



Original Article

Evaluation of suspected physical abuse in children: a 500-case study[☆]



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ABSTRACT

Objective: This study evaluated the epidemiological profile of patients with suspected physical abuse, especially regarding the occurrence of fractures, treated in a referral hospital.

Methods: The authors reviewed all reports of suspected abuse against children and adolescents (AACA) in this hospital from January 2005 to December 2015. They were assessed and separated by month and year. The characteristics of the victims of physical abuse with occurrence of fractures were studied. The features of the fractures were evaluated in those patients with available radiographs.

Results: Of the 3125 notifications, 500 were classified as physical injuries; of these, 63 had fractures. An annual progressive increase in notifications was observed. As for age group, 50 patients (80.6%) were up to three years old and 36 (58%) up to one year. Most were male (60%) and the likely aggressors were mother alone and both parents (27.5% each). In 30 patients with available images, fractures of long bones (femur, tibia, and humerus) predominated (71%), as well as a single fracture line (74%), diaphyseal location (73%), and a transverse line (57%). There were two deaths in fracture cases (3%).

Conclusion: All orthopedists should be alert to suspected AACA in children with trauma below the age of three, even without classic signs of abuse.

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Avaliação de crianças com suspeita de maus-tratos físicos: um estudo de 500 casos

RESUMO

Objetivo: Este estudo tem objetivo de avaliar o perfil epidemiológico de pacientes atendidos em hospital de referência com suspeita de maus-tratos físicos, em especial quanto à ocorrência de fraturas.

Métodos: Todas as notificações de suspeita de maus-tratos contra crianças e adolescentes (MTCAA) feitas entre janeiro de 2005 e dezembro de 2015 foram avaliadas e separadas por

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mês e ano. Dentre as vítimas de maus-tratos físicos, várias características dos pacientes que apresentavam fraturas foram avaliadas. Quando as radiografias estavam disponíveis, analisaram-se as características das fraturas.

Resultados: De 3.125 notificações, 500 foram classificadas como lesões físicas e dentre essas 63 apresentavam fraturas. Observou-se um aumento progressivo anual das notificações. Quanto à idade, 50 pacientes (80,6%) tinham até 3 anos e 36 (58%) até 1 ano. A maioria era do gênero masculino (60%) e o provável agressor era a mãe isoladamente e ambos os pais (27,5% cada). Em 30 pacientes com imagens disponíveis, predominaram as fraturas de ossos longos (fêmur, tibia e úmero, 71%), únicas (74%), diafisárias (73%) e transversas (57%). Ocorreram dois de óbitos nos casos de fraturas (3%).

Conclusão: Todos os ortopedistas devem estar alertas para suspeita de MTCAA em crianças com traumas abaixo de 3 anos, mesmo sem sinais clássicos de maus-tratos.

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Introduction

Despite Tardieu's pioneering study in 1860, it was only in the second half of the last century that violence against children and adolescents began to be studied more consistently.¹⁻³ Nowadays, abuse against children and adolescents (AACA) is recognized as a complex public health problem, with high financial, social, and emotional costs to society.⁴ In Brazil, although covered in previous legislation, notification by the healthcare professional of suspected or confirmed cases of AACA only became compulsory in 1990, with the implementation of the Statute of the Child and Adolescent (Estatuto da Criança e do Adolescente [ECA]), through the Federal Law No. 8069.³ Even with the obligation to notify, the increased interest in the subject, and the data showing that Brazil has high levels of violence, there are few concrete statistics of the incidence of AACA in Brazil. This is due to the difficulties in definition, recognition, and reporting by healthcare professionals.⁵

Because fractures are one of the most common forms of abuse presentation, the orthopedist is often the first physician to evaluate these children.⁴ Nevertheless, few studies on these fractures and on the role of the orthopedic surgeon have been published in the national orthopedic literature; they consist of case reports^{5,6} or trauma series in which suspected cases of AACA were identified.^{7,8} Only one publication that specifically addressed the occurrence of fractures in patients victims of abuse was retrieved, in a non-indexed journal.⁹

This study aimed to evaluate the epidemiological profile of children who were suspected victims of AACA, specifically physical abuse with occurrence of fractures, attended to at a pioneering referral service in the Metropolitan Region of Paraná, Brazil.

Material and methods

All reports of suspected AACA were assessed between January 2005 and December 2015, subdivided into physical, psychological, and sexual abuse, as well as neglect. Of the cases of physical abuse, all those with a record of fractures were

separated for evaluation. Exclusion criteria were incorrectly completed notification, illegibility, or loss of medical chart.

The monthly and annual distribution of notifications were assessed, as well as the proportion between total number of victims of physical abuse and occurrence of fractures. The following data were collected from patients victims of physical abuse and with fractures: age, gender, probable aggressor, topography, number of fractures per patient, and occurrence of death.

For patients whose radiographs were available for evaluation in the electronic or medical record system, fracture characteristics were collected, including location, and classified using the Müller AO classification as simple (A), wedge (B), and complex (C) diaphyseal fractures.

The study was approved by the Institution Review Board; under No. 47209215.0.0000.0097.

Results

A total of 3125 reports of abuse between January 2005 and December 2015 were retrieved. Among the forms, the vast majority was related to sexual aggression, 2144 cases (68.6%). Physical violence was identified in 500 patients (16%), mostly minor musculoskeletal injuries (bruises, contusions, abrasions); of these, 12.4% ($n=62$) presented fractures (Table 1).

There has been a steady increase in notifications over the years, as shown in Fig. 1. An increase in physical aggression was observed, from 11% in 2005 to 23% in 2015, as well as in the number of fractures, from 4% to 10%. Some fluctuations in relationship to the number of cases were observed, with peaks in some years, such as 2008, but the main increase was from 2011 onwards.

As shown in Fig. 2, young children comprised most of the victims of abuse. A total of 50 cases (80.6%) were observed in the age range of up to 3 years, and 36 cases (58%) in the age range of up to 1 year. As age increases, these fractures become less prevalent, with a new peak in adolescence.

Among children who were victims of abuse, a male predominance was observed, corresponding to 38 boys (60%). Both parents and the mother alone were suspected to be the aggressor, corresponding to 17 cases each (27.5%). The father

Table 1 – Form of violence and its monthly distribution, from 2005 to 2015.

Form of violence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Physical	34	53	58	31	42	33	34	48	39	45	39	44	500
Psychological/Moral	5	4	2	6	5	3	2	7	5	5	5	7	56
Sexual	188	168	177	178	155	188	163	173	201	186	170	197	2144
Neglect/Abandonment	28	49	37	29	34	35	25	32	43	39	25	45	421
Total per month	255	274	274	244	236	259	224	260	288	275	239	293	3121
Fractures	Number	62											

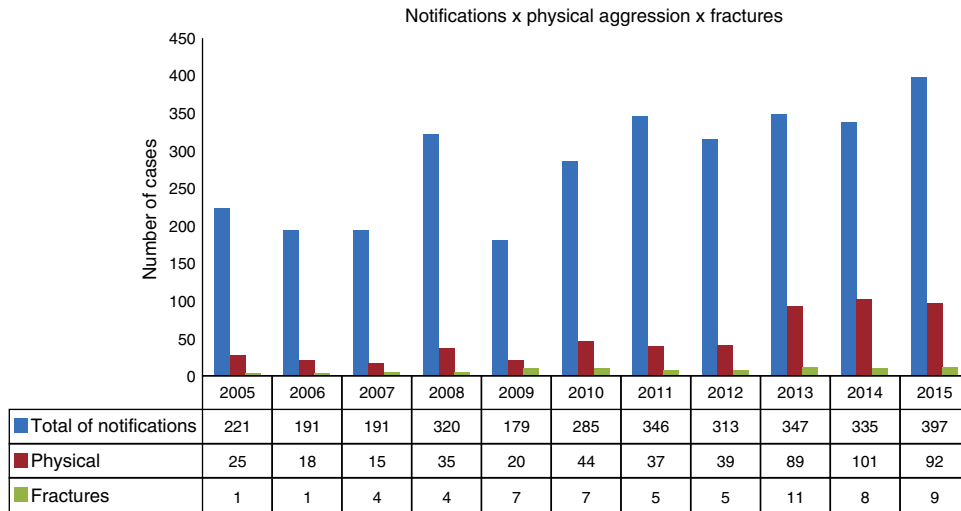


Fig. 1 – Annual distribution of notifications.

alone was indicated in eight episodes (13%), and others (relative, neighbor, caregiver, colleague and, non-informed), in ten cases (15.8%). Data were not entered in ten notifications (15.8%).

Forty-four patients (71%) had fractures of the long bones, with 19 in the femur (30%), followed by humerus and tibia, with ten patients each (16%). Fractures of the ribs and skull were observed in 14 patients (22%; Fig. 3).

As to the number of fractures per patient, 46 (74%) presented a single fractured bone. Only 16 patients had multiple

fractures, nine (15%) in two bones, and seven (11%) in three or more. Two patients with fractures died (3.2%). Both had multiple fractures, including severe traumatic brain injury (TBI), which was the cause of death.

Radiographs were available for 30 patients; 26 cases (87%) consisted of simple fractures. Two (6%) had complex fractures and two (6%) had incomplete fracture lines, with absence of wedge. As to the direction of the simple fractures, 17 cases (57%) had transverse fractures, five (17%), oblique, and four (13%), spiral. Regarding the location in the bone, 26 (87%) were

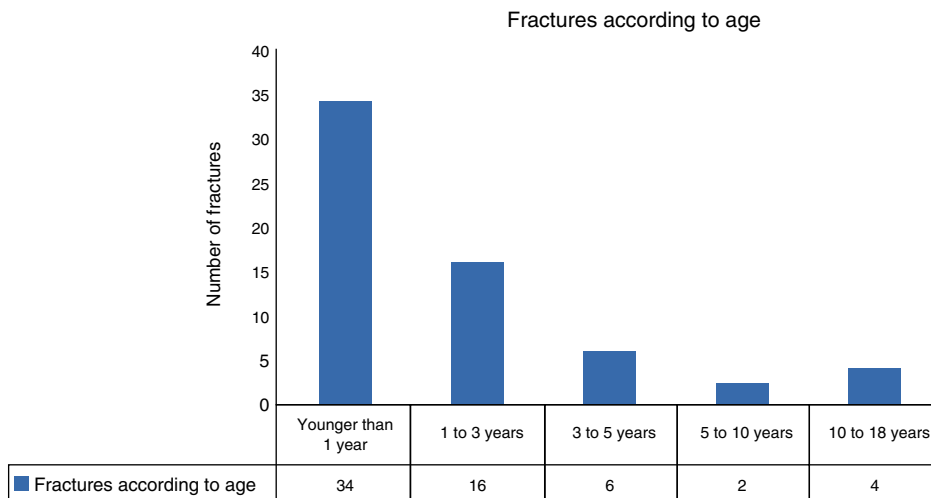


Fig. 2 – Distribution of fractures according to age, from 2005 to 2015.

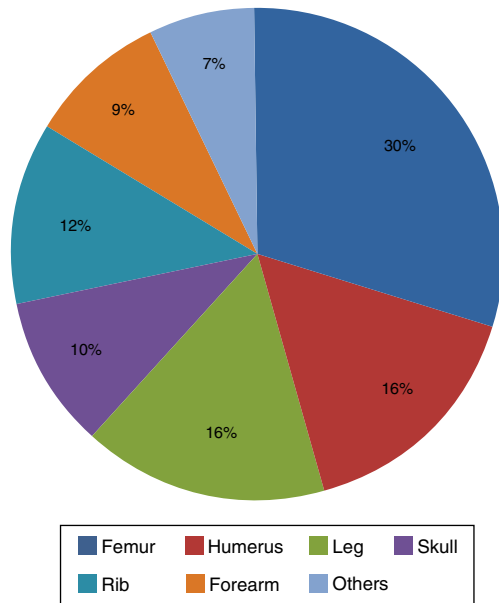


Fig. 3 – Topography of fractures, from 2005 to 2015.

diaphyseal and four metaphyseal–epiphyseal (13%), including a case of transepiphyseal detachment.

Discussion

Tardieu was one of the first to address the issue in a study in 1860, describing 18 deaths of children under 5 years whose injuries were not satisfactorily explained by their parents/guardians. Despite this study, only in the second half of the last century did the theme gain importance. The term battered-child syndrome, coined by Kempe in 1961, and the publication of other major studies drew attention to the problem.¹⁻⁴

AACA has gained greater interest in Brazil only in the last 20 years. This is especially surprising, as the country has some of the highest rates of violence worldwide.⁴ Despite being addressed in previous legislation, it was only with the implementation of the ECA that there was a change in the understanding of society's responsibility to minors,¹⁻⁴

especially in Article 13, which establishes mandatory report, by physicians, of cases of suspected child abuse. For cases of non-compliance, a fine of three to 20 Brazilian minimum wages is established, which is doubled in the event of a repeat offense.³ Nonetheless, there is widespread difficulty both in identifying and managing suspected cases. Reasons may be the lack of knowledge about the characteristics of the clinical picture or about the necessary measures, as well as a fear of involvement of professionals in this situation.^{6,10}

In order to adequately address the problem, in some cities, protection networks have been created to address situations of violence; these networks train healthcare and education professionals and create care and referrals systems. Curitiba was one of the first cities to establish this network, in 2003; in its early stages, over 10,000 people were trained to identify and manage cases of suspected AACA.¹¹ Therefore, the number of suspected cases has increased dramatically, and a more realistic picture of the situation could be identified. But even in centers where there is a better identification and management, underreporting is thought to be high.^{11,12} According to Rolim et al.,¹³ the main factors for underreporting are the inexperience of the healthcare professional, with less than five years of work, and unfamiliarity with the notification form. Pascolat et al.¹⁴ estimated that, in Brazil, for each case of physical abuse, 10–20 cases go unreported. Herman and McCarthy¹⁵ indicated that in the United States, less than 8% of cases of abuse are reported by healthcare professionals.

Due to the frequency of physical abuse and fractures, the orthopedist is the professional who first cares for these patients (in 30%–50% of the cases).^{6,16} Although this implies that orthopedists should be prepared to diagnose and manage these cases, these professionals hardly ever report the cases. One of the aspects that demonstrate this fact is the small number of studies published in Brazilian orthopedic journals. Only two studies^{5,6} that directly address AACA were retrieved; both consist of case reports and literature review. Another study by Bergamaschi et al.⁷ assessed the cause of femoral fracture in children under 3 years; of the 18 cases evaluated, six were considered to be physical abuse and three, neglect. Franciozi et al.⁸ assessed 182 pediatric patients treated for trauma at a public hospital and observed two deaths (1%) by AACA. The only study that included a series of cases of fractures was that by Dirani et al.,⁹ published in a non-indexed journal, which eval-



Fig. 4 – Transepiphyseal detachment in a child younger than 1 year.

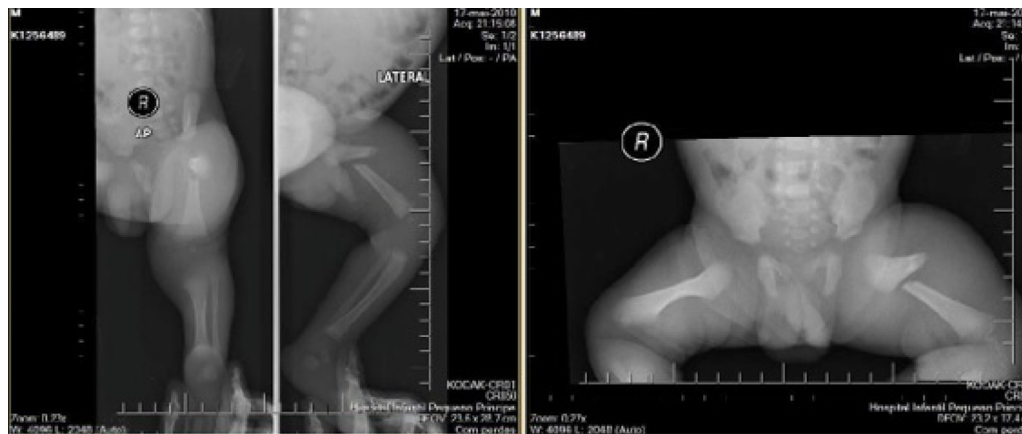


Fig. 5 – Femur fractures in a child aged 1 month.

uated 122 cases of suspected physical abuse, among whom 25 patients presented fractures.

Therefore, this is the first Brazilian study in the field of orthopedics that addresses a large number of suspected cases of abuse. In the literature, the frequency of physical abuse ranges from 20% to 30%.^{6,7,11} The lower rate observed in the present study (16%) can be explained by the fact that this hospital is the reference in the city for cases of sexual abuse, which explains the large number of cases of this type of abuse. Regarding trauma, patients can be attended to in other emergency tertiary centers. Therefore, the authors believe that the number of cases of abuse may be much greater than that found. This reinforces the need for the orthopedist to be prepared to appropriately identify and refer these cases. It was observed that most of the victims of physical abuse were boys (60%). In the literature, the prevalence between genders differ between studies, which suggest both a higher prevalence of males¹⁴ and of females.^{9,17} According to the AACA definition, the aggressors are individuals who are close and known to the victims. In the present study, as well as in that by Dirani et al.,⁹ it was observed that the mother alone, then both parents, were the most frequent suspects. In turn, Pascolat et al.¹⁴ indicated the mother as the main suspect, and Menezes et al.,¹⁷ both parents.

International studies show that up to 36% of patients suffering from physical abuse have fractures.^{4,18} In the study by Dirani et al.,⁹ the only Brazilian case series retrieved, this rate was 21%. In the present study, this rate was lower (12%); once again, this may be justified by the fact that, although this hospital has pediatric emergency services, the city also has at least four hospitals with high-volume trauma emergency rooms that can treat patients with fractures.

Regarding fracture pattern, although many expect AACA fractures to have typical features, such as transepiphyseal detachment in young children (Fig. 4), the present study, in line with several others, has shown that the most common pattern (observed in at least 50% of cases) is isolated diaphyseal and transverse fracture of long bones (Fig. 5).^{6,19-21} In the present series, 71% of the cases presented an isolated fracture; the most commonly fractured bone was the femur, followed by the humerus, and bones of the leg and forearm. Canale

and Beaty¹⁹ observed figures similar to those of the present study. In turn, Schwend et al.¹⁶ and King et al.²⁰ observed no prevalence differences regarding femur, tibia, and humerus. However, it is important to note that, in the vast majority of cases, a typical AACA fracture characteristic cannot be observed. As for the fracture line, we observed that the great majority (87%) presented a single line, mainly in the transverse plane (57%). These data corroborate the studies by King et al.,²⁰ Loder and Bookout,²¹ and especially that by Murphy et al.,²² in which a strong correlation between simple transverse fractures and suspected AACA was established. In the present study, the percentage of fractures located in the diaphysis (73%) was higher than that found in other series.^{18,19}

There was a low prevalence of fractures with special characteristics, which are classically associated with AACA, such as sternum and scapula fractures and presence of fractures in multiple sites.⁴ Only 11% of the present patients had multiple fractures (Fig. 6), which corroborates other studies.⁹ For these reasons, the authors believe that the present data support the recommendation that suspicion of AACA should not be based on specific characteristics of fractures. None of the present patients had a history of violence, and it was not possible to establish the time of evolution. Therefore, two factors considered as fundamental, which are the incompatibility between history and injury and the delay in seeking treatment, were not evaluated. Another important aspect not addressed in this study is the risk of recurrence of the aggression; this is another factor that alerts to the need for proper identification and management of cases of abuse to trigger measures to protect the patient.

In attending to these patients, it is essential to evaluate possible associated lesions, especially TBI, due the high risk of serious sequelae and even death.^{8,23} Studies have shown that AACA patients with skull fracture have a higher incidence of intracranial hematomas than those in whom the fracture had an accidental cause.^{4,23} Among the present patients, two of those who had these fractures died. Because of its extreme severity, the authors consider this index to be very high, which once again emphasizes the importance of the suspicion and the proper management of these patients. Therefore, the role of the orthopedist can be crucial not only in treating but also



Fig. 6 – Classic AACA signs, fractures at different stages of consolidation in a child aged 15 months.

in the protection and survival of children and adolescents who are victims of abuse.

Conclusion

This study reinforces the theory that cases of abuse usually present single, diaphyseal and transverse fractures of long bones in young children, predominantly male, and the aggressor is close to the victim. Patients who are victims of abuse are at risk of TBI-associated deaths.

The orthopedist, who is often the first to evaluate such patients, should be prepared to identify and appropriately manage child and adolescent victims of AACA.

Conflicts of interest

The authors declare no conflicts of interest.

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