

Five-Year Review of Patients Presenting with Non-Accidental Injury to a Children's Emergency Unit in Singapore

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Abstract

Introduction: There is an increasing trend of physical child abuse cases reported in Singapore. Children presenting to the Emergency Department with injuries require a high index of suspicion for clinicians to distinguish those that are abusive in nature. **Materials and Methods:** A retrospective study of children with diagnosis of NAI presenting to KK Women's and Children's Hospital (KKH) from June 2011 to May 2016 was conducted. **Results:** There were 1917 cases reported from 1730 subjects, of which: 8.8% of subjects had repeat visits; 55.2% of cases were male; and mean age was 7.69 years. Racial demographics were: Chinese 45.5%, Malay 33.4%, Indian 15.4% and Others 5.9%. The most frequent injuries sustained were head and neck (50.8%), limbs (32.2%), and chest (5.7%). Of the type of injuries, 55% had contusions, 21% had cane marks, 16% had lacerations, 4.4% had burn marks and 1% sustained fractures. Males were more likely to be caned ($P < 0.001$); 54.9% of cases were admitted and 38.9% were discharged. Cases that presented without a parent ($P < 0.001$), were known to Child Protective Service ($P < 0.001$), or had a history of parental substance abuse ($P = 0.038$), mental illness in caregiver ($P = 0.021$), or domestic violence ($P < 0.001$) were more likely to require admission. **Conclusion:** Analysing these factors provide a better understanding of the presentation of NAI cases, including 'red flags' and vulnerable groups who should have better protection.

Ann Acad Med Singapore 2018;47:413-9

Key words: Physical abuse, Presentation of child abuse, Risk factors of child abuse

Introduction

Physical abuse constitutes 60% of child maltreatment.¹ In Singapore, the Child Protective Service of the Ministry of Social and Family Development (MSF) has reported an increasing trend of physical abuse cases (confirmed by their child abuse investigations) from 117 in 2012 to 263 in 2015.²

Children presenting to the Emergency Department with injuries require a high index of suspicion for clinicians to distinguish those that are abusive in nature. Failure to

detect abuse puts children at risk of further serious injury, death and well described negative long-term behavioural and mental consequences of prolonged abuse.^{3,4}

Existing local clinical research describing epidemiology, risk factors and presentation^{5,6,7} of child physical abuse is sparse. A study⁵ on 89 cases of physical abuse admitted to National University Hospital from 2010 to 2012 described the epidemiology and profile of hospitalised patients only. Initial presentation of physical abuse to a Children's Emergency in Singapore has not been described in the literature.

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This study describes the epidemiology of suspected physical abuse cases presenting to the Children's Emergency in KK Women's and Children's Hospital (KKH), Singapore. We specifically describe the injuries, medical encounter, disposition, alleged perpetrators, and risk factors. With this, we hope to improve identification of physical abuse cases amongst emergency personnel.

Materials and Methods

Data Retrieval

This is a retrospective study of children with the clinical diagnosis of non-accidental injury (NAI) who presented to KKH's Children's Emergency from June 2011 to May 2016, as identified from clinical records with this diagnosis code. This diagnosis was based upon corroborated history and clinical findings. For our study, we included all patients with suspected physical abuse by parents, guardians or caregiving figures. We excluded assault by neighbours, school staff and peers and self-harm. We also excluded other forms of child abuse (sexual abuse, emotional abuse and neglect) where physical abuse was absent.

A structured data extraction form was used for data collection by 3 authors. All data collected was cross-checked by a second author for accuracy. Any differences were resolved by discussion among the 3 authors to reach consensus. Variables selected describe the profile of cases and circumstances of presentation (listed in Appendix 1). Risk factors were selected with reference to existing studies^{8,9} describing child abuse risks.

Data Analysis

Statistical analysis was performed using the SPSS statistical software programme, version 19 (IBM Corporation, Armonk, NY, USA). Descriptive statistics and univariate analyses were generated using chi-squared tests to compare discrete outcomes, and t-tests were used to compare means across conditions, except for skewed distributions which warrant the use of Kruskal-Wallis test. *P* values were considered statistically significant at <0.05.

Ethics

The study was approved by the SingHealth Centralised Institutional Review Board.

Results

Epidemiology

There were 1917 cases of reported visits, from 1730 patients, of which 187 patients had repeated visits. The mean age was 7.69 years (standard deviation [SD]=4.12). A breakdown of cases according to yearly trend, ethnicity, time of presentation and disposition are shown in Table 1.

Investigations and Procedures

Of the cases reviewed, 229 (12%) required x-rays in the Emergency Department. Of those requiring x-rays, 124 (54%) had x-rays of the skull, facial bones and/or neck, 158 (69%) limb x-rays, 52 (23%) chest x-rays and 29 (13%) pelvis x-rays. (Full skeletal surveys are not performed at the time of Emergency Department consultation in our centre).

There were 14 cases requiring haematological investigations and 9 requiring biochemical investigations in the context of ruling out differentials of thrombocytopenia and coagulopathy, 11 required toilet and suturing, and 34 required other wound management.

Alleged Perpetrator

The breakdown of major alleged perpetrators is described in Table 2. Other perpetrators also include siblings (3%), stepmothers (2%), and 9% were unknown.

Of the cases where the biological parents were perpetrators, 626 (51%, $P \leq 0.001$) had a history of domestic violence. Of the cases presenting by 0 to 5 hours, 16% were alleged abuse by fathers, as compared to 11% by stepfathers and 7% each for mothers and domestic helpers,

Table 1. Suspected Physical Abuse: Breakdown of Cases According to Year, Ethnicity, Time of Presentation and Disposition

	Number of Cases (%)
Year	
2012	372
2013	354
2014	370
2015	382
Ethnicity	
Chinese	860 (45)
Malay	652 (34)
Indian	293 (15)
Others	112 (6)
Time of presentation	
<10 hours	354 (19)
10 – 24 hours	344 (18)
24 – 72 hours	412 (21)
3 – 30 days	369 (19)
>30 days	109 (6)
Undocumented	329 (17)
Disposition	
Admission	1051 (55)
Discharge without follow-up	744 (39)
Outpatient clinic follow-up	88 (4)
Abscond	20 (1)
Discharge against medical advice	11 (0.6)

respectively. Of the cases presenting before 24 hours, 46% were alleged abuse by fathers, 32% by domestic helpers, 30% by stepfathers and 30% by mothers, respectively.

There were 595 cases (31%) who came from a nuclear family, while 928 cases (48%) had parents who were divorced/undergoing divorce, and 87 cases (5%) had single parents. There were 294 (42%) whose fathers as the alleged perpetrators were married, and 294 (42%) divorced/awaiting divorce. Conversely, 107 (20%) of the mothers were married and 322 (61%) were divorced/awaiting divorce.

Table 2. Profile of Perpetrators, People Who Highlighted Concern and Injuries Mechanisms

	Number of Cases (%)
Perpetrator	
Father	708 (37)
Mother	530 (28)
Stepfather	146 (8)
Relatives	158 (8)
Domestic helper	117 (6)
Concerns highlighted	
Parents	1056 (55)
Social welfare	521 (27)
Relatives	322 (17)
School	259 (14)
Police/civil defence	205 (11)
Location of alleged injuries	
Head and neck	974 (51)
Limbs	1108 (58)
Chest	395 (21)
Abdominal/pelvis	235 (12)
Tool/body part that inflicted injury	
Hand	671 (35)
Leg	106 (6)
Cane/stick	453 (24)
Household items	199 (10)
Scalding items/liquids	96 (5)
Sharps	26 (1)
Unknown	366 (19)

Table 3. Types of Injuries Sustained in Accordance to Sex and Age Distribution

	Total Cases (%)	Male n (%)	Female n (%)	0 – 1 Year (%)	1 – 5 Years (%)	5 – 10 Years (%)	>10 Years (%)
Total	1917	1066 (56)	851 (44)	82 (4)	488 (26)	740 (38)	607 (32)
Cane	403 (21)	276 (68)	127 (32)	0 (0)	56 (14)	200 (50)	147 (36)
Laceration	314 (16)	180 (57)	134 (43)	17 (5)	86 (27)	115 (37)	96 (31)
Contusion	1055 (55)	578 (55)	477 (45)	35 (3)	278 (26)	381 (36)	361 (35)
Burn	84 (4)	43 (51)	41 (49)	2 (2)	36 (43)	37 (44)	9 (11)
Fracture	19 (1)	11 (58)	7 (42)	6 (32)	4 (21)	6 (31)	3 (16)

Fathers were more likely to use body parts (i.e. their hands and legs) to hit their child. A total of 311 (46%) of cases hit by the hand were by fathers, compared to 156 (23%) by mothers. Also, 52 (49%) of the cases hit by the leg were by fathers, compared to 22 (21%) by mothers. Mothers, however, were more likely to use the cane (172 cases, 33%) compared to fathers (152 cases, 22%).

The number of cases injured by cane/stick decreased from 97 in 2012, to 90 in 2013, to 84 in 2014, and 81 in 2015. The trend for injuries by hand generally decreased from 155 in 2012, to 143 in 2013, 88 in 2014, to 128 in 2015. Injuries by household objects were from 31 in 2012, to 29 in 2013, and 44 in both 2014 and 2015.

Of 117 cases with the domestic helper as the alleged perpetrator, 63% (74) were Chinese, 15% (17) Malays and 13% (15) Indians. The most common body parts injured were the limbs (60 cases, 51%) followed by the head and neck (54 cases, 46%). The most common type of injury was contusions (73 cases, 62%). A total of 103 cases (88%) were highlighted by the parents. Eighty-one cases (69%) belonged to nuclear families. Of those cases who were abused by the domestic helper, none had parental history of incarceration, 1 had a history of parental substance abuse, 1 was previously known to Child Protective Service, 3 had more than 2 siblings and 5 had history of domestic violence. Forty-six cases (39%) presented within 48 hours, and 10 cases (9%) presented more than a month later.

Injuries

Reviewing the injuries sustained, 284 (15%) cases had more than 1 type of injury and the breakdown is shown in Table 3. Despite alleged injuries previously, 312 (16%) cases were examined to not bear visible signs or injuries. The mechanism of injuries are listed in Table 2.

Of the cases who presented with cane marks, 54% (218) are Chinese, 30% (119) Malay and 11% (45) Indians. For burn marks, 49% (41) are Malay, 25% (21) Indians and 21% (18) Chinese. Boys were more likely to be caned (276 cases, 61%, $P < 0.001$).

Of the 19 cases of fractures, there were 6 humerus, 3 clavicular, 3 condylar/supracondylar and 1 orbital floor fracture. The racial demographics are 11 Chinese (58%), 7

Malays (37%) and 1 Indian (5%). A slight majority of the 11 cases (58%) are boys. Four of the cases were perpetrated by the father, 2 by the stepfather, 3 by the mother and 3 by the domestic helper. Only 10 cases (53%) presented within 24 hours.

There were 20 injuries from bite marks, and the most frequent were found at the head and neck (45%, $P=0.596$), followed by the limbs (25%, $P=0.844$) and the chest (15%, $P=0.007$). The most frequent cane marks were found at the limbs (55%, $P<0.001$) followed by the head and neck (34%, $P<0.001$) and chest (5%, $P<0.001$). Burn marks were most commonly on the limbs (55%, $P<0.001$), the head and neck (31%, $P<0.001$) and chest (8%, $P=0.26$).

Risk Factors

Cases which presented with a parent were more likely to be discharged ($P<0.001$). Risk factors found to be significant for cases requiring admission are: children with psychological history or behavioural issues, previously known to Child Protective Service, previous history of substance abuse by parents, non-nuclear family, history of mental illness in caregiver and history of domestic violence (Table 4).

Discussion

The above results reveal the types of injuries sustained, prevalent methods of sustaining injury, perpetrator groups, as well as epidemiology and risk factors of those who suffered physical abuse.

Epidemiology

Whilst the number of confirmed physical abuse cases have increased according to MSF,² this did not translate

to more suspected cases presenting to our hospital. The main likely reason for this is that MSF conducts child abuse investigations only for the more serious cases of abuse; less serious cases are often managed at hospital and/or community agency level, in accordance with MSF guidance. Whilst the number of cases involving MSF has increased, the overall number of cases presenting to our hospital has not.

The racial distribution in Singapore is 74% Chinese, 13% Malays and 9% Indians.¹⁰ In our study, the Malay and Indian populations were over-represented. In the Singapore population census of 2010,¹¹ the average household size for Malays was 4.2 people—much higher than 3.6 for Indian and 3.4 for Chinese. Considering that our study also revealed that patients with more than 2 siblings was a risk factor, increased household size resulting in parenting stress might help explain this finding.

There was a prevalence of delayed presentation of cases (occurring after 48 and 72 hours) and this was also seen in serious injury cases such as fractures. Seeking medical attention invariably flags up child abuse, and the fear of the implications—such as leading to investigation and legal processes—results in the delay. Also, the severity of injuries may be falsely perceived by caregivers, only to be picked up by others (e.g. school) upon later contact, hence delaying the detection of abuse. Delayed presentation after injury can be a red flag for possible physical abuse in future medical encounters.

Investigations

X-rays performed were according to clinical indication and departmental guidelines; 8% of x-rays detected a fracture. In our centre, full skeletal surveys are conducted

Table 4. Correlation of Risk Factors with Admission

Factors Affecting	Number of Cases (%)	P Value of Admission (Odds Ratio, 95% Confidence Interval)	P Value of Previously Known by Child Protective Service
Psychological history/behavioural issues	109 (6)	0.004 (1.820, 1.206 – 2.748)	0.018
Special needs	76 (4)	0.015 (1.822, 1.114 – 2.981)	0.154
Developmental delay	40 (2)	0.010 (2.510, 1.220 – 5.164)	0.056
Previous attendance for similar issues	328 (17)	0.005 (1.416, 1.109 – 1.8060)	<0.001
Previous CE attendance of any kind	1477 (77)	0.026 (1.275, 1.030, 1.578)	<0.001
Previously known to Child Protective Service	315 (16)	<0.001 (2.034, 1.572 – 2.632)	NA
History of substance abuse by parents	148 (8)	0.023 (1.876, 1.082 – 3.251)	0.019
Non-nuclear family	1323 (69)	<0.001 (0.961, 0.791 – 1.168)	<0.001
History of mental illness in caregiver	97 (5)	0.004 (1.893, 1.219 – 2.941)	<0.001
History of domestic violence	844 (45)	<0.001 (1.520, 1.266 – 1.824)	<0.001
History of incarceration of parents	30 (12)	0.864 (0.939, 0.456 – 1.934)	<0.001
More than 2 siblings	178 (9)	0.211 (1.218, 0.894 – 1.658)	<0.001

CE: Children's Emergency; NA: Not applicable

subsequent to initial Emergency Department consultation, and were outside the scope of our study.

Alleged Perpetrator

Our results revealed that in a greater proportion of cases, the alleged abuse was committed by the father or stepfather rather than the mother or stepmother—a finding that is consistent with other studies in Singapore.^{5,6} The societal perception of men as the predominant figures of abuse might allow abuse committed by women to remain undetected for longer periods or not reported at all.¹² Our study also revealed greater delay in presentation times in cases where mothers were the alleged perpetrators, compared to fathers. Women still form a significant proportion of the alleged perpetrators, and should not be accorded a lower index of suspicion.

Despite parental abuse being the majority, abuse by stepparents also formed a substantial proportion of the cases. Our study, however, did not identify if stepchildren were more likely to be abused than biological children of the same abuser. This would be an interesting factor to investigate in further studies.

Abuse by domestic helpers comprised a smaller proportion (6%), as compared to relatives (8%). These cases also have delayed presentation and are mostly highlighted by parents. Unlike other cases, risk factors are minimal in this group. Often, financial stability—as reflected in the family's ability to hire a domestic helper—precludes these risk factors.

Injuries

The number of cases were greatest amongst 5- to 10-year-olds, followed by those older than 10 for the cane, laceration and contusion injuries. The older children also made up the largest proportion of limb, head and neck injuries. The older age group suffered more physical abuse and possible reasons could be that parenting is tougher as the child grows increasingly independent and has a mind of his/her own. They may also be perceived to be less frail and able to withstand physical punishment.

The distribution of fractures was equally high in cases aged less than 1 as compared to cases aged 5 to 10, and did not follow the previously mentioned trend. This could be attributed to trauma in young children with incomplete ossification of bones who would more likely suffer from fractures, as compared to older children who tended to sustain soft tissue injuries.

Contusions formed the majority of the injuries sustained. This was most likely because the majority of mechanism of injury was hitting with hands or kicking with legs. Both caning and hitting with hands showed a decreasing trend over the years; instead there was more use of household objects. These included furniture, daily equipment, clothing,

accessories and kitchenware. The possible conclusion could be that physical abuse increasingly might be more unplanned. The impulsive nature of the abuse caused perpetrators to use items generally within reach, and not to deliberately retrieve canes specifically for physical punishment. This could be a sign that our society is moving away from the previously common practice of caning, well described in Tong et al (1996) and Ngiam and Tung (2014).^{13,14}

Risk Factors for Admission

Admission to hospital implies a lack of alternative care plans that are safe enough to prevent the child from further abuse—which might represent an imminent threat of further injuries rather than existing ones. Of the factors that were statistically significant, behavioural issues,¹⁵ special needs,¹⁶ domestic violence¹⁷ and substance abuse in the family¹⁸ have been well described. These highlighted groups of vulnerable children deserve attention for better protection from physical abuse.

Mental illness in caregivers is associated with a theorised social drift¹⁹ which puts them in more economically disadvantaged circumstances. Possible emotional dysregulation, irritability, delusions and hallucination disrupt the caregiver's function, leading to conflict.

The proportion of cases belonging to divorced parents (48.4%) was slightly higher than the national divorce rates for males (44.4%) and females (41.6%).²⁰ Raising children in a non-nuclear family increases stressors for the parent, as compared to a shared burden. There are also considerations of alleged abuse as part of custody battle in divorce process, which might not reflect true physical abuse.

Parental incarceration history did not show any significant correlation and could be due to the presence of existing stable care plans already established under jurisdiction, and hence need not require admission.

Limitations

This study is limited by its retrospective nature, where information is only available through documented clinical records, which might be incomplete.

Our study did not look at physical abuse cases that were subsequently diagnosed in the ward (but not at the point of Emergency Department consultation). Such information would be valuable to consider detection rates and factors that resulted in initial missed diagnosis, for improvement of detection at the Emergency Department level in future.

Our study included both suspected and confirmed physical abuse cases. We did not have access to information on the outcome of child abuse investigations conducted by MSF. We did not exclude cases where no evidence of abuse was found upon MSF investigation.

Conclusion

This study analysed the demographics, type of injuries, alleged perpetrators and risk factors related to physical abuse presenting to the Children's Emergency. The data highlighted vulnerable children belonging to groups with significant risk factors and who should have better protection. It also identified red flags such as delayed presentation time for future medical encounters to pay attention to. It also provided a better understanding on the state of child abuse presentation in Singapore, and is useful for future comparisons across Asian countries and internationally.

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Appendix 1 – Variables Extracted

Demographics	<ul style="list-style-type: none"> • Age • Sex • Ethnicity
Clinical encounter	<ul style="list-style-type: none"> • Date of visit • Investigations: haematological, biochemical, radiological • Procedures • Medications • Disposition • Diagnosis
Details of the alleged physical abuse	<ul style="list-style-type: none"> • Body parts injured • Type of injuries sustained • Equipment used • Alleged perpetrator • Time of incident • Timing of presentation • People who highlighted concerns
Medical background of patient	<ul style="list-style-type: none"> • Past medical history • Special needs • Psychological history • Developmental delay • Previous attendance to the Children's Emergency • Previous physical abuse
Risk factors	<ul style="list-style-type: none"> • Previously known by Child Protective Service • History of drug abuse by parents • Marital status of parents • History of mental illness in caregiver • History of domestic violence • Incarceration of parents