Clinical and imaging patterns of child abuse in Hong Kong: a 10-year review from a tertiary centre

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A B S T R A C T

Introduction: Child abuse, a pressing medical and social issue in Hong Kong, requires high vigilance for prompt identification and early management. The Mandatory Reporting of Child Abuse Ordinance has recently been gazetted, establishing a mandatory obligation for suspected injury reporting to protect children's rights. This study aimed to describe the incidence and patterns of child abuse in Hong Kong to draw attention to this key issue.

Methods: A retrospective review of all reported child abuse cases admitted to Prince of Wales Hospital over a 10-year period (2014-2023) was performed.

Results: In total, 503 cases of child abuse were retrieved from the hospital's electronic system, revealing an increasing trend over the years. Of these cases, 341 cases (67.8%) were attributed to physical abuse. Most cases involved trivial soft tissue injuries, apart from two limb fracture cases, which represented 0.4% of all reported child abuse cases (n=503) and 0.6% of all reported physical child abuse cases (n=341). Abusive head trauma (n=3) constituted 0.6% of all reported physical child abuse cases and 0.9% of all reported child abuse cases. Two cases of severe abusive head trauma required paediatric intensive care, and one case warranting neurosurgical intervention subsequently exhibited gross motor delay.

Conclusion: Most child abuse cases in Hong Kong present with minor clinical manifestations. Imaging evidence of skeletal or neurological injury is present in a small proportion of patients. Abusive head injury is uncommon but carries far-reaching consequences; early recognition is essential to protect affected children from further harm. Paediatric radiologists play a pivotal role in making the diagnosis.

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New knowledge added by this study

- Fractures resulting from non-accidental injury are less common in Hong Kong, which has a predominantly Chinese population, than in Western countries; the fracture patterns differ.
- The overall incidence of abusive head trauma is low; however, a substantial proportion of patients with non-accidental injury who undergo further neuroimaging display positive findings.

Implications for clinical practice or policy

- Interpretation of plain radiographs in cases of non-accidental injury should not solely rely on classical textbook fracture patterns; correlations with a compatible clinical history are particularly important.
- Neuroimaging is essential for children under 1 year of age with clinical suspicion of non-accidental injury, particularly those showing abnormal neurological signs, to detect abusive head trauma.

Introduction

Child abuse is a prevalent yet frequently overlooked condition in paediatric patients worldwide, affecting between 4% and 16% of the paediatric population.[1] It may manifest as physical abuse, neglect, sexual abuse, or psychological abuse,[2] all of which carry substantial long-term medical and psychological consequences. Clinical presentation is often vague, requiring a high degree of clinical suspicion by both clinicians and radiologists to ensure early activation of child protection services. Multidisciplinary input is needed for timely intervention and prevention of recurrence.

While clinical evaluation is crucial for identifying apparent or superficial injuries, radiological imaging also plays a vital role in detecting old or clinically occult injuries. John Caffey, a paediatric radiologist, was among the first to describe

香港虐待兒童個案的臨床與影像學特徵：一所香港三級醫療中心的十年病例回顧

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引言：虐待兒童是香港迫切的醫學及社會議題，社會需要保持高度警惕，以便及時識別和及早處理個案。香港政府最近就《強制舉報虐待兒童條例》刊憲，建立了申報懷疑受傷個案的強制責任，以保護兒童的權利。本研究旨在描述香港虐待兒童的發生率和受傷模式，讓社會關注此重要議題。

方法：本研究檢討了過往十年（2014-2023）威爾斯親王醫院接收過的所有已申報虐待兒童個案。

結果：本研究在醫院的電子系統中取得合共503個虐待兒童個案，當中揭露了多年來個案有上升趨勢。341宗個案（67.8%）屬於身體虐待，大部分涉及輕微的軟組織損傷，除了兩個肢體骨折個案佔所有已成立的兒童身體虐待個案的2.1%和佔所有已成立的虐待兒童個案的1%。虐待性頭部創傷則佔所有已成立的兒童身體虐待個案的5.3%和已成立的虐待兒童個案的2.5%。兩宗個案需要兒科深切治療，而其中一宗需要腦科手術介入繼而出現粗大動作發展遲緩的現象。

結論：香港大部分虐待兒童個案呈現輕微的臨床表現，少部分患者呈現骨骼或神經損傷的影像證明。虐待性頭部創傷並非常見但對患者影響深遠，因此應及早識別，避免已受傷的兒童進一步受害。兒童放射科醫生在診斷過程中扮演關鍵角色。

the association between long bone fractures and chronic subdural haematoma in infants, introducing the concept of non-accidental injury.[3] Since then, a growing body of literature has emerged concerning the radiological features of non-accidental injury, contributing to increased global awareness. Various guidelines have also been developed, including those by The Royal College of Radiologists[4] and the American College of Radiology,[5] which recommend appropriate imaging modalities in suspected cases to protect children's welfare while balancing the risks of radiation exposure.

Various retrospective studies in Western populations have examined the epidemiology, injury patterns, and outcomes of non-accidental paediatric injuries in their respective regions[6-9]; however, limited research has been conducted in Asia, particularly within Hong Kong. This study aimed to describe the incidence, clinical presentation, imaging features, and treatment outcomes of child abuse in a tertiary regional hospital in Hong Kong, with the goal of raising awareness towards this commonly overlooked condition.

Methods

This retrospective study included all reported cases of child abuse involving paediatric patients (aged 0-18 years) admitted to Prince of Wales Hospital, a tertiary regional hospital in Hong Kong, over a 10-year period (from January 2014 to December 2023). All suspected or confirmed cases of child abuse were identified from the Clinical Data Analysis and Reporting System, an electronic health registry managed by the Hospital Authority of Hong Kong. The search utilised key terms under the International Classification of Diseases, Ninth Revision coding, including "Child maltreatment syndrome", "Child and adult battering and other maltreatment", "Child abuse", and "Child maltreatment syndrome, shaken infant syndrome". Clinical records of all reported cases were reviewed. Cases were excluded if they were inappropriately categorised (aged >18 years), erroneously reported as unrelated to child abuse, or duplicate entries of the same episode (Fig 1).

Clinical data including patient demographics (age at presentation and sex), clinical presentation, type of abuse, imaging performed, multidisciplinary case conferences (MDCCs) held, management strategies, and any long-term adverse outcomes were reviewed from electronic patient records and case notes. Relevant imaging studies were reviewed by the primary investigator (5 years of radiology experience) and cross-checked against the original reports. In cases of discrepancy, images were re-interpreted through consensus reading with an experienced paediatric radiologist (20 years of radiology experience).

Results

Patient demographics and clinical presentation

In total, 503 reported cases of child abuse were included in the study. The number of reported cases showed an upward trend over the 10-year period, from 23 cases in 2014 to 50 cases in 2023 (Fig 2).

The case distribution is presented in Table 1. The cohort comprised 265 (52.7%) girls and 238 (47.3%) boys. The mean age was 8.25 years (range, 0-17), with 55 cases (10.9%) involving infants under 1 year of age. Physical abuse was the most common type at presentation, accounting for 341 cases (67.8%). The vast majority (>99%) of patients presented with erythematous marks, bruises, or lacerations. Other presenting symptoms included seizures, loss of consciousness, and vomiting. Sexual abuse was the second most common type (n=87, 17.3%), followed by child neglect (n=75, 14.9%).

More than half of the cases (n=263, 52.3%) were admitted via the Accident and Emergency (A&E) Department. The vast majority of these patients presented directly to our hospital, and only two transferred from adjacent acute hospitals—one involving abusive head trauma requiring neurosurgical intervention, and another with a suspected vaginal tear necessitating input from obstetricians and gynaecologists. Most of these

patients (254 cases, 96.6%) were referred due to clinical suspicion of abuse raised by non-offending parents (n=137), social workers (n=78), the patients themselves (n=22), or witnesses (n=17). In the remaining nine cases (3.4%), suspicion was first raised by medical staff either in the Emergency Department/General Outpatient Clinic (n=4) or after admission (n=5). Although medical staff identified a relatively small proportion of these cases, many were severe, including three abusive head trauma cases initially presenting with seizures. In such cases, abuse was only suspected after imaging.

The remaining 240 cases (47.7%) were admitted through other channels, including referral by social workers (n=203), neonatal admission (n=28), abnormalities identified by medical staff during follow-up or screening (n=8), and sibling screening (n=1).

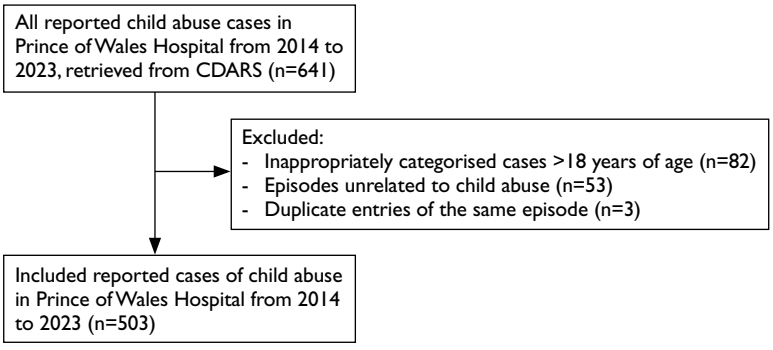

FIG 1. Patient recruitment
Abbreviation: CDARS = Clinical Data Analysis and Reporting System

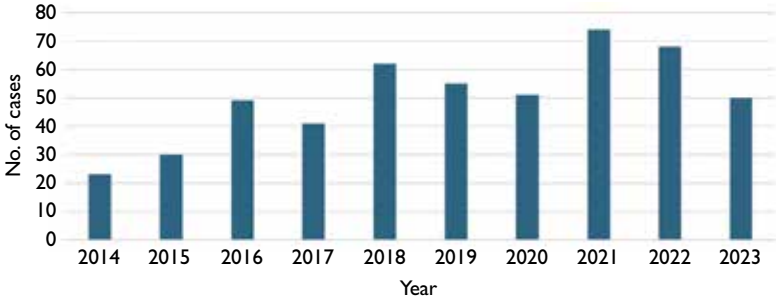

FIG 2. Trend of reported child abuse cases at Prince of Wales Hospital from 2014 to 2023

Imaging modalities and findings

Imaging was performed for 100 patients (19.9%), including 86 cases with skeletal imaging, 24 with neurological imaging, and one with abdominal imaging. Among the 24 patients who underwent neuroimaging, 10 also had skeletal imaging, while 14 received neuroimaging only.

Of the 86 patients who underwent skeletal imaging, 77 had plain radiographs of the targeted region as initial screening, and nine received a complete skeletal survey. Most patients had minor soft tissue injuries. Fractures were identified in two patients: a supracondylar fracture in a 3-year-old boy and a foot fracture in a 13-year-old girl, representing 2.3% of all skeletal imaging cases (Fig 3). Both fractures were detected on dedicated radiographs directed at regions of pain, as indicated by the patients. In another case, initial radiographs in a 13-year-old boy showed no obvious fracture, but magnetic resonance imaging (MRI) for persistent wrist pain subsequently revealed a mild ligamentous sprain.

Computed tomography (CT) was the initial imaging modality in 24 cases evaluated for suspected intracranial injury; five cases (20.8%) showed positive findings. Three cases (12.5%) demonstrated alarming features suggestive of shaken baby syndrome on initial brain CT scans, including subdural haemorrhage (n=3) and cerebral oedema (n=1), prompting further evaluation by MRI. Shaken baby syndrome was confirmed in all three cases on MRI, which showed subdural haemorrhage (n=3) and brain parenchymal injuries, including diffuse axonal injury (n=3) and hypoxic-ischaemic injury (n=2) [Fig 4]. These patients, aged between 2 and 7 months, presented with non-specific symptoms such as seizures (n=3), vomiting (n=2), and loss of consciousness (n=1). Fundoscopic examination confirmed multilayered retinal haemorrhages in all three cases, whereas skeletal surveys were unremarkable (Table 2). The remaining two CT-positive cases included one with a scalp haematoma and another with a mildly depressed parietal skull fracture; both lacked intracranial findings.

TABLE 1. Distribution of various types of reported child abuse by age and sex (n=503)*

	Age, y			
	<1	1-3	4-10	>10
Physical abuse	12	43	180	106
Male	6	22	105	53
Female	6	21	75	53
Sexual abuse	1	11	26	49
Male	1	2	3	5
Female	0	9	23	44
Neglect	42	8	21	4
Male	24	3	11	3
Female	18	5	10	1

* Data are shown as No.

FIG 3. (a) Anteroposterior plain radiograph of the right elbow showing a linear transverse supracondylar fracture of the right humerus (arrow). (b) Anteroposterior plain radiograph of the left fifth toe showing cortical buckling over the lateral aspect of the shaft of the left fifth metatarsal bone (arrow)

Ultrasound of the abdomen and pelvis was performed in one patient with persistent abdominal pain; no clinically significant solid organ injury was identified.

Multidisciplinary case conference assessment and long-term adverse outcomes

Overall, 44 cases (8.7%) were dismissed for various reasons, such as cross-border status, family refusal, or discharge against medical advice. Of the remaining 459 cases (91.3%) evaluated by MDCC, documentation was not retrievable from clinical records in 45 cases (8.9%).

Among the 414 cases with available MDCC documentation or conclusions, child abuse was confirmed in 199 cases (48.1%), comprising physical abuse (n=95), child neglect (n=63), and sexual abuse (n=41). Another 84 cases (20.3%) were categorised as high-risk, involving suspected physical abuse (n=81) or sexual abuse (n=3). Child abuse was not established in the remaining 131 cases (31.6%); these were considered to have low or moderate risk of recurrence.

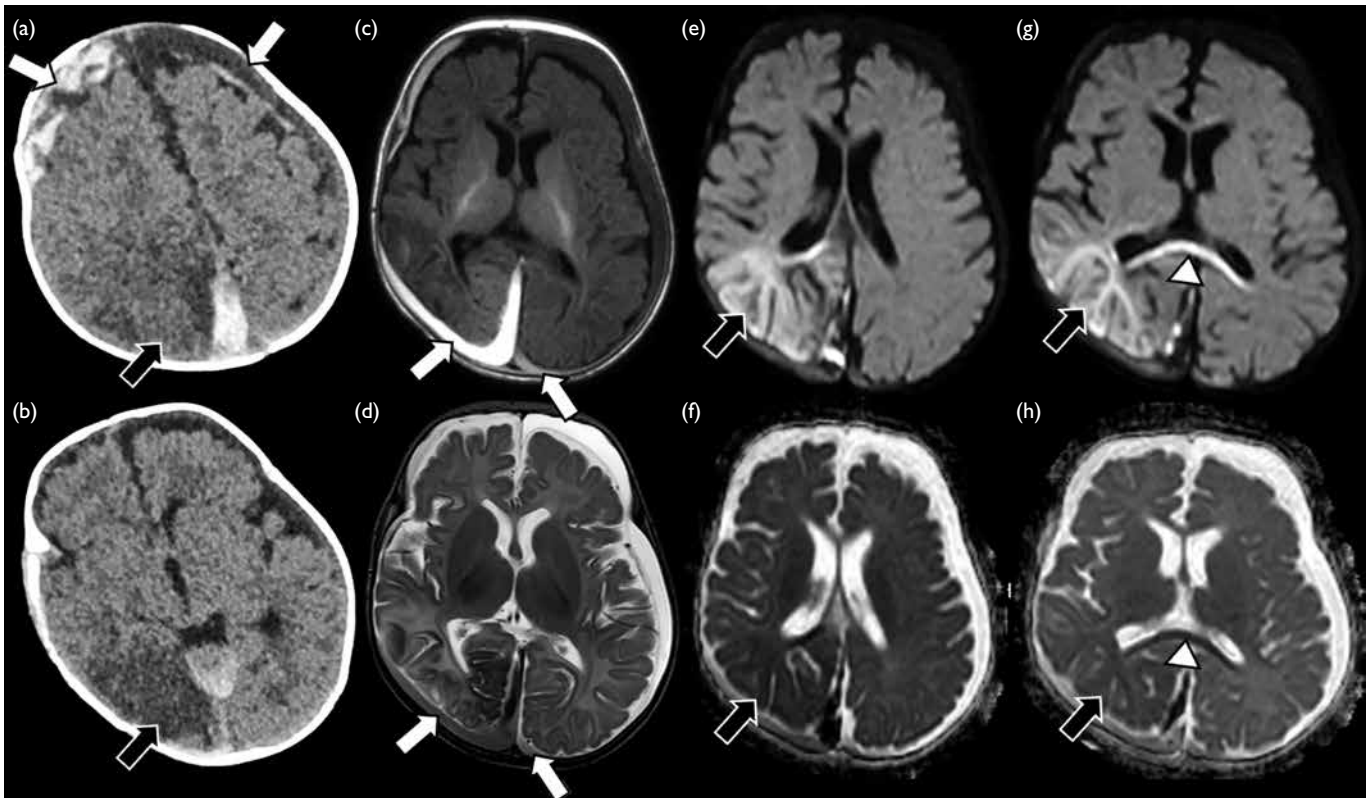

FIG 4. Representative case of shaken baby syndrome. (a, b) Computed tomography of the brain shows mixed-density subdural haematoma along bilateral cerebral convexities, extending into the interhemispheric space (white arrows in [a]). A large hypodense area with loss of grey-white differentiation in the right parieto-occipital region (black arrows) suggests cerebral oedema or hypoxic-ischaemic injury. (c-h) Magnetic resonance imaging of the brain confirms subdural collections of varying intensities over bilateral cerebral convexities and the interhemispheric space (white arrows in [c] and [d]), as well as a large area of restricted diffusion in the right parieto-occipital lobe (black arrows in [e] to [h]), consistent with hypoxic-ischaemic injury. Restricted diffusion in the splenium of the corpus callosum (white arrowheads in [g] and [h]) indicates diffuse axonal injury. (c) T1-weighted imaging. (d) T2-weighted imaging. (e, g) Diffusion-weighted imaging. (f, h) Apparent diffusion coefficient mapping

TABLE 2. Clinical presentation, radiological findings, and clinical outcomes of the three cases of shaken baby syndrome

	Case 1	Case 2	Case 3
Presenting age	3 months	2 months	7 months
Clinical presentation	Vomiting, limb twitching	Vomiting, limb twitching	Limb twitching, loss of consciousness
Fundoscopy	Multilayered retinal haemorrhage	Multilayered retinal haemorrhage	Multilayered retinal haemorrhage
Radiological findings			
Brain CT	- Bilateral mixed-density subdural haemorrhage extending to the interhemispheric space - Cerebral oedema/infarct in the right parieto-occipital region	- Bilateral subdural haemorrhage extending to the interhemispheric space	- Bilateral subdural haemorrhage extending to the interhemispheric space
Brain MRI	- Bilateral subdural haemorrhage extending to the interhemispheric space - Hypoxic-ischaemic injury in the right parieto-occipital lobe - Diffuse axonal injury in the splenium of the corpus callosum	- Subacute subdural haemorrhage extending to the interhemispheric space - Hypoxic-ischaemic injury in the left occipital lobe - Diffuse axonal injury in the splenium of the corpus callosum	- Resolved subdural haemorrhage - Haemorrhagic diffuse axonal injury in the posterior fossa
Skeletal survey	Unremarkable	Unremarkable	Unremarkable
Clinical outcomes			
Clinical management	- Admission to paediatric ICU - Bilateral burr hole drainage of subdural haemorrhage - Ventriculoperitoneal shunt insertion for secondary hydrocephalus	- Monitored in paediatric ICU - No neurosurgical intervention	- Monitored by paediatricians - No neurosurgical intervention
Follow-up	Global developmental delay at 19 months	No residual deficits at 9 years	No residual deficits at 33 months

Abbreviations: CT = computed tomography; ICU = intensive care unit; MRI = magnetic resonance imaging

Of the 89 cases in which MDCC was dismissed or notes were unavailable, more than half (n=63, 70.8%) had presented with suspected physical abuse, followed by sexual abuse (n=22, 24.7%) and neglect (n=4, 4.5%). All cases were deemed minor, with no clinically or radiologically significant findings. No specific treatment or long-term follow-up was required.

The majority of cases exhibited minor severity and were managed conservatively without long-term adverse outcomes.

A long arm cast was applied for one patient with a supracondylar fracture, whereas a resting splint was prescribed for another patient with a ligamentous wrist sprain. Both patients recovered uneventfully after short-term follow-up (1 year) by the orthopaedics team, with no residual impact on daily functioning.

Two patients with severe abusive head trauma required admission to the paediatric intensive care unit. One of these patients warranted multiple neurosurgical interventions, including bilateral burr hole drainage and placement of a ventriculoperitoneal shunt. The remaining two cases of abusive head trauma were managed conservatively. At the most recent follow-up, one patient—the most severely affected—demonstrated gross motor delay at 19 months of age. All other patients showed no neurological deficits or developmental delay to date. No mortality was recorded in this cohort.

Repeated admissions for suspected child abuse were identified in 22 cases. Of these, 16 were recurrent, established cases of child abuse. In 14 of these 16 cases, the type of abuse remained consistent across episodes, whereas two cases involved different types of abuse in separate incidents. Four cases were initially classified as established child abuse, but subsequent admissions were considered non-established, with recurrence risk ranging from low to high. Two cases were categorised as non-established child abuse on both occasions but were considered to have moderate or high risk of recurrence.

Discussion

This retrospective 10-year study documented a significant rise in reported child maltreatment cases, emphasising that child abuse remains an ongoing medical and social concern. This issue persists despite concerted efforts by the government and various organisations to provide social support to new mothers and at-risk families in an effort to prevent child maltreatment.

Types of child abuse

Physical abuse was the most common type of presentation in our study, consistent with data from the Child Protection Registry[10] and similar findings from Singapore.[11] The high prevalence of physical abuse in Hong Kong may reflect cultural differences in parenting practices, such that corporal punishment remains more commonly accepted in Chinese households than in Western contexts.[12] Over 50% of families in Hong Kong use physical punishment as part of child-rearing.[13] In moments of anger or impulsiveness, the line between ineffective parenting and child abuse may easily be crossed.

Pattern of injury and imaging findings

The majority of cases in our study were considered mild in nature, with no serious long-term consequences after clinical evaluation and appropriate imaging. Fractures were infrequent, comprising 0.4% of all reported child abuse cases and 0.6% of all reported physical child abuse cases. These rates are slightly lower than those reported in previous Asian studies, which revealed fractures in 1% of all reported physical child abuse cases[11] and 3.6% to 7% of all reported child abuse cases.[14,15] The present rates are substantially lower than the 28% observed in a Western population.[6] The fracture detection rate among patients who underwent imaging in our study (2.3%) was also considerably lower than that in Western populations (24%-32%).[7,8] Compared with a previous Hong Kong study in 2005,[15] our findings suggest a decline in the overall fracture rate despite an overall increase in reported child maltreatment cases, implying a trend towards milder injuries in recent years. This trend may reflect increased societal awareness of the consequences of severe child abuse, potentially leading parents to move away from traditional forms of physical punishment (eg, caning) and towards less injurious methods, such as striking with the hand. Greater awareness may also facilitate earlier detection and reporting, thereby preventing escalation.

No fractures were identified on skeletal surveys in the few cases of confirmed shaken baby syndrome in our cohort. One case of parietal bone fracture was documented—the parietal bone is among the most commonly fractured skull bones, according to current literature.[14,16] The other identified fractures—supracondylar and foot fractures—do not reflect the classical abuse-specific fracture types described in the literature, such as posteromedial rib fractures or metaphyseal corner fractures.[16] However, these findings align with previous studies in Singapore, where the humerus was the most frequently fractured bone.[11,14] Our results also differ from the findings of Fong et al,[15] who reported that forearm and rib fractures were most common in Hong Kong. With the exception of rib fractures, the sites noted in our study are not typically associated with non-accidental injury. This highlights potential differences in injury severity and fracture patterns between Asian and Western populations and underscores the importance of maintaining clinical suspicion for non-accidental injury, even in the absence of classical fracture sites or textbook imaging findings.[16]

Abusive head trauma is the leading cause of morbidity and mortality among children subjected to abuse, with an estimated morbidity rate of up to 80% and a mortality rate ranging from 15% to 30%.[17,18] Despite the deceptively low overall occurrence of abusive head trauma in our study (0.6% of all reported physical child abuse cases and 0.9% of all reported child abuse cases), compared with Western counterparts (up to 40%-50%),[6,9] it is notable that 20.8% of our imaged cases showed positive findings, and shaken baby syndrome was confirmed in 12.5% via MRI. All confirmed cases involved infants under 1 year of age, whose relatively oedematous brains, immature intracranial vasculature, and poor neck muscle control render them more susceptible to the effects of abusive head trauma.[19] It is therefore imperative that neuroimaging be performed for all children under 1 year of age with suspected non-accidental injury, particularly those with abnormal neurological signs, such as seizures or coma.[4] Bilateral subdural haemorrhages of varying densities, focal and diffuse brain parenchymal injuries (eg, diffuse axonal injury or cerebral oedema), and multilayered retinal haemorrhages on fundoscopy, as demonstrated in our study, are consistent with cardinal features of abusive head trauma described in the literature.[17,20] Our study also revealed more favourable morbidity (33%) and mortality (0%) outcomes compared with current literature reports,[2,17] possibly due to the relatively small number of cases.

Current practice in the management of cases of suspected child abuse

At present, suspected child maltreatment presents to our hospital via two main pathways: attendance at the A&E Department for suspicious injuries, and referral by social workers who observe unusual behaviour or injuries.[21] For cases requiring inpatient care, the paediatric team conducts history taking and physical examination, documents findings (including clinical photographs), and manages the injuries.[21] Relevant parties—such as social workers, clinical psychologists, and police officers—are informed as necessary.[21] Minor cases may be assessed and discharged directly from the A&E Department.[21] An MDCC is typically convened within 10 days of presentation, involving doctors, social workers, school personnel, clinical psychologists, and police officers to determine the nature of the incident, assess

the risk of future maltreatment, and recommend preventive measures.[21]

Radiologists play an active role in the multidisciplinary management of child abuse—not only in assessing the full extent of injuries but also in detecting subtle, suspicious findings, alerting the clinical team, and proactively contributing to early intervention and the reduction of long-term adverse outcomes. The reporting of suspicious injuries is currently conducted on a voluntary basis, guided by recommendations from the Social Welfare Department.[22] However, the recently gazetted Mandatory Reporting of Child Abuse Ordinance,[23] which becomes effective in January 2026, will impose a legal obligation on professionals to report suspected injuries, thereby strengthening safeguards for children.

Strengths and limitations

To the best of our knowledge, this is the largest retrospective study to investigate the clinical and radiological features of child abuse in a regional hospital in Hong Kong over the past decade. It provides an updated local overview while drawing comparisons with Western data to highlight distinguishing features and emphasise the need for greater attention to this critical issue.

This study had several limitations. First, it was a retrospective analysis based on voluntarily reported cases, and some instances of child abuse may have been under-recognised or underreported by attending clinicians. A small number of cases also lacked accessible MDCC notes or conclusions due to record loss over time. Second, our dataset includes only admitted cases from a single regional hospital, which may have introduced selection bias because minor cases discharged directly from A&E were excluded. The generalisability of our findings is limited, given that the distribution of child maltreatment cases varies substantially across Hong Kong districts. Sha Tin accounted for approximately 6.2% of all reported child maltreatment cases from 2014 to 2023, whereas Yuen Long accounted of 12%.[24] Variations in demographic and socio-economic backgrounds across districts may also influence clinical presentation and severity of injuries; further investigation is warranted. Third, despite the large cohort of child abuse cases included in our series, the proportion of positive imaging findings remains relatively small. Larger-scale studies are needed to better characterise local injury patterns. Finally, due to the extended retrospective recruitment period, follow-up durations varied widely—from 15 months in recent cases to 9 years in earlier cases. Consequently, the long-term effects of abusive head trauma may not yet be evident in patients with shorter follow-up, highlighting the need for further longitudinal assessment into later childhood.

Conclusion

This study provides an updated overview of the clinical and radiological features of child abuse in Hong Kong, revealing patterns that differ from those described in Western literature. Although most cases involved only minor clinical manifestations, a small proportion of patients exhibited positive imaging findings of skeletal or neurological injury, which may carry serious long-term consequences. Radiologists play a critical role in the multidisciplinary management of child abuse, both in flagging suspicious injuries to alert clinicians and in evaluating the full extent of trauma to protect children from further harm.

Author contributions

Concept or design: CYM Young, WCW Chu.
Acquisition of data: All authors.
Analysis or interpretation of data: CYM Young, WCW Chu.
Drafting of the manuscript: CYM Young.
Critical revision of the manuscript for important intellectual content: All authors.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Ethics approval

This research was conducted in accordance with the Declaration of Helsinki. Ethics approval was obtained from the Joint Chinese University of Hong Kong–New Territories East Cluster Clinical Research Ethics Committee, Hong Kong (Ref No.: 2024.071). The requirement for informed patient consent was waived by the Committee due to the retrospective design of the research.

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