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A multicentre and prospective study of suspected cases of child physical abuse

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Abstract In this multicentre prospective study, the authors aim to describe the social and clinical characteristics of a population of children who arrived with a suspicion of physical abuse at five Emergency Services across France and who underwent clinical and thorough radiological screening according to a common predetermined protocol. A total of 185 cases of children seen at the Emergency units of five French hospitals over a 4-year period was assessed via a specific protocol and included in this study. The results of this study show socio-cultural factors consistent with previous reports on abused populations, and in particular give interesting data concerning the type and severity of lesions present, on the whole, in 80% of the population studied. In particular this study revealed a high prevalence (30%) of bone fractures. Apart from giving a perspective on the French population, this study adds some information to the too few preexisting studies of its kind—and stresses the importance of effective identification of possible cases of child abuse and of a thorough and sensitive screening protocol.

Keywords Child physical abuse · Emergency departments · Lesions · Fractures

Introduction

Physical child abuse is a frequent event and certainly greatly underestimated across Europe. The medico-legal

community is more and more frequently presented with cases in which a differential diagnosis between accidental and deliberately inflicted trauma is crucial. Apart from the technical and methodological difficulties inherent to this kind of diagnosis, an additional problem which Europe (especially continental Europe) has to deal with, far more than the United States, Canada and the UK, is the lack of population studies, particularly from a clinical perspective: some forensic literature does exist on child abuse; however, it mainly focuses on case reports or autopsy findings [2, 9, 12, 14, 18, 26].

Even among North American and English literature, details are lacking as regards the type of children presenting to hospitals, the nature of lesions, and the sensitivity of different screening procedures. Some reports are evaluations of children which presented at clinical centres and hospitals [10, 24], others show data from child protection agencies or other sources with substantiated cases (i.e. cases in which there is confirmed evidence of child abuse) [4, 20, 25]; finally, there are national social incidence reports based, in most countries, on social studies (<http://www.audipog.inserm.fr>, 20.12.2004).

For example, in France, according to recent epidemiological data and information from the Observatoire de l'Action Sociale Décentralisée (ODAS 2004) (a non-judicial agency) (<http://www.odas.fr>, 20.12.2002), in 2003 there was a total of 18,000 substantiated (confirmed) cases of child maltreatment: 31% were victims of physical violence, 28.9% victims of sexual abuse, 40% of psychological violence and of severe neglect. These numbers probably underestimate the true situation [3], and very little is known on the type of trauma sustained by the children, particularly those who required medical attention. Similar data for the United States [22] show slightly lower general percentages: 18.6% of physical abuse; 9.9% of sexual abuse and 65% of neglect or psychological/emotional maltreatment.

Regardless of the source, many of these studies do not have common denominators; in other words, they study different populations (substantiated vs non-substantiated), observe different groups of children, and classify the nature and severity of lesions through different methods.

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Even less data exist for children seen for suspected physical abuse at emergency units. Studies such as the present one, even if not performed on substantiated cases, are of the utmost importance because they often present the possibility of verifying how the children present and how efficient clinical protocols are for detecting trauma. For all types of child abuse, it is crucial to be able to establish common parameters based on epidemiological information and scientific data in order to create guidelines which may help experts form an opinion on the actual possibility of a child having been abused.

In this multicentre prospective study, the authors aim to describe the social and clinical characteristics of a population of children who arrived with a suspicion of physical abuse at five Emergency Services across France and who underwent clinical and thorough radiological screening according to a common predetermined protocol.

Materials and methods

Data collected in this study come from a multicentre research project organised by forensic pathologists in Montpellier in collaboration with pediatric departments of five main French hospitals over a period of 4 years (2000–2003). A total of 185 cases of children seen mainly at the emergency units of these hospitals was assessed via a specific protocol: 53 from Montpellier Centre Hospitalier Universitaire (CHU), 43 from Rennes CHU, 28 from Nimes CHU, 57 from Rouen CHU and CRLC, four from Caen CHU. These hospitals have, on average, 10,000–14,000 cases of pediatric emergencies every year.

All physicians taking part in the project had a superimposable educational level on child abuse: this involved a university course on child abuse during specialisation in Pediatrics, and a short review course on this topic given to all Units before the beginning of the study, when the protocol was also explained. These were the measures taken to minimise any error due to difference in training and awareness in such a large-scale study.

The protocol included recruitment of all children between 0 and 8 years of age with suspicion of physical abuse determined by the physician according to the following criteria: (1) on collecting information on the background (e.g. how the accident happened), there was disagreement between the physical lesions and explanations given by parents or relatives or maltreatment was admitted or reported by parents or relatives; (2) during clinical examination, signs typical, even if not pathognomonic, of maltreatment were found such as lesions of different ages, burns, etc.; (3) social services or other authorities signalled the case as being highly suspect. Uniformity in recruitment (as well as in clinical evaluation) among physicians could only be guaranteed by the similar training of all personnel involved. However, as in all clinical studies in which anamnestic data are evaluated, the influence of personal judgment is inevitable.

Children with suspicion of sexual abuse but with signs of physical or psychological maltreatment and children with

disorders which could mimic child abuse (bleeding disorders, dermatological pathologies, osteogenesis imperfecta, etc.) were not included in this study.

For every case, the same form was completed. Apart from the subject's background and history, which were also manually written by each physician, all questions were in a "yes/no" or "fill in the blank" mode and included: age, sex, clinical history (if the child was premature, handicapped,¹ had already been admitted to hospital for similar reasons), history of the family (if parents were separated, if they were abusers of alcohol or drugs, if they were already known to social services or legal authorities, and if conditions of precariousness² existed). The reasons why the child was taken to hospital (named "Symptoms") was classified into the following categories: (1) signs of trauma clearly present, (2) symptoms of ill health; (3) other reasons were given; (4) the reason was unknown. History (why the child was brought to hospital) was further classified in the following categories: (1) an accident was witnessed, (2) actual physical abuse was witnessed, (3) abuse was not directly witnessed but strongly suspected by the accompanying adult, (4) other motivations were given, (5) reasons were unknown. Finally, the suspected perpetrator was classed as (1) both parents, (2) mother, (3) father, (4) mother's boyfriend, (5) a juvenile member of the family, (6) another adult member of the family; (7) a stranger, (8) a child minder, (9) others or (10) unknown (i.e. no suspected perpetrator was revealed).

In a similar fashion, for every region of the body, the presence, number, type of skin lesions (bruising, abrasions, lacerations), burns, bite marks, and age of lesion (recent, relatively recent or old) was recorded. A legenda instructed the physician to evaluate bruises as recent when red or purplish, and as semirecent or old when greenish, brownish or yellow. This was done in order to guarantee a certain degree of uniformity among physicians, although it is only too well known how subjective both colour and age evaluation may be [15]. Presence of retinal haemorrhaging, neurological symptoms or other signs of cerebral damage was then entered. A thorough radiological examination was carried out including traditional X-rays of the cranium (antero-posterior and profile), thorax (antero-posterior), limbs (antero-posterior and profile), antero-posterior of hip region, and vertebral column. Bone scintigraphy was then performed, when possible, within the first 48 h after trauma. The presence of, number, site, and age (recent or old) of bone fractures was then included in the form. Finally, the physician was instructed to add any other clinical data at the end of the form. Data was then pooled in the following manner into two major databases, one with information on the family environment and history of the child, the other on the lesions encountered.

¹This means that the child presented in his or her medical history a diagnosed handicap, either physical or mental.

²This is a translation of the term "precarité", which has a specific social significance. It refers to situations where there are difficulties in employment, in social and cultural integration, in lodging and access to appropriate health services.

Table 1 Familial situation

Situation	Presence	Total (N=185)	
		Number	Percent
Precariousness	Y	65	35.1
	N	42	22.7
	U	78	42.2
Parents drug or alcohol abusers	Y	31	16.7
	N	75	40.5
	U	79	42.7
Parents separated	Y	67	36.2
	N	57	30.8
	U	61	33.0
Parents known to authorities	Y	57	30.8
	N	78	42.2
	U	50	27.0

Y yes, N no, U unknown

Results and discussion

Familial situation

As can be seen in Table 1, although some data inevitably remained unknown, because at times within the emergency unit it was impossible to collect background information thoroughly, at least one third of these cases of suspected child maltreatment comes from families in which there are substantial problems concerning social and/or economical inadequacy, all factors (economic distress, drug abuse and parental conflict) which have been signalled as being associated with child abuse, as has been reported by numerous authors and child abuse agencies [4, 10, 22, 25].

Data on children

Although 66% of the population is male (Table 2), data on the sex distribution is in accord with most literature—which roughly shows an equal repartition in the sex of the children abused, some with slightly more males [10, 21], others with a slight prevalence of females [8, 20].

From a demographic point of view, the most represented age group is always that of young infants, less than 1 year of age; followed by the 1- to 3-year age group, and finally by the 4- to 7-year age group (Table 3). In this population, the older age groups are less represented. It is difficult to compare this data with previously published data because age groups and statistics vary greatly within the literature. Several authors have already reported a larger prevalence of physical abuse among younger children [11, 19] and

Table 2 Sex of the children

Sex	Total (N=185)	
	Number	Percent
Male	122	65.9
Female	63	34.1

Table 3 Age of the children

Age (years)	Total (N=185)	
	Number	Percent
<1	101	54.6
1–3	57	30.8
4–7	27	14.6

infants [21], although in their work on the nature and severity of physical harm and abuse Trocmé et al. [25] showed an inverse trend: i.e. the number of children with physical signs increased with age. However, this must not be seen as a difference among cultures, but rather as a difference in the populations studied since the present study was performed on a hospital population whereas Trocmé's study concerned a general population substantiated for physical abuse.

At least 13% of the children were premature at birth (Table 4)—this is a higher prevalence than that found among the normal French population (7.1% in 2003) (<http://www.odas.fr>, 20.12.2004), and at least 5.4% were handicapped, compared to the 2% prevalence among the general child population (<http://www.sante-gouv.fr/drees/handicap/handicap.pdf>, 18.12.2004). Thus violence may be a result of difficult children and/or of a family in difficulty. This may indicate that premature and handicapped children are more at risk than normal children. In fact, the above-mentioned literature does stress the fact that socio-cultural factors associated with special conditions of the child, such as a handicap or prematurity, make these children more “difficult”, and possibly more prone to triggering abusive events. The complexity of correlations between prematurity, handicap and physical abuse, however, deserves further research and more elaborate statistical evaluation.

About 10% of cases had had previous hospital admissions. This may represent a lack of proper prevention within the system, if it were ascertainable that the previous admissions were for suspected child abuse. Unfortunately, across France and Europe, the means of automatic detection of previously admitted children is not currently feasible; nevertheless, this possibility should be investigated.

Table 4 Clinical background data on children

Clinical situation	Presence	Total (N=185)	
		Number	Percent
Premature	Y	25	13.5
	N	107	57.8
	U	53	28.6
Handicapped	Y	10	5.4
	N	144	77.8
	U	31	16.7
Known to hospital	Y	16	8.6
	N	104	56.2
	U	65	35.1

Y yes, N no, U unknown

Table 5 Symptoms: main reasons why the child reaches the hospital

Symptom class	Total (N=185)	
	Number	Percent
Signs of trauma	111	60.0
Malaise, illness	50	27.0
Other	7	3.8
Unknown	17	9.2

Background information (symptoms and history)

If we consider the story behind the “accident” or illness reported (Tables 5, 6), we can see that the majority of children were brought to a hospital because of evident signs of trauma (60%), whereas another 27% was brought because of episodes of general ill health (seizures, vomiting, loss of consciousness, etc.). This is interesting given that, after having followed the predetermined clinical and radiological protocol, the number of children actually showing traumatic lesions increased to 80% (Table 8), indicating the high sensitivity of the protocol. In some cases, it was impossible to pin down the actual reason for admission (e.g. the parent or relative did not want to disclose any information), and in other cases more general reasons were presented, such as the fact that the child had disclosed the abuse. In 15% of cases, the story told directly by the accompanying adult was that of an accidental event (e.g. fall down stairs, etc.). In 20% of cases physical abuse had been witnessed, and in 28% of cases it was strongly suspected by the accompanying adult mainly because of signs of trauma with no explanation or because the child had made a disclosure. In the remaining 38% of cases no history was told, “unreasonable” accounts were made, or the reason given for bringing the child was that symptoms of ill health were presented.

Suspected perpetrator

With regard to the possible perpetrator, the main suspects, in decreasing order, were both parents, followed by the father, the mother, the babysitter, and finally other members of the family (Table 7). In about half of the cases (50.7%), the perpetrator was someone from the family. In

Table 6 History: the background history of events, i.e. what happened to the child according to the accompanying adult or child him or herself

Background	Total (N=185)	
	Number	Percent
Accident witnessed	27	14.6
Physical abuse witnessed	36	19.4
Physical abuse strongly suspected	52	28.1
Other	20	10.8
Unknown	50	27.0

Table 7 Classification of suspected perpetrators

Suspected perpetrator	Total (N=185)	
	Number	Percent
Mother and father	27	14.6
Mother	25	13.5
Father	28	15.1
Mother’s boyfriend	5	2.7
Juvenile member of family	6	3.2
Other adult member of the family	3	1.6
Stranger	0	0.0
Babysitter/educational	12	6.5
Other	4	2.2
Unknown	75	40.5

no case was the perpetrator a stranger. The suspected perpetrator was labelled unknown (because the child or accompanying person did not reveal the possible identity of the perpetrator).

Thus, from what is known, from a more social perspective, for the United States and the UK and from the scanty data from other continents, socio-cultural trends are similar to the ones observed in this study as regards the types of abuse, perpetrators and possible “at-risk” groups. General studies from South America [17], Portugal [1, 6], Africa [5] and China [8] confirm similar trends.

General overview of lesions

Data obtained from physical examination and radiological assessment showed that 80% of children presented some form of a lesion (Table 8): only 20% of all children presented no signs of trauma. This is very similar to the data presented by Keshavarz et al. [10], who found, on a similar population group, that only 17% of children presented no lesions.

However, it should not be surprising that among the “general” population of physically abused children (i.e. which may not have required medical attention), the number of children presenting some physical lesion is much lower, as shown by Trocmé et al. [25], who presented precisely inverse trends. In their Canadian incidence study, only in 20% of the physically maltreated population was

Table 8 General overview of types of lesions

Type of lesion	Total (N=185)	
	Number	Percent
No lesions	37	20.0
Bruises, abrasions, lacerations	94	50.8
Bone fractures	52	28.1
Bites	3	1.6
Burns	8	4.3
Cerebral damage	25	13.5
Retinal haemorrhaging	15	8.1
Other	0	0.0

Table 9 General overview of types of lesions in individuals less than 1 year of age

Type of lesion	Total (N=152)	
	Number	Percent
No lesions	21	20.8
Bruises, abrasions, lacerations	34	33.7
Bone fractures	33	32.7
Bruises and fractures	11	10.9
Bites	2	1.9
Burns	2	1.9
Cerebral damage	21	20.8
Retinal haemorrhaging	13	12.9
No external signs but cerebral damage	15	14.9
Other	0	0.0

there any physical harm. This does not represent a difference in the prevalence of trauma, but simply the fact that Trocmé et al.'s population group is different, and comes from a dataset of child welfare investigators. On the other hand, the present study focuses on a hospital and/or emergency unit population.

In our study, half of the children presented soft tissue blunt injury lesions such as bruises, abrasions and lacerations—these lesions represent the type of harm with the highest incidence seen in the few studies performed in this sense [10, 25]. However, although even the prevalence of other types of injury (burns, head trauma) is similar, a great divergence can be noticed for bone fractures. In this study, almost 30% of children presented with bone fractures, three times higher than that reported in a New York study [10] which observed a similar population. It is interesting to note that this may be due to the fact that performing both traditional radiology and scintigraphy on all suspected cases may provide a more sensitive tool for detecting fractures.

Data concerning lesions on the most represented age group, i.e. below 1 year, show similar tendencies (Table 9). Such a high incidence of severe trauma in children below 1 year has already been described [7, 21] in cases of child abuse. Furthermore, the presence of bruises and fractures in non-mobile infants should be considered suspicious [16].

Table 10 Single vs multiple lesions and fractures of same and different ages

Class	Total (N=185)	
	Number	Percent
Single lesion	22	11.9
Multiple lesions of same age (at same or different sites)	46	24.9
Multiple lesions of different ages (at same or different sites)	26	14.0
Single fracture	32	17.3
Multiple fractures of same age	13	7.0
Multiple fractures of different ages	7	3.8

Table 11 Distribution of blunt force injury soft tissue lesions and fractures of the head, trunk and limbs

	Total (N=185)		Percent
	Number	Percent	
Site of lesion			(N=94)
Head	74	40.0	46.5
Limb	38	20.5	23.9
Trunk	47	25.4	29.5
Site of fracture			(N=52)
Head	15	8.1	27.2
Limb	28	15.1	50.9
Trunk	12	6.5	11.8

The last column shows the relative percentage of lesions on children presenting soft tissue lesions (N=94) or fractures (N=52)

Distribution and age of lesions

External soft tissue blunt injury lesions and fractures (the two most common types of injury) were grouped according to variables which could indicate severity or reiteration (Tables 10, 11). Concerning soft tissue lesions (called henceforth just “lesions”), more children (25% circa) showed multiple lesions of the same age (contemporary) to one or different areas and 14% of children showed lesions of different ages to one or more body areas. A lesser number of children showed only a single lesion (12% circa). As regards fractures, 17% of children showed a single fracture, and 14% showed multiple fractures: about one quarter of this latter group presenting multiple fractures of different ages. The majority of soft tissue lesions were seen at the head, with the remainder presenting a more or less equal distribution between limbs and trunk. The majority of fractures were present at the limbs, followed by head and trunk.

This population therefore shows traits which may be considered alarming: presence of multiple lesions, sometimes of different ages, at times distributed in regions of the body which are more frequently correlated, particularly in the <1 year age group, to non-accidental trauma. However, whereas aging fractures may be less ambiguous, much caution should be applied when considering the age of bruises, since studies have shown that colour is observer-dependent and frequently does not reflect age in a predictable fashion [13, 15, 23].

In four cases the children died. Two of these cases presented no signs of trauma and were, in the end, classified as SIDS (sudden infant death syndrome); one died after having been found shut in a car heated by the sun, and one died of multiple fractures and cerebral trauma.

In conclusion, the general profile of the child presenting at emergency centres taken into consideration in this study with a suspicion of child physical abuse is that of a child who comes from a family with signs of precariousness, exhibits some sort of lesion 80% of the time, and presents with a history of trauma inflicted by the mother and/or father. Apart from providing a perspective on the French population, this study adds information to the too few

preexisting studies of its kind and stresses the importance of effective identification of possible cases of child abuse and of a thorough and sensitive screening protocol [in our study, the number of children presenting with visible traumatic lesions (60%) rose to 80% with actual diagnosed lesions following the clinical and radiological assessments]. Further studies concerning the sensitivity and specificity of scintigraphy are needed and are being performed within this research project.

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