, Jaykar KC. Multifocal cutaneous tuberculosis coexisting with pulmonary tuberculosis. *Int J Mycobacteriol.* 2022;11(3):329-331.
3. Arango-Ferreira C, Zapata-Muñoz CM, Gotuzzo E. Cutaneous Tuberculosis Presenting as Mastitis in a Prepubertal Girl. *Am J Trop Med Hyg.* 2018;99(6):1360-61.
4. Kumar, Bhushan, Sheetanshu Kumar. Pediatric cutaneous tuberculosis: Indian scenario. *Indian Journal of Paediatric Dermatology* 19.3 (2018): 202-211.
5. Vashisht P, Sahoo B, Khurana N, Reddy BS. Cutaneous tuberculosis in children and adolescents: a clinicohistological study. *J Eur Acad Dermatol Venereol.* 2007;21(1):40-47.
6. Gupta N, Kashyap B, Dewan P, Hyanki P, Singh NP. Clinical Spectrum of Pediatric Tuberculosis: A Microbiological Correlation from a Tertiary Care Center. *J Trop Pediatr.* 2019;65(2):130-138.
7. Chen Q, Chen W, Hao F. Cutaneous tuberculosis: A great imitator. Clin Dermatol 2019; 37:192.
8. Abdelmalek R, Mebazaa A, Berriche A, et al. Cutaneous tuberculosis in Tunisia. *Med Mal Infect.* 2013;43(9):374-378.

DESCRIPTION

Journal of Child is an international, scientific, open acces, peer-reviewed official publication of Istanbul University, Faculty of Medicine, Department of Child Health and Diseases and Istanbul University, Institute of Child Health. It is a quarterly journal published in March, June, September and December. Starting from January 2023, except for the articles in process, the journal has started to consider manuscripts in English for evaluation and publication language has become English.

AIMS AND SCOPE

Journal of Child aims to contribute to the literature by publishing high quality original articles, reviews focusing on key subjects and contemporary developments, and case reports in the field of child health and diseases.

The journal welcomes articles about internal and surgical medicine as well, provided that these are related to child health and diseases. The target group of the journal consists of academicians, researchers, professionals, students, related professional and academic bodies and institutions.

POLICIES

Publication Policy

The journal is committed to upholding the highest standards of publication ethics and pays regard to Principles of Transparency and Best Practice in Scholarly Publishing published by the Committee on Publication Ethics (COPE), the Directory of Open Access Journals (DOAJ), the Open Access Scholarly Publishers Association (OASPA), and the World Association of Medical Editors (WAME) on https://publicationethics.org/resources/guidelines-new/principles-transparency-and-best-practice-scholarly-publishing

The subjects covered in the manuscripts submitted to the Journal for publication must be in accordance with the aim and scope of the Journal. Only those manuscripts approved by every individual author and that were not published before in or sent to another journal, are accepted for evaluation.

Changing the name of an author (omission, addition or order) in papers submitted to the Journal requires written permission of all declared authors.

Plagiarism, duplication, fraud authorship/denied authorship, research/data fabrication, salami slicing/salami publication, breaching of copyrights, prevailing conflict of interest are unethical behaviors. All manuscripts not in accordance with the accepted ethical standards will be removed from the publication. This also contains any possible malpractice discovered after the publication.

Plagiarism

Submitted manuscripts that pass preliminary control are scanned for plagiarism using iThenticate software. If plagiarism/self-plagiarism will be found authors will be informed. Editors may resubmit manuscript for similarity check at any peer-review or production stage if required. High similarity scores may lead to rejection of a manuscript before and even after acceptance. Depending on the type of article and the percentage of similarity score taken from each article, the overall similarity score is generally expected to be less than 15 or 20%.

Double Blind Peer-Review

After plagiarism check, the eligible ones are evaluated by the editors-in-chief for their originality, methodology, the importance of the subject covered and compliance with the journal scope. The editor provides a fair double-blind peer review of the submitted articles and hands over the papers matching the formal rules to at least two national/international referees for evaluation and gives green light for publication upon modification by the authors in accordance with the referees' claims.

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All parties involved in the publishing process (Editors, Reviewers, Authors and Publishers) are expected to agree on the following ethical principles.

All submissions must be original, unpublished (including as full text in conference proceedings), and not under the review of any other publication synchronously. Authors must ensure that submitted work is original. They must certify that the manuscript has not previously been published elsewhere or is not currently being considered for publication elsewhere, in any language. Applicable copyright laws and conventions must be followed. Copyright material (e.g. tables, figures or extensive quotations) must be reproduced only with appropriate permission and acknowledgement. Any work or words of other authors, contributors, or sources must be appropriately credited and referenced.

Each manuscript is reviewed by at least two referees under double-blind peer review process. Plagiarism, duplication, fraud authorship/denied authorship, research/data fabrication, salami slicing/salami publication, breaching of copyrights, prevailing conflict of interest are unethical behaviors.

All manuscripts not in accordance with the accepted ethical standards will be removed from the publication. This also contains any possible malpractice discovered after the publication.

Research Ethics
Journal of Child adheres to the highest standards in research ethics and follows the principles of international research ethics as defined below. The authors are responsible for the compliance of the manuscripts with the ethical rules.

- Principles of integrity, quality and transparency should be sustained in designing the research, reviewing the design and conducting the research.
- The research team and participants should be fully informed about the aim, methods, possible uses and requirements of the research and risks of participation in research.
- The confidentiality of the information provided by the research participants and the confidentiality of the respondents should be ensured. The research should be designed to protect the autonomy and dignity of the participants.
- Research participants should participate in the research voluntarily, not under any coercion.
- Any possible harm to participants must be avoided. The research should be planned in such a way that the participants are not at risk.
- The independence of research must be clear; and any conflict of interest or must be disclosed.
- In experimental studies with human subjects, written informed consent of the participants who decide to participate in the research must be obtained. In the case of children and those under wardship or with confirmed insanity, legal custodian's assent must be obtained.
- If the study is to be carried out in any institution or organization, approval must be obtained from this institution or organization.
- In studies with human subject, it must be noted in the method's section of the manuscript that the informed consent of the participants and ethics committee approval from the institution where the study has been conducted have been obtained.

Ethics Committee Approval and Informed Consent
Journal of Child takes as principle to comply with the ethical standards of World Medical Association (WMA) Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects revised in 2003 and WMA Statement on Animal Use in Biomedical Research revised in 2016.

An approval of research protocols by the Ethics Committee in accordance with international standards mentioned above is required for experimental, clinical, and drug studies and for some case reports. If required, ethics committee reports or an equivalent official document will be requested from the authors. For manuscripts concerning experimental research on humans, a statement should be included that shows that written informed consent of patients and volunteers was obtained following a detailed explanation of the procedures that they may undergo. For studies carried out on animals, the measures taken to prevent pain and suffering of the animals should be stated clearly. Information on patient consent, the name of the ethics committee, and the ethics committee approval number should also be stated in the Materials and Methods section of the manuscript. It is the authors' responsibility to carefully protect the patients' anonymity. For photographs that may reveal the identity of the patients, signed releases of the patient or of their legal representative should be enclosed.

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It is authors' responsibility to ensure that the article is in accordance with scientific and ethical standards and rules. And authors must ensure that submitted work is original. They must certify that the manuscript has not previously been published elsewhere or is not currently being considered for publication elsewhere, in any language. Applicable copyright laws and conventions must be followed. Copyright material (e.g. tables, figures or extensive quotations) must be reproduced only with appropriate permission and acknowledgement. Any work or words of other authors, contributors, or sources must be appropriately credited and referenced.

All the authors of a submitted manuscript must have direct scientific and academic contribution to the manuscript. The author(s) of the original research articles is defined as a person who is significantly involved in "conceptualization and design of the study", "collecting the data", "analyzing the data", "writing the manuscript", "reviewing the manuscript with a critical perspective" and "planning/conducting the study of the manuscript and/or revising it". Fund raising, data collection or supervision of the research group are not sufficient roles to be accepted as an author. The author(s) must meet all these criteria described above. The order of names in the author list of an article must be a co-decision and it must be indicated in the Copyright Agreement Form. The individuals who do not meet the authorship criteria but contributed to the study must take place in the acknowledgement section. Individuals providing technical support, assisting writing, providing a general support, providing material or financial support are examples to be indicated in acknowledgement section.

All authors must disclose all issues concerning financial relationship, conflict of interest, and competing interest that may potentially influence the results of the research or scientific judgment.

When an author discovers a significant error or inaccuracy in his/her own published paper, it is the author's obligation to promptly cooperate with the Editor to provide retractions or corrections of mistakes.

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Editor-in-Chief evaluates manuscripts for their scientific content without regard to ethnic origin, gender, citizenship, religious belief or political philosophy of the authors. Editor-in-Chief provides a fair double-blind peer review of the submitted articles for publication and ensures that all the information related to submitted manuscripts is kept as confidential before publishing.

Editor-in-Chief is responsible for the contents and overall quality of the publication and must publish errata pages or make corrections when needed.

Editor-in-Chief does not allow any conflicts of interest between the authors, editors and reviewers. Only he has the full authority to assign a reviewer and is responsible for final decision for publication of the manuscripts in the Journal.

Reviewers must have no conflict of interest with respect to the research, the authors and/or the research funders. Their judgments must be objective.

Reviewers must ensure that all the information related to submitted manuscripts is kept as confidential and must report to the editor if they are aware of copyright infringement and plagiarism on the author's side.

A reviewer who feels unqualified to review the topic of a manuscript or knows that its prompt review will be impossible should notify the editor and excuse himself from the review process.

The editor informs the reviewers that the manuscripts are confidential information and that this is a privileged interaction. The reviewers and editorial board cannot discuss the manuscripts with other persons. The anonymity of the referees must be ensured. In particular situations, the editor may share the review of one reviewer with other reviewers to clarify a particular point.

PEER REVIEW POLICIES

Only those manuscripts approved by its every individual author and that were not published before in or sent to another journal, are accepted for evaluation.

Submitted manuscripts that pass preliminary control are scanned for plagiarism using iThenticate software. After plagiarism check, the eligible ones are evaluated by editor-in-chief for their originality, methodology, the importance of the subject covered and compliance with the journal scope.

The editor hands over the papers matching the formal rules to at least two national/international referees for double-blind peer review evaluation and gives green light for publication upon modification by the authors in accordance with the referees' claims.

Responsibility for the Editor and Reviewers
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Editor-in-Chief evaluates manuscripts for their scientific content without regard to ethnic origin, gender, citizenship, religious belief or political philosophy of the authors and ensures a fair double-blind peer review of the selected manuscripts.

The selected manuscripts are sent to at least two national/international referees for evaluation and publication decision is given by Editor-in-Chief upon modification by the authors in accordance with the referees' claims.

Editor-in-Chief does not allow any conflicts of interest between the authors, editors and reviewers and is responsible for final decision for publication of the manuscripts in the Journal.

Reviewers' judgments must be objective. Reviewers' comments on the following aspects are expected while conducting the review.

- Does the manuscript contain new and significant information?
- Does the abstract clearly and accurately describe the content of the manuscript?
- Is the problem significant and concisely stated?
- Are the methods described comprehensively?

- Are the interpretations and consclusions justified by the results?
- Is adequate references made to other Works in the field?
- Is the language acceptable?

Reviewers must ensure that all the information related to submitted manuscripts is kept as confidential and must report to the editor if they are aware of copyright infringement and plagiarism on the author's side.

A reviewer who feels unqualified to review the topic of a manuscript or knows that its prompt review will be impossible should notify the editor and excuse himself from the review process.

The editor informs the reviewers that the manuscripts are confidential information and that this is a privileged interaction. The reviewers and editorial board cannot discuss the manuscripts with other persons. The anonymity of the referees is important.

AUTHOR GUIDELINES

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The manuscripts should be prepared in accordance with ICMJE-Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals (updated in December 2015 - http://www.icmje.org/icmje-recommendations.pdf). Author(s) are required to prepare manuscripts in accordance with the CONSORT guidelines for randomized research studies, STROBE guidelines for observational original research studies, STARD guidelines for studies on diagnostic accuracy, PRISMA guidelines for systematic reviews and meta-analysis, ARRIVE guidelines for experimental animal studies, and TREND guidelines for non-randomized public behavior.

Manuscripts can only be submitted through the journal's online manuscript submission and evaluation system, available at https://dergipark.org.tr/en/pub/jchild Manuscripts submitted via any other medium will not be evaluated.

Manuscripts submitted to the journal will first go through a technical evaluation process where the editorial office staff will ensure that the manuscript has been prepared and submitted in accordance with the journal's guidelines. Submissions that do not conform to the journal's guidelines will be returned to the submitting author with technical correction requests.

Author(s) are required to submit the following documents together with the manuscript and must ensure that the abstract and keywords are in line with the standards explained in below.

- **Copyright Agreement Form**
- **Author Form and ICMJE Potential Conflict of Interest Disclosure Form**
- **Ethics Committee Approval**
- **Cover Letter to the Editor**
- **Title Page:** A separate title page should be submitted with all submissions and this page should include:

- The full title of the manuscript as well as a short title (running head) of no more than 50 characters,
- Name(s), affiliations, academic degree(s) and ORCID ID(s) of the author(s),
- Grant information and detailed information on the other sources of support,
- Name, address, telephone (including the mobile phone number) and fax numbers, and email address of the corresponding author,
- Acknowledgment of the individuals who contributed to the preparation of the manuscript but who do not fulfil the authorship criteria.

Abstract: A Turkish and an English abstract should be submitted with all submissions except for Letters to the Editor. Submitting a Turkish abstract is not compulsory for international authors. The abstract of Original Articles should be structured with subheadings (Objective, Materials and Methods, Results, and Conclusion). Abstracts of Case Reports and Reviews should be unstructured. Abstracts should be 250 words.

Keywords: Each submission must be accompanied by a minimum of 3 to a maximum of 6 keywords for subject indexing at the end of the abstract. The keywords should be listed in full without abbreviations. The keywords should be selected from the National Library of Medicine, Medical Subject Headings database (http://www.nlm.nih.gov/mesh/MBrowser.html) .

Manuscript Types

Original Articles: The main text of original articles should be structured with Introduction, Material and Method, Results, Discussion, and Conclusion subheadings. Statistical analysis to support conclusions is usually necessary. Statistical analyses must be conducted in

accordance with international statistical reporting standards (Altman DG, Gore SM, Gardner MJ, Pocock SJ. Statistical guidelines for contributors to medical journals. Br Med J 1983: 7; 1489-93). Information on statistical analyses should be provided with a separate subheading under the Materials and Methods section and the statistical software that was used during the process must be specified.

Units should be prepared in accordance with the International System of Units (SI).

Review Articles: Manuscripts prepared by experts who have received an invitation letter from the Journal of Child have knowledge on the subject of the article and whose knowledge is reflected in the number of publications and citations in the international literature are welcomed. Reviews should describe, discuss, and evaluate the current level of knowledge of a topic in clinical practice and should guide future studies. The main text should contain Introduction, Clinical and Research Consequences, and Conclusion sections.

Case Reports: There is limited space for case reports in the journal and reports on rare cases or conditions that constitute challenges in diagnosis and treatment, those offering new therapies or revealing knowledge not included in the literature, and interesting and educative case reports are accepted for publication. The text should include Introduction, Case Presentation, Discussion, and Conclusion subheadings.

Letters to the Editor: This type of manuscript discusses important parts, overlooked aspects, or lacking parts of a previously published article. Articles on subjects within the scope of the journal that might attract the readers' attention, particularly educative cases, may also be submitted in the form of a "Letter to the Editor." Readers can also present their comments on the published manuscripts in the form of a "Letter to the Editor." Abstract, Keywords, and Tables, Figures, Images, and other media should not be included. The text should be unstructured. The manuscript that is being commented on must be properly cited within this manuscript.

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Tables should be included in the main document, presented after the reference list, and they should be numbered consecutively in the order they are referred to within the main text. A descriptive title must be placed above the tables. Abbreviations used in the tables should be defined below the tables by footnotes (even if they are defined within the main text). Tables should be created using the "insert table" command of the word processing software and they should be arranged clearly to provide easy reading. Data presented in the tables should not be a repetition of the data presented within the main text but should be supporting the main text.

Figures and Figure Legends

Figures, graphics, and photographs should be submitted as separate files (in TIFF or JPEG format) through the submission system. The files should not be embedded in a Word document or the main document. When there are figure subunits, the subunits should not be merged to form a single image. Each subunit should be submitted separately through the submission system. Images should not be labeled (a, b, c, etc.) to indicate figure subunits. Thick and thin arrows, arrowheads, stars, asterisks, and similar marks can be used on the images to support figure legends. Like the rest of the submission, the figures too should be blind. Any information within the images that may indicate an individual or institution should be blinded. The minimum resolution of each submitted figure should be 300 DPI. To prevent delays in the evaluation process, all submitted figures should be clear in resolution and large in size (minimum dimensions: 100 × 100 mm). Figure legends should be listed at the end of the main document.

All acronyms and abbreviations used in the manuscript should be defined at first use, both in the abstract and in the main text. The abbreviation should be provided in parentheses following the definition.

When a drug, product, hardware, or software program is mentioned within the main text, product information, including the name of the product, the producer of the product, and city and the country of the company (including the state if in USA), should be provided in parentheses in the following format: "Discovery St PET/CT scanner (General Electric, Milwaukee, WI, USA)"

All references, tables, and figures should be referred to within the main text, and they should be numbered consecutively in the order they are referred to within the main text.

Limitations, drawbacks, and the shortcomings of original articles should be mentioned in the Discussion section before the conclusion paragraph.

Revisions

When submitting a revised version of a paper, the author(s) must submit a detailed "Response to the reviewers" that states point by point how each issue raised by the reviewers has been covered and where it can be found (each reviewer's comment, followed

by the author's reply) as well as an annotated copy of the main document. Revised manuscripts must be submitted within 20 days from the date of the decision letter. If the revised version of the manuscript is not submitted within the allocated time, the revision option may be canceled. If the submitting author(s) believe that additional time is required, they should request this extension before the initial 20-day period is over.

Accepted manuscripts are copy-edited for grammar, punctuation, and format. Once the publication process of a manuscript is completed, it is published online on the journal's webpage as an ahead-of-print publication before it is included in its scheduled issue. A PDF proof of the accepted manuscript is sent to the corresponding author(s) and their publication approval is requested within 2 days of their receipt of the proof.

Reference Style and Examples

While citing publications, preference should be given to the latest, most up-to-date publications. If an ahead-of-print publication is cited, the DOI number should be provided. Authors are responsible for the accuracy of references. Journal titles should be abbreviated in accordance with the journal abbreviations in Index Medicus/ MEDLINE/PubMed. When there are six or fewer authors, all authors should be listed. If there are seven or more authors, the first six authors should be listed followed by "et al." In the main text of the manuscript, references should be cited using Arabic numbers in parentheses. The reference styles for different types of publications are presented in the following examples.

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Book Section: Suh KN, Keystone JS. Malaria and babesiosis. Gorbach SL, Barlett JG, Blacklow NR, editors. Infectious Diseases. Philadelphia: Lippincott Williams; 2004.p.2290-308.

Books with a Single Author: Sweetman SC. Martindale the Complete Drug Reference. 34th ed. London: Pharmaceutical Press; 2005.

Editor(s) as Author: Huizing EH, de Groot JAM, editors. Functional reconstructive nasal surgery. Stuttgart-New York: Thieme; 2003.

Conference Proceedings: Bengisson S. Sothemin BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, editors. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 1992 Sept 6-10; Geneva, Switzerland. Amsterdam: North-Holland; 1992. pp.1561-5.

Scientific or Technical Report: Cusick M, Chew EY, Hoogwerf B, Agrón E, Wu L, Lindley A, et al. Early Treatment Diabetic Retinopathy Study Research Group. Risk factors for renal replacement therapy in the Early Treatment Diabetic Retinopathy Study (ETDRS), Early Treatment Diabetic Retinopathy Study KidneyInt: 2004. Report No: 26.

Thesis: Yılmaz B. Ankara Üniversitesindeki Öğrencilerin Beslenme Durumları, Fiziksel Aktivitelerive Beden Kitle İndeksleri Kan Lipidleri Arasındaki Ilişkiler. H.Ü. SağlıkBilimleriEnstitüsü, DoktoraTezi. 2007.

Manuscripts Published in Electronic Format: Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis (serial online) 1995 Jan-Mar (cited 1996 June 5): 1(1): (24 screens). Available from: URL: http:/ www.cdc.gov/ncidodIElD/cid.htm.

CHECKLIST

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  - The category of the manuscript
  - Confirming that "the paper is not under consideration for publication in another journal".
  - Including disclosure of any commercial or financial involvement.
  - Confirming that the statistical design of the research article is reviewed.
  - Confirming that last control for fluent English was done.
  - Confirming that journal policies detailed in Information for Authors have been reviewed.
  - Confirming that the references cited in the text and listed in the references section are in line with NLM.
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- Statement that informed consent was obtained after the procedure(s) had been fully explained. Indicating whether the institutional and national guide for the care and use of laboratory animals was followed as in "Guide for the Care and Use of Laboratory Animals".

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  - The category of the manuscript
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  - Corresponding author's email address, full postal address, telephone and fax number
  - ORCIDs of all authors.
  - Acknowledgement (if exists)

- **Main Manuscript Document**
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  - Abstracts both in Turkish and in English (250 words)
  - Key words: 3 - 6 words both in Turkish and in English
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  - References
  - All tables, illustrations (figures) (including title, description, footnotes)