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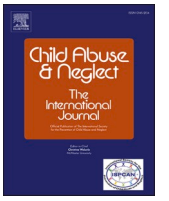

Hospitalization for physical child abuse: Associated medical factors and medical history since birth

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ABSTRACT

Background: Physical abuse often begins at a very young age and sometimes results in serious or fatal injuries. It is crucial to diagnose physical abuse as early as possible to protect this vulnerable population.
Objective: To study the factors associated with the first hospitalization for physical abuse from birth to the infant's first birthday in France.
Participants and setting: We included all singleton children born in a hospital setting in France between 2009 and 2013, who were identified from the French national information system database (SNDS).
Methods: To study factors associated with the first hospitalization for physical abuse during the first year after birth, we used the Fine and Gray regression model. Factors included in the multivariate model were the infant's sex, prematurity, neonatal conditions, the number of hospitalizations (at least two), medical consultations and complementary universal health insurance (proxy for family precariousness and socio-economic vulnerability).
Results: Over the 2009–2013 period, among 3,432,921 newborn singletons, 903 (0.026 %) were hospitalized for physical abuse in the year following birth. Among the factors associated with physical abuse, such as prematurity (aHR = 2.2[1.8–2.7]), male sex (aHR = 1.3[1.2–1.5]), or having had at least two hospitalizations (aHR = 1.7[1.4–2.1]), we found that complementary universal health insurance coverage was the factor most associated (aHR = 4.1[3.5–4.7]) with being hospitalized for physical abuse.

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Conclusion: These findings could help introduce preventative measures for infant protection in certain groups, such as parents of infants born prematurely, especially if they are in a precarious situation. This study also suggests that particular attention should be paid to infants who have been hospitalized at least two times in the first year of life, whatever the reason.

1. Background

Numerous publications have underlined that the phenomenon of child abuse is underestimated (Gilbert et al., 2009; Maguire et al., 2008; Tursz et al., 2010).

In 2017, the French plan to prevent violence against children and the national health strategies issued by the High Council for Public Health (HCSP, 2017; Plan violences enfants 2017–2019, s. d.) stated that it was essential to improve epidemiological knowledge by quantifying and understanding the mechanisms leading to child abuse.

The World Health Organization describes several types of child abuse (physical, psychological, sexual), which are often interrelated (OMS, s. d.). Regardless of the type, violence against children has short-term and long-term individual and societal repercussions (Hélie & Clément, 2019). Physical abuse is easier to detect in hospital data due to injuries directly visible to those around the child, which may help constitute an objective diagnostic criterion. As we pointed out in a previous study (Gilard-Pioc et al., 2019), this type of violence often begins at a very young age and can result in serious or even fatal injuries such as head injury (Chang et al., 2004; Davies et al., 2015; Sabotta & Davis, 1992). According to the literature, the incidence of hospitalization for child physical abuse is >50 infants per hundred thousand births per year in US or in Wales (Leventhal et al., 2012; Sibert et al., 2002). Moreover, in the long term, it has been shown that childhood violence is the cause of psychosocial mental disorders and reduced life expectancy. These disorders may have their origins in cerebral and neurobiological modifications. People who have suffered violence in childhood (Gordon, 2021; Hailes et al., 2019; Mainali et al., 2020) are more likely to become perpetrators of violence themselves (Machisa et al., 2016) in adulthood.

It is therefore crucial to diagnose physical abuse as early as possible in order to protect children and avoid recurrence.

One useful approach for meeting this objective could be to explore the medical history of children who have been abused. The healthcare follow-up of these children from birth (either hospital or ambulatory care) may help to identify factors from early life that are associated with physical abuse. The literature mentions factors associated with maltreatment such as prematurity, the child's sex, family history of violence or even socio-economic factors (Davies et al., 2015; Gumbs et al., 2013; HAS, 2014; Hurme et al., 2008; Lee & Kim, 2011; Lyons-Ruth & Yarger, 2022; Miyamoto et al., 2017; Salem et al., 2020; Sidebotham et al., 2002; Spencer et al., 2006; Wong et al., 2009). Recent meta-analyses have confirmed the association between low socio-economic status and child maltreatment (Mulder et al., 2018), and syntheses of meta-analyses have identified low socio-economic status as one of the five major antecedents of child maltreatment (van Ditzhuijzen et al., 2013). While this result is confirmed for abuse and neglect overall, the association is less clear for physical abuse specifically (Maker et al., 2005; Mulder et al., 2018; Roskam et al., 2022; Tran et al., 2021). Furthermore, to our knowledge, there is no nationwide study in Europe on the factors associated with physical abuse requiring hospitalization.

Our main objective was thus to study the factors associated with the first hospitalization for physical abuse, using information available in the SNDS database, including characteristics of children at birth, medical care during follow-up and some socio-economic characteristics. For this purpose, we accessed the national SNDS database, which covers all children born in France.

2. Material and methods

2.1. Databases

The SNDS (Système National des Données de Santé) is the French national information system that contains individual, extensive, and linkable but anonymous data on healthcare use for approximately 77 % of the French population during the study period (Tuppin et al., 2010) and almost 99 % nowadays (Bezin et al., 2017). It aggregates data from the following sources:

(a) The hospital discharge abstract database (Programme de Médicalisation des Systèmes d'Informations [PMSI]), which is designed to include discharge abstracts for all inpatient admissions to public and private hospitals in France. Diagnoses identified during the hospital stay are coded according to the 10th edition of the International Classification of Diseases (ICD-10). The very good quality of this database has previously been evaluated, making it possible to conduct epidemiological studies involving hospitalized patients in France (Maitre et al., 2021; Mariet et al., 2021; Piroth et al., 2021).
(b) The reimbursement data for out-of-hospital care (consultations with a physician, whether a general practitioner or a specialist, procedures, drugs).
(c) The codes for long-term illnesses (LTIs) that entitle patients to coverage without coinsurance under the French national health insurance program (Rodwin, 2018).

Various control procedures are regularly conducted to ensure the quality of these data. The reliability of the SNDS has been established in recent studies (Luu et al., 2019; Quantin et al., 2013, 2021; Zabawa et al., 2018).

2.2. Design and population

We constituted a longitudinal cohort study using the SNDS. From this database, we identified all singleton children born in a hospital setting in France between 2009 and 2013. The population of singleton children included in the SNDS is almost complete: in France, almost all deliveries are recorded in the PMSI database, because out-of-hospital delivery is rare, accounting for only 0.4 % of all births (Blondel et al., 2011).

2.3. Follow-up and outcome

We followed all singleton children from birth (identified by the birth stay) to the infant's first birthday, using both hospital and ambulatory care data. Our main outcome was the first hospital stay for physical abuse occurring at any time up to the infant's first birthday. We used an algorithm created by our team to identify children aged 0–5 years who were hospitalized for injuries due to physical abuse (Gilard-Pioc et al., 2019). We generated "physically abused" and "non-physically abused" groups via our algorithm, children with physical abuse and children without physical abuse, which is based on ICD-10 codes used to report physical abuse and specific to intentional physical assaults (Supplementary Table 1). In 2022, we demonstrated that the positive predictive value of this algorithm was very high 92.3 % [83.9–100] for children under one year (Loiseau et al., 2022). We also calculated the incidence of infants hospitalized for physical abuse using a denominator from census figures provided by the Institut National de la Statistique et des Études Économiques, which is responsible for a regular national census of the population in France. The incidence was defined as the number of infants hospitalized for physical abuse divided by the number of singleton children born in France in the same period.

2.4. Variables

For all children, we studied:

- Characteristics at birth (gestational age, sex, neonatal conditions such as malformations, respiratory distress or neurological problems identified using ICD-10 codes (Supplementary Table 2)),
- Follow-up after birth (consultation with either a general practitioner or a specialist), hospitalization (particularly in cases of fracture or gastroenteritis), and death (in or out of hospital).
- Socio-economic characteristics: the complementary universal health insurance (known as CMU—C), delivered on a means-tested basis and providing access to free complementary health protection. In France, CMU-C is intended for economically disadvantaged populations, and was used in this study as a proxy for family precariousness and socio-economic vulnerability, which are known to influence the characteristics and management of pregnancy.

Using our algorithm (Gilard-Pioc et al., 2019), we were also able to identify previous hospital stays where physical abuse was suspected (occurring before the first stay classified as a physical abuse stay) (Gilard-Pioc et al., 2019), i.e. all hospitalized children who may have been physically abused but whose hospital stays were not coded as such. A meticulous search of the literature (Rey-Salmon & Adamsbaum, 2018) enabled us to identify most suspicious physical injuries associated with child abuse, such as fractures or intracranial injuries. For instance, a child less than one year old (before the average walking age) who was hospitalized for a fracture of the femoral shaft in the absence of a serious accident (road accident, etc.) and who had no bone fragility due to disease (osteogenesis imperfecta) was considered a possible victim of physical abuse.

2.5. Statistical analysis

Firstly we described the physically abused group; their characteristics of the first stay for physical abuse in terms of length of stay, time between birth and the first stay for physical abuse, and hospital mortality during this first stay. We also wanted to know whether the child had already been hospitalized for suspected physical abuse or if they had attended a medical consultation either with a general practitioner or with a specialist.

Secondly, we used the entire cohort to compare "physically abused" and "non-physically abused" children. To this end we first performed univariate analyses in describing the children's medical and socio-economic characteristics collected at birth and compared children with physical abuse and children without physical abuse. Categorical variables are presented as numbers and percentages and compared with a Chi-square test or Fisher's exact test, depending on the conditions of application of the test. Quantitative variables are presented as means (standard deviations) or medians (interquartile range) and compared using a Student's *t*-test or a Wilcoxon-Mann-Whitney test, depending on the conditions of application. We then performed a multivariate analysis using the Fine and Gray competing risk regression model to study factors associated with a hospitalization for physical abuse during the first year after birth. This model avoids a bias in the estimation of risk by considering competing events such as death, which may prevent the observation of the hospitalization for physical abuse, which is the event of interest. Notably, in survival analysis, a competing risk is an event whose occurrence precludes the occurrence of the primary event of interest (Austin & Fine, 2017). For the subdistribution hazard function, introduced by Fine and Gray, we consider the rate of the event in those subjects who are either currently event-free or who have previously experienced a competing event (Austin & Fine, 2017). We thus followed individuals until the first hospitalization for physical abuse, death (both in and out of hospital) or the end of the follow-up period (one year after birth), whichever came first. We calculated adjusted subdistribution hazard ratios (aHRs) and 95 % confidence intervals (95 % CIs). Interpretation of the Fine and Gray

subdistribution hazard ratio (SHR) is similar to that of the Cox model hazard ratio (Dignam et al., 2012).

In addition to variables of clinical interest, the variables with a p-value <0.20 in univariate analysis were included in the multivariate model. These variables included sex, prematurity (defined as a birth before 37 weeks of gestation, according to the WHO classification (Howson et al., 2013)), neonatal conditions, the number of hospitalizations (at least two), complementary universal health insurance, and medical consultations, where medical consultation was considered as a time-dependent variable. Some variables were correlated with each other, and we were unable to include them all in the model. Statistical significance was set at a p-value of 0.05, and SAS 9.4 software (SAS Institute Inc., Cary, NC, USA) was used for all analyses.

2.6. Ethics

This study was carried out by a multidisciplinary team including epidemiologists with expertise in the SNDS database, forensic physicians, psychologists and psychiatrists. The work was approved by the French Institute of Health Data (INDS, *Institut National des Données de Santé*, registration number 218, December 1, 2016) and authorized by the French Data Protection Authority (CNIL, *Commission Nationale de l'Informatique et des Libertés*, registration number DE-2017-270, June 14, 2017). Written consent was not needed for this longitudinal study as there was no impact on patient care and all data were anonymous.

3. Results

Between 2009 and 2013, 3,432,921 newborn singletons were identified, giving an average of 690,000 newborns each year, of whom 903 (0.026 %) had at least one hospital stay for physical abuse during the first year of life. This represents an incidence of infants hospitalized for physical abuse of approximately 26 infants per hundred thousand singleton births per year.

3.1. First stay for physical abuse

The first stay for physical abuse took place in the majority of cases (75 %) during the first six months of life (3rd quartile = 186 days, Table 1). The average length of stay was 8 days, with a median of 4 days. Among these 903 children, 2.1 % died during this first hospital stay.

Before the first stay for physical abuse, 28.1 % (254/903) of these children had at least one other hospital stay and 12.0 % (108/903) had more than two (Supplementary Table 3). Among the 254 children with at least one previous hospital stay, 26.4 % were hospitalized with a fracture, 17.3 % had a diagnosis of intracranial injury and 16.1 % had a diagnosis of gastroenteritis (including nausea or vomiting). Among the 108 children with at least two previous hospital stay, 28.7 % were hospitalized with a fracture, 19.4 % had a diagnosis of intracranial injury and 23.1 % had a diagnosis of gastroenteritis (including nausea or vomiting). Moreover, 4.4 % of these children (40/903) had already one stay where physical abuse was suspected (Table 1). Among these 40 children, 9 (22.5 %) had two stays where physical abuse was suspected. Overall, there was an approximate one-month lag between the first stay where physical abuse was suspected and the first stay classified as being for physical abuse.

Finally, between birth and the stay for physical abuse, 83.1 % of the physical abuse children had attended a medical consultation, either with a general practitioner (a little over two thirds) or a specialist, and 25.7 % had seen a pediatrician (Table 1). Moreover, 28.1

Table 1
Characteristics of the first hospital stay for physical abuse, suspected physical abuse and medical consultation before this first stay.

	2009–13
First hospital stay for physical abuse	
Number of children hospitalized for physical abuse	903
Length of stay (day)	
Mean ± Std	8.5 ± 10.1
Median [IQR]	5 [2–12]
Time since birth (days)	
Mean ± Std	129 ± 90
Median [IQR]	109 [56–186]
In-hospital death (%)	19/903 (2.1 %)
Suspected physical abuse before the first physical abuse stay	
Number of children with suspected physical abuse stays	40 (4.4 %)
Number of stays with suspected abuse	
1	31 (77.5 %)
2	9 (22.5 %)
Time between 1st stay for suspicion and 1st stay for abuse, Median [IQR] (days)	28 [11.5–85]
Time between last suspected stay and first stay for abuse, Median [IQR] (days)	28 [11–76]
Medical consultation before the first physical abuse stay	
Number of children receiving medical consultation (%)	750 (83.06 %)
General practitioner (%)	490 (54.26 %)
Specialist (%)	262 (29.01 %)
Pediatrician (%)	232 (25.69 %)

% of the abused children had been hospitalized between birth and their first stay for physical abuse.

3.2. Comparison of "physically abused" and "non-physically abused" children

3.2.1. Univariate analyses: comparison of socio-demographic characteristics

The results of the initial stay at birth (Table 2) showed that the "physically abused" group had a higher proportion of boys (58.4 % vs. 51.0 %; $p < 0.01$); a longer length of hospital stay at birth (6.9 ± 11.8 days vs. 5.0 ± 6.3; days $p < 0.01$) and twice the rate of premature birth (15.5 % vs. 6.8 %; $p < 0.01$). There was no significant difference between the two groups of infants in terms of admission to the intensive care unit.

There was no significant difference in the distribution of the child's place of residence (Table 3) at birth (urban or rural) between the two groups (66.2 % in urban areas for physically abused children and 64.0 % for non-physically abused children; $p = 0.19$).

The rate of complementary universal health insurance was three times higher for physically abused children than for those without physical abuse (42.1 % vs 14.8 %; $p < 0.01$).

Finally, the number of deaths was about 15 times higher among physically abused children (2.21 %) than non-physically abused children (0.14 %).

3.2.2. Multivariate analysis: factors associated with physical abuse

After adjusting for consultations (either with a general practitioner or a specialist) and neonatal conditions at birth (malformations and respiratory distress), the risk of being hospitalized for physical abuse was increased (Supplementary Fig. 1) for children receiving coverage from the complementary universal health insurance (aHR = 4.1[3.5–4.7]), for children born prematurely (aHR = 2.2 [1.8–2.7]), those with at least two hospital stays (aHR = 1.7[1.4–2.1]), and for boys (aHR = 1.3[1.2–1.5]).

4. Discussion

To our knowledge, this is the first national study of this type to focus on the in-hospital and out-of-hospital medical care pathway of children from birth to one year with the aim of detecting factors associated with physical abuse. As expected, physical abuse is a serious phenomenon that occurs from an early age, and the mortality rate is 15 times higher among children hospitalized for physical abuse.

Moreover, among the factors associated with physical abuse, such as prematurity or male sex, we found that the most important factor was the complementary universal health insurance cover (a proxy for family precariousness and socio-economic vulnerability). These findings could help with the introduction of preventative measures for certain groups, such as parents of children born prematurely, especially if they are in a precarious situation.

Between 2009 and 2013, we identified an annual incidence of infants hospitalized for physical abuse of around 26 infants per 100,000 singleton births per year (i.e. around 0.026 %), which may seem low compared with the rates in the literature (Diaz & Petersen, 2014; Gessner et al., 2004; Leventhal et al., 2012; Sibert et al., 2002), which are substantially higher and with rates >50 infants per hundred thousand births per year. However, these studies were based on classifications (Leventhal et al., 2012) other than ICD-10 codes, other sectors of activity (Sibert et al., 2002) or used several different databases in order to be as exhaustive as possible (Gessner et al., 2004). According to Gilbert et al., 10 % of infants in high-income countries were neglected or abused (Gilbert et al., 2009). However, they considered all types of abuse, while our study focused on physical abuse alone. More generally, estimates for the incidence of abuse vary considerably depending on how they are defined (Salem et al., 2020). Our study had to rely on a restrictive case definition, limited to cases hospitalized for physical abuse identifiable through ICD-10 codes. The low incidence rate found in our study may also be explained by the fact that an undefined proportion of physically abused infants are not hospitalized.

Prior to their first hospitalization for physical abuse, 4.4 % of the children already had at least one hospital stay where physical abuse was suspected, of which 20 % had two stays suspected to be due to abuse, suggesting a pattern of violence. This is not very surprising considering that child abuse can be difficult to diagnose in young children. Following a meticulous search of the literature

Table 2
Characteristics of birth stay, comparison between physically abused and non-physically abused children born in the 2009–2013 period.

	Physically abused children (n = 903)	Non-physically abused children (n = 3,432,018)	p-Value
Boy	527 (58.36 %)	1,748,814 (50.96 %)	<0.01
Length of birth stay (days)			
Mean ± Std	6.9 ± 11.8	5.0 ± 6.3	<0.01
Median [IQR]	4[4–6]	4 [3–5]	
Stay in intensive care unit	0 (0 %)	1074 (0.03 %)	1
Respiratory distress	4 (0.44 %)	6322 (0.18 %)	0.09
Malformation	51 (5.65 %)	168,443 (4.91 %)	0.30
Neurological problem	1 (0.11 %)	7176 (0.21 %)	1
Gestational age[a] (GA)			
Mean ± Std	38.32 ± 2.60	39.03 ± 1.84	<0.01
Median [IQR]	39 [38–40]	39 [38–40]	
Premature birth (GA < 37WA)[a]	137 (15.53 %)	224,610 (6.78 %)	<0.01

[a] Gestational age has been collected exhaustively since 2010. We have some missing data for 2009. Overall, the rate of missing data for this variable is <5 %.

Table 3
Socio-economic characteristics, comparison between physically abused and non-physically abused children born in the 2009–2013 period.

	Physically abused children (n = 903)	Non-physically abused children (n = 3,432,018)	p-Value
Urban[a]	541 (66.22 %)	1,955,576 (64.01 %)	0.19
Complementary universal health insurance	351 (42.09 %)	462,619 (14.76 %)	<0.01

[a] Missing data: <10 %.

suggesting that some symptoms and signs can reveal undetected child abuse, the identification of stays where physical abuse was suspected was based on suspicious physical injuries such as fractures or intracranial injuries, (Eismann et al., 2021; Feldstein et al., 2023; Jenny et al., 1999; Letson et al., 2016; Rey-Salmon & Adamsbaum, 2018). The median time between the stay where physical abuse was suspected and the hospitalization for confirmed abuse was around one month. This alarming repetition of hospital stays for abuse or suspected abuse has also been underlined in the literature (Rey-Salmon & Adamsbaum, 2018). Most of the time it is related to the medical nomadism of these families, complicating the diagnosis and allowing the child to return home and the abuse to be repeated.

However, between birth and the stay for physical abuse, about 85 % of the physically abused children had attended a medical consultation. They had been seen either by a general practitioner (a little over two thirds) or a specialist, and 25 % had been seen by a pediatrician. The general practitioner thus has a central role in identifying situations at risk of abuse.

When we compared children with and without physical abuse, we found that being a boy was associated with a 1.3-fold higher risk of physical abuse, which is also reported in the literature (Davies et al., 2015; Gumbs et al., 2013; Lee & Kim, 2011; Miyamoto et al., 2017; Salem et al., 2020). Recently, Richey et al. suggested an explanation for this phenomenon, demonstrating that boys' crying and their facial expressions while crying were more likely to generate aversion in adults, which may contribute to an increased vulnerability to abuse (Richey et al., 2022).

We also demonstrated that prematurity (birth before 37 weeks of gestation) was associated with physical abused. Children born prematurely were twice as likely to be physically abused as children born at full term. These findings are consistent with the literature, which says that prematurity is often associated with child abuse (Hurme et al., 2008; Spencer et al., 2006). Children who had been physically abused were more likely to be covered by the complementary universal health insurance, and the risk of being physically abused was 4 times greater when the child's parents were beneficiaries of this complementary insurance. In France, the complementary universal health insurance is intended for economically disadvantaged populations, and was used in this study as a proxy for family precariousness and socio-economic vulnerability, which are known to influence the characteristics and follow-up of pregnancy. This complementary insurance is a specificity of the French health system, which reimburses medical expenses not covered by social security. In our study, the data concerning this complementary insurance was collected administratively and are therefore exhaustive and reliable, allowing us to identify the most severely disadvantaged families. There is growing evidence of an association between low socio-economic status and child maltreatment, as shown in the study of Sidebotham or the meta-analyses by Mulder et al. or Van IJzendoor et al. Moreover, a 2009 study conducted in China (Wong et al., 2009) showed that the risk of physical abuse was higher in patients whose family had a lower socio-economic status.

According to the literature (O'Donnell et al., 2010), abused children had twice as many hospital stays (excluding the birth stay and the stay identified as abuse) as children without abuse. Having been hospitalized at least twice was a factor associated with the occurrence of physical abuse (Lyons-Ruth & Yarger, 2022). This finding is not surprising given the difficulty of diagnosing maltreatment without stigmatizing the child, or the medical nomadism of these families.

This study has multiple strengths. First, the SNDS database on which the study is based is unique in Europe and even in the world, constituting a considerable advance in the analysis and improvement of health for the entire population. It allows us to obtain a complete follow-up, whether in or out of the hospital. Moreover, the population studied is almost complete since, as mentioned above, only 0.4 % of deliveries are not recorded (Blondel et al., 2011). Our team has considerable experience using the SNDS database for epidemiological purposes and in the construction or the validation of algorithms to identify people suffering from certain diseases or health events (Goueslard et al., 2020; Hanf et al., 2013; Maitre et al., 2021; Piroth et al., 2021; Quantin et al., 2012, 2021) including in the context of child abuse (Paget et al., 2020). Thus, in a previous study supported by the Observatoire National de la Protection de l'Enfance (ONPE), we developed algorithms for the identification of cases of physical abuse in children under one year in France (Gilard-Pioc et al., 2019). We were able to validate this algorithm with a positive predictive value of >90 % (Loiseau et al., 2022).

Our study also has some limitations. The appropriateness of using hospital data to identify cases of physically abused children could be questioned. However, a large proportion of abused children will be hospitalized at least once in their first year of life and will therefore be recorded in the PMSI database because situations of child abuse or trauma are serious medical conditions that are difficult to ignore in a hospital discharge summary. Moreover, we are aware that some physically abused children die outside the hospital before they can be hospitalized for abuse. Thus, the mortality rate for abused children reported here is certainly underestimated.

Furthermore, while we have identified family socio-economic status/poverty as a factor associated with physical abuse, we must be cautious with its interpretation to avoid biased diagnosis. As mentioned by Najdowski et al., "stereotypes can potentially lead to a misdiagnosis of abuse". For instance, there may be a recruitment bias since medical teams may unconsciously suspect maltreatment less often when the child comes from a higher socio-economic background (Laskey et al., 2012; Najdowski & Bernstein, 2018). Moreover, the type of abuse found in these environments (such as emotional deprivation or abuse) may be harder to diagnose. Another limitation concerns analyses based on data from 2009 to 2013 only, because we were authorized by the National Committee for data

protection (CNIL) to carry out our analyses on these years specifically and were unable to extend to data from more recent years. Finally, our study only included singletons because we could not easily identify newborns from multiple pregnancies separately in our database, especially when they were the same sex. Newborns from multiple pregnancies are given the same unique number and it is therefore not possible to identify their follow-up separately in the various hospital stays.

Overall, there is a need for early detection of at-risk situations, particularly in cases of prematurity or precariousness. In the case of premature birth, families could be offered psychological support, aiming to help the parents accept and better manage their child's issues. In case of precariousness, social monitoring could be developed or strengthened. Follow-up with the general practitioner is another opportunity to improve primary prevention and detection of risk. All of the medical personnel who are in contact with children should have access to a specialized team or a designated professional for child abuse. Specialized teams could also be in charge of monitoring and coordinating inpatient and outpatient care for these children to ensure continuity.

5. Conclusion

Physical abuse is a severe phenomenon that occurs from an early age. Given that the mortality rate is 15 times higher among children hospitalized for physical abuse, it is urgent to detect these children as early as possible and ensure that any situation suggesting abuse is not overlooked. In this study performed on national data, we found that prematurity, male sex, socio-economic vulnerability and having at least two hospitalizations before the abuse stay were associated with physical abuse. These findings provide evidence for the introduction of preventative measures for certain groups, such as parents of children born prematurely, especially if they are in a precarious socio-economic situation. This study also suggests that particular attention should be paid to children who have been hospitalized at least two times in the first year of life, whatever the reason for these hospitalizations.

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Data sharing statement

Data used in this study are available for researchers who meet the criteria for access to these French data from the National Health Insurance Fund (training that open a personal accreditation, approval of the protocol by required authorities (Expert Committee to research, studies and evaluations in the health field-CESREES, and National Committee for data protection-CNIL). The use of these data by our department was approved by the National Committee for data protection. We are not allowed to transmit these data.

Declaration of competing interest

None.

Data availability

The authors do not have permission to share data.

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Appendix A. Supplementary data

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