

Medicolegal evaluation in terms of physical abuse of children aged 0–3 years presenting at the emergency department with brain hemorrhage

✉ Güven Seçkin Kırıcı, M.D., ✉ Hacı Seyit Bölükbaşı, M.D., ✉ Deniz Utku Öztürk, M.D.,
✉ Hilal Çakır, M.D., ✉ Erdal Özer, M.D.

Department of Forensic Medicine, Blacksea Technical University Faculty of Medicine, Trabzon-Türkiye

ABSTRACT

BACKGROUND: Physical abuse of children covers all types of non-accidental and preventable physical violence and injury perpetrated by the caregiver.

METHODS: The study included children in the 0–3 years age group who presented at the Emergency Department (ED) with the finding of intracranial hemorrhage during the 5-year period of 2017–2021. These children were evaluated retrospectively, and findings that should be considered were revealed.

RESULTS: In the 32 cases included in the study, the most common cranial finding was subdural hematoma, and the most common extracranial finding was ecchymoses. Presentation at the ED was seen to be 2 days after the trauma in 9.37% of the cases.

CONCLUSION: Any physician who encounters findings related to physical abuse of a child must make a forensic and social services report. Physicians who do not make the necessary reports or act to the contrary have both a legal and moral responsibility in the subsequent process.

Keywords: Cerebral hemorrhage; physical abuse; shaken baby syndrome.

INTRODUCTION

Physical abuse of a child includes all kinds of non-accidental and preventable physical violence and injury perpetrated by a caregiver.^[1] A multidisciplinary approach is required in the diagnosis and treatment process of physical abuse, which is a significant public health problem. Findings can be seen in a broad spectrum ranging from simple traumatic lesions such as ecchymosis and grazes to serious medical problems such as intracranial bleeding and internal organ damage.^[2] As these findings are usually not specific to abuse, evaluation in respect of possible abuse is of vital importance for the victim.

The most severe clinical finding of physical abuse is intracranial hemorrhage, which also constitutes the most fatal clinical presentation of physical abuse.^[3]

Physical abuse of children was first defined by Dr Caffey in 1946 in children with suspicious bone fractures and intracranial hemorrhage. These findings observed in radiological studies were later defined as “shaken baby syndrome.”^[4] In shaken baby syndrome, an infant without head control cannot provide head control due to the weight of the head associated with severe shaking. Therefore, subdural cerebral hemorrhage usually occurs with the rupturing of blood vessels associated with the sudden acceleration-deceleration movement. In addition to intracranial findings, long bone and rib fractures are seen in these children, and retinal bleeding in ophthalmic examinations.^[4]

A 2018 study in the USA reported that 1000–3000 children per year are exposed to this syndrome. It was also stated that one in four of these children died, and permanent neurological

Cite this article as: Kırıcı GS, Bölükbaşı HS, Öztürk DU, Çakır H, Özer E. Medicolegal evaluation in terms of physical abuse of children aged 0–3 years presenting at the emergency department with brain hemorrhage. *Ulus Travma Acil Cerrahi Derg* 2023;29:105-108.

Address for correspondence: Güven Seçkin Kırıcı, M.D.

Karadeniz Teknik Üniversitesi Tıp Fakültesi, Adli Tıp Anabilim Dalı, Trabzon, Türkiye

Tel: +90 462 - 377 50 00 E-mail: guvenseco@hotmail.com

Ulus Travma Acil Cerrahi Derg 2023;29(1):105-108 DOI: 10.14744/tjtes.2022.06730 Submitted: 26.07.2022 Revised: 14.10.2022 Accepted: 01.11.2022
OPEN ACCESS This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).



damage developed in 80%.^[5] In a study in Turkey, Oral et al.^[6] evaluated cases of non-accidental head trauma and reported intracranial findings of abuse in 7% of children aged <3 years.

When evaluating the risk factors of physical abuse in children, child-related factors, family-related factors, and society-related factors are accepted as playing a role. Child-related factors can be listed as age <3 years, female gender, being an unwanted child, the presence of mental disease, hyperactivity, and being a step-child. Family-related factors include marriage at a young age, low education level, alcohol-substance use, and a parental history of abuse in childhood, and the society-related factors include cultural norms, gender discrimination, and insufficient legal regulations.^[7]

As there is an extremely broad spectrum of findings and they are non-specific, diagnosis can only be established from a detailed and correct anamnesis taken from the parents. In a study conducted in 2016, it was reported that as the family very often did not provide a correct and sufficiently detailed anamnesis, it is extremely difficult to determine the incidence of abuse.^[8]

The aim of this study was to investigate the findings suggestive of physical abuse in children aged <3 years who presented at the Emergency Department (ED) due to non-accidental intracranial hemorrhage and to evaluate the results in the light of the relevant literature.

MATERIALS AND METHODS

A retrospective evaluation was made of children in the 0–3 years age group who presented at the ED of Karadeniz Tech-

nic University Medical Faculty Hospital with findings of intracranial hemorrhage in the 5-year period of 2017–2021. Age, gender, the person bringing the child to ED, clinical diagnosis, and findings other than hemorrhage were examined. The findings to which attention must be paid in respect of physical abuse of the child were examined in the light of the relevant literature.

The data obtained were analyzed using SPSS statistical software and the results were presented in the form of number and percentages in graphs and tables.

Approval for the study was granted by the Ethics Committee of Karadeniz Technical University Medical Faculty (decision no:24237859-837, dated: November 19, 2021).

RESULTS

Evaluation was made of 32 cases aged <3 years who presented at the ED with brain hemorrhage between 2017 and 2021. The female/male ratio was 1/4. The age groups of the children were determined as 43.75% (n=14) aged 0–12 months, 31.25% (n=10) 12–24 months, and 25% (n=8) 24–36 months (Table 1).

The information in the history of the 32 cases was examined. In 71.8% (n=23) of the cases, there was nothing remarkable in the patient history, convulsions of unknown etiology were determined in 12.5% (n=4), hydrocephaly in 6.25% (n=2), macrocephaly in 6.25% (n=2), and multiple myeloma in 3.1% (n=1) (Table 2).

All the cases in the study had been brought to the ED by the parents. When the time from the onset of symptoms

Table 1. The mechanism of trauma of the cranial findings

Cranial findings	%	n	Mechanism of trauma	%	n
Subdural hemorrhage	56.25	18	Fall from height (within the home)	40.6	13
Intracerebral hemorrhage	25	8	Accident at home (blunt trauma)	40.6	13
Subarachnoid hemorrhage	18.75	6	Spontaneous	12.5	4
			Traffic accident	6.25	2

Table 2. Symptoms and extracranial findings

Symptoms	%	n	Extracranial findings	%	n
Tendency to sleepiness	56.25	18	No findings	68.75	22
Nausea-vomiting	18.75	6	Rib fractures	9.37	3
Changes in consciousness	18.75	6	Ecchymosis in the lower extremity	9.37	3
Impairment in walking	12.5	4	Ecchymosis in the upper extremity	6.25	2
Seizure	9.37	3	Fracture in the upper extremity	6.25	2
Erythema	3.1	1			

to arrival at ED was examined, 68.75% (n=22) of the cases presented at ED within the first 2 h, 21.7% (n=7) at 2–24 h, 6.25% (n=2) at 24–48 h, and 3.12% (n=1) presented later than 1 week.

DISCUSSION

Physical abuse of children, which is seen with very different clinical presentations in ED, is a significant public health problem, which can only be diagnosed by experienced specialists with a detailed anamnesis. Otherwise, diagnosis can be easily overlooked. Each missed diagnosis can be a reason for injury which could have been prevented, disability, and even death of the child.^[8] In this study, a retrospective evaluation was made in respect of the signs and findings of physical abuse of children aged 0–3 years who presented at ED with intracranial bleeding, which is the most fatal form of clinical presentation of physical abuse of a child.^[9]

Of the 32 cases in the present study, the female/male ratio was found to be 1/4. In studies in literature, this rate has been reported as approximately 1/1,^[10] whereas in another study by Zeren et al.,^[11] it was determined as 3/2. Although female gender is known to be a risk factor for physical abuse, it can be seen that many different rates have been reported in the literature. The rate determined in the present study was thought to be due to the low number of cases, and that not all the cases included were diagnosed as physical abuse.

When the types of brain hemorrhage were examined, 56.25% of the cases presented at ED with subdural hemorrhage, which was determined to be chronic in nature in two cases. Brain hemorrhage is known to be the most fatal clinical finding in the physical abuse of children, and within brain hemorrhages, subdural hemorrhage is the most frequently seen.^[12] The study published in 1994 attended that among 369 cases of physical abuse seen over a 4-year period, 41 (11.4%) had intracranial hemorrhage, of whom 37 (90%) were 2 years old or less. Another study published in pediatrics in 2009 shows that from a total of 16,661 autopsies during the study period, 715 (4.3%) involved infants <1 year of age. Fifty (7.0%) of those had SDB. NAHI was identified in 17 patients. The most common cause of SDB was trauma (15 cases [30.0%]), with NAHI accounting for 14 cases.^[13,14] These findings were also evaluated as compatible with our study. In cases of acceleration-deceleration type injuries, such as shaken baby syndrome, the veins in this region are damaged and bleeding occurs as subdural type.^[5]

According to the anamneses obtained in the present study, the event occurred as a fall from height within the home or as another accident in the home in 81.2% of cases. However, there were no details available of the height of the fall or the movement status of the child. When evaluating head trauma in children, it should be known that findings such as brain hemorrhage are not expected with a fall from <150 cm.^[15]

Whenever there is thought to be conflict between the anamnesis provided and the clinical condition, the case must be carefully re-evaluated. In the present study, 4 (12.5%) cases were seen to have presented at ED with spontaneous brain hemorrhage. When investigating the etiology of the clinical condition when there are no traumatic findings in such cases presenting at ED, it must be kept in mind in the differential diagnosis that there could be various forms of physical abuse that are being hidden by the parents in the history. Conflicting responses and explanations in the anamnesis of these cases must be questioned, there should be focus on reported histories not consistent with the development of the child, and attention must be paid to the family showing greater agitation than normal or conversely, a calmer attitude than normal.^[16]

When the extracranial findings were examined in the present study cases, no extracranial findings were determined in 68.75%. Extracranial findings were observed in the form of rib fractures, and ecchymosis and fractures in the upper and lower extremities. The study published in 2018 showed that a total of 318 fractures were detected histologically; of these, 178 (56%) were of the ribs, 119 (37.5%) were of major limb long bones, 10 (3%) were of the skull, and 11 (3.5%) were recorded as “other.”^[17] Old and recent fractures are extremely important in the diagnosis of physical abuse in children.^[9] It is known that fractures are seen in a third of abuse cases aged <3 years. It has also been reported that 30% of the fractures in the 3-year age range, and 75% of fractures in the age range of 0–12 months occur due to physical abuse.^[18] Although the specificity of ecchymosis is lower, it is the most frequently observed finding of physical abuse.^[19] The frequency of ecchymosis has been reported as 1% in infants who cannot walk, 17% in those who are crawling, and 50% in toddlers who are walking.^[20] Therefore, the physical abuse evaluation must be made more carefully especially in children who are not walking and only crawling.

All the cases in the present study had been brought to the ED by the parents. When the time from the onset of symptoms to arrival at ED was examined, 68.75% (n=22) of the cases presented at ED within the first 2 h, 21.7% (n=7) at 2–24 h, 6.25% (n=2) at 24–48 h, and 3.12% (n=1) presented later than 1 week. When evaluating physical abuse of a child, late presentation at a health-care center must be examined carefully in respect of abuse. Several studies have reported that the time of presentation could be delayed in these cases to wait for the regression of the findings of abuse and to prevent the abuse being revealed.^[21]

Conclusion

Physical abuse of a child is a public health problem as the cases which can be determined as wished with explanations and findings are just the tip of the iceberg and there are many more cases which cannot be determined or go unnoticed. These cases can be found in the presentations at centers, where there are many different specialist physicians such

as EDs, pediatric disease clinics, health centers, and family practice units. Therefore, it is necessary for all physicians, especially those working in these units, to be knowledgeable about and aware of child abuse. When physical abuse cannot be identified from the findings of ecchymosis alone on first presentation and the necessary forensic and social examinations are not made, there can be irreversible brain hemorrhage on the second presentation. A physician encountering findings related to child physical abuse must inform the forensic and social authorities when there is evidence of abuse with the data obtained from the physical examination and a detailed anamnesis. Physicians who do not make the necessary reports or act to the contrary have both a legal and moral responsibility in the subsequent process.

Ethics Committee Approval: This study was approved by the Blacksea Technical University Faculty of Medicine Clinical Research Ethics Committee (Date: 15.11.2021, Decision No: 11).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: G.S.K., E.Ö.; Design: G.S.K., E.Ö.; Supervision: G.S.K.; Data: H.S.B., D.U.Ö., H.Z.Ç.; Analysis: H.S.B., D.U.Ö., H.Z.Ç.; Literature search: G.S.K., D.U.Ö.; Writing: G.S.K., H.S.B.; Critical revision: G.S.K., E.Ö., H.Z.Ç.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Beyaztaş FY, Özen B, Bütün C. The evaluation of the physical child abuse. *Med Sci* 2014;3:1315–31. [CrossRef]
2. Turhan E, Sangün Ö, İnandı T. Birinci basamakta çocuk istismarı ve önlenmesi. *Sted* 2006;15:153–7.
3. Christian CW, Block R; Committee on Child Abuse and Neglect, American Academy of Pediatrics. Abusive head trauma in infants and children. *Pediatrics* 2009;123:1409–11. [CrossRef]

4. Blumenthal I. Shaken baby syndrome. *Postgrad Med J* 2002;78:732–5.
5. Deleş B. Shaken baby syndrome. *IDUHES J* 2018;1:1–13. [CrossRef]
6. Oral R, Sahin F, Gazioglu N. Tackling denial of abusive head trauma in Turkey. *International shaken baby syndrome. Abusive Head Trauma* 2010;3:30–4.
7. National Center for Injury Prevention and Control (NCIPC); 2018. Available from: <https://www.cdc.gov/about/organization/cio-orgcharts/ncipc.html>. Accessed Mar 22, 2022.
8. Fujiwara T, Yamaoka Y, Morisaki N. Self-reported prevalence and risk factors for shaking and smothering among mothers of 4-month-old infants in Japan. *J Epidemiol* 2016;26:4–13. [CrossRef]
9. Kara B, Biçer Ü, Gökalp AS. Çocuk istismarı, Çocuk Sağlığı ve Hastalıkları Dergisi 2004;47:140–51.
10. Altıparmak S, Yıldırım G, Yardımcı F, Ergin D. Child abuse and neglect based on the information obtained from mothers, and the factors affecting child abuse. *Anatolian J Psychiatry* 2013;14:354–61. [CrossRef]
11. Zeren C, Yengil E, Çelikel A, Arık A, Arslan M. Frequency of childhood abuse in university students. *Dicle Tıp Dergisi* 2012;39:536–41. [CrossRef]
12. Herman BE, Makoroff KL, Corneli HM. Abusive head trauma. *Pediatr Emer Care* 2011;27:65–9. [CrossRef]
13. Cheah IG, Kasim MS, Shafie HM, Khoo TH. Intracranial haemorrhage and child abuse. *Ann Trop Paediatr* 1994;14:325–8. [CrossRef]
14. Matschke J, Voss J, Obi N, Görndt J, Sperhake JP, Püschel K, et al. Non-accidental head injury is the most common cause of subdural bleeding in infants <1 year of age. *Pediatrics* 2009;124:1587–94. [CrossRef]
15. Williams RA. Injuries in infants and small children resulting from witnessed and corroborated free falls. *J Trauma* 1991;31:1350–2. [CrossRef]
16. Pelendecioglu B, Bulut S. Çocuğa yönelik aile içi fiziksel istismar. *Abant İzzet Baysal Üniv Eğitim Fakül Derg* 2009;9:49–62.
17. Beals RK, Tufts E. Fractured femur in infancy: The role of child abuse. *J Pediatr Orthop* 1983;3:583–6. [CrossRef]
18. Raynor E, Konala P, Freemont A. The detection of significant fractures in suspected infant abuse. *J Forensic Leg Med* 2018;60:9–14. [CrossRef]
19. Worlock P, Stower M, Barbor P. Patterns of fracture in accidental and non-accidental injury in children: A comparative study. *Br Med J* 1986;293:100–2. [CrossRef]
20. Magiure S. Which injuries may indicate child abuse? *Arch Dis Child Educ Pract Ed* 2010;95:170–7. [CrossRef]
21. Sugar NF, Taylor JA, Feldman KW. Bruises in infants and toddlers: Those who don't bruise rarely bruise. *Arch Pediatr Adolesc Med* 1999;153:399–403. [CrossRef]

ORJİNAL ÇALIŞMA - ÖZ

Beyin kanaması ile acil servise başvuran 0–3 yaş çocukların fiziksel istismar açısından medikolegal değerlendirilmesi

Dr. Güven Seçkin Kırcı, Dr. Hacı Seyit Bölükbaşı, Dr. Deniz Utku Öztürk, Dr. Hilal Çakır, Dr. Erdal Özer

Karadeniz Teknik Üniversitesi Tıp Fakültesi, Adli Tıp Anabilim Dalı, Trabzon

AMAÇ: Çocuğun fiziksel istismarı; bakım veren tarafından yapılan, kaza dışı ve önlenilebilir her türlü fiziksel şiddet ve yaralanmayı kapsar.

GEREÇ VE YÖNTEM: Çalışmaya 2017–2021 yılları arasındaki beş yıllık süreçte, 0–3 yaş grubu kafa içi kanama bulgusu ile acil servisine başvuran çocukların, yaş, cinsiyet, başvuru yapan kişi, klinik tanı, kanama dışı bulguları yönleriyle geriye dönük değerlendirilerek, başvuruların çocuğun fiziksel istismarı açısından dikkat edilmesi gereken bulguları literatür eşliğinde ortaya konulmuştur.

BULGULAR: Çalışmaya dahi edilen 32 olguda en sık rastlanan kraniyal bulgu subdural hematom iken, en sık gözlenen ekstrakraniyal bulgu ekimozlar olarak tespit edilmiştir. Olguların yüzde 9.37'sinin ise acil servise başvurusun iki gün daha geç sürede yapıldığı görülmüştür.

TARTIŞMA: Çocuğun fiziksel istismarına ilişkin bulgular ile karşılaşan hekim, ayrıntılı bir anamnez ve muayene sonucu elde ettiği veriler ile istismar lehinde kanaat oluşturduğunda mutlaka adli ve sosyal bildirim yapılmalıdır. Aksi halde davranan ya da bildirimden kaçınan hekim, ilerleyen süreçte hem hukuki hem de vicdani sorumluluk içinde kalacaktır.

Anahtar sözcükler: Beyin kanaması; fiziksel istismar; sarsılmış bebek sendromu.

Ulus Travma Acil Cerrahi Derg 2023;29(1):105-108 doi: 10.14744/tjtes.2022.06730