



Menace of childhood non-accidental traumatic brain injuries: A single unit report

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ABSTRACT

Background: Childhood traumatic brain injury (TBI) has high rate of mortality and morbidity worldwide. There are dearths of reports from developing countries with large paediatric population on trauma; neurosurgery trauma of nonaccidental origin is not an exemption. This study analysed menace of non-accidental TBI in the paediatric population from our center. **Materials and Methods:** This is a single unit, retrospective study of the epidemiology of non-accidental TBI in children starting from September, 2008 to March, 2014. The management outcomes of the epidemiology of the non-accidental TBI were analysed. **Results:** Total of 109 children age range from 0 (intra-natal) to 16 years with a mean of 5.8 ± 4.6 years (median, 5 years) were enrolled into the study. 34 (31.2%) were domestic violence, 26 (23.9%) street assaults, 16 (14.7%) were due to animal assaults and mishaps, 17 (15.6%) fall from heights. Seven (6.4%) cases of collapsed buildings were also seen during the period. Four (3.7%) industrial accidents and two (1.8%) were self-inflicted injuries. There were also three (2.8%) cases of iatrogenic TBI out of which two infants (1.8%) sustained TBI from cesarean section procedure while one patient (0.9%) under general anaesthesia felt from the operation bed resulting to severe TBI. **Conclusion:** Child abuse, unprotected child labour, parental/care-givers negligence are the main cause of nonaccidental TBI. Human right activists and government agents should be incorporated in curtailing the menace.

Key words: Child abuse, non-accidental, traumatic brain injury

INTRODUCTION

Traumatic brain injury (TBI) is one of the most important public health problems worldwide.^[1] Paediatric TBI is of major concern due to high mortality and morbidity in different societies.^[2-6] Various epidemiological factors can lead to severe TBI in societies overwhelmed with poverty, low educational level, child labour/abuses, limited laws in child protection, limited trained surgeons and poorly organised management protocols for head injured paediatric population, including preventive measures in protecting vulnerable children.

The management pattern of TBI in resource-limited and man-power-limited centres can be critical with devastating sequelae and needing extra efforts, research and evaluations. In addition, there are reports on accidental TBI,^[3,4,7] but there are limited analysis on epidemiology of non-accidental TBI/abused and neglects hence, consequences of untreated or poorly managed head trauma can be devastating.^[8] Notwithstanding the aetiology of TBI, the medical, social, psychological and economic burden of a disabled child who survives such injuries can be considerable to the medical system, parents and the society. Domestic/street violence, animal assaults and industrial accidents due to neglects; self-inflicted and iatrogenic TBI are rarely reported in children. We are reporting our experience, the epidemiology and management of paediatric non-accidental TBI from Kano in Northern Nigeria by paediatric surgical team and calling for actions in protecting helpless children.

MATERIALS AND METHODS

This is a single unit, retrospective study of the epidemiology of non-accidental TBI in children starting from September, 2008 to March, 2014 from Children Surgical Unit of Murtala Mohammed Specialist Hospital, Kano, in Northern Nigeria.

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Accidental (road traffic/motor-vehicular) related TBI, scalp laceration, abrasion and transient loss of consciousness of <24 h were excluded from the study.

The brain injured children due to human violence, animal assaults, industrial mishaps, fall from heights and story stair-cases, collapsed buildings, self-inflicted TBI and of iatrogenic origin are incorporated into the study [Chart 1].

Simple linear skull fractures and depressed skull fractures without neurological deficits were managed conservatively while depressed skull fractures with neurological deficits were surgically explored.

The management outcomes of the epidemiology of the non-accidental TBI were analysed.

RESULTS

From 2008 to 2014 (6-year period) a total of 109 children age range from 0 (intra-natal) to 16 years with a mean of 5.8 ± 4.6 years (median, 5 years) were enrolled into the study. Male was 67 and female was 42 with male to female ratio male:female = 1.6:1.

All the children that were enrolled into the study sustained TBI of non-accidental aetiology. 34 (31.2%) were domestic violence, 26 (23.9%) street assaults, 16 (14.7%) were due to animal assaults and mishaps, 17 (15.6%) fall from heights. Seven (6.4%) cases of collapsed buildings were also seen during the period. Four ($n = 4$) (3.7%) industrial accidents and two ($n = 2$) (1.8%) were self-inflicted injuries. There were also three ($n = 3$) (2.8%) cases of iatrogenic TBI out of which two infants (1.8%) sustained TBI from cesarean section procedure while one patient (0.9%) under general anaesthesia felt from the operation bed resulting to severe TBI [Figures 1a-g].

All the patients were evaluated with the Glasgow coma scale (GCS [3-15]) and modified scale for non-verbal children. Post-surgical management and conservative management of the outcome were measured with the Glasgow outcome scale (1-5). The severity of TBI were classified into mild (GCS 13-15), moderate (GCS 9-12) and severe (GCS 3-8). Management outcome was graded as follows: recovery = 1, moderate disability = 2, severe disability = 3, vegetative state = 4 and death = 5.

Out of 109 patients, 25 (22.9%) was acute sub-dural haematoma, 18 (16.5%) was skull fractures with

defragmentation, dural lacerations and parenchymal penetration. There were 16 (14.7%) cases of intra-parenchymal haematoma while 14 (12.8%) were cases of contusion with cerebral oedema and multiple patchial haemorrhages. Dural laceration resulting

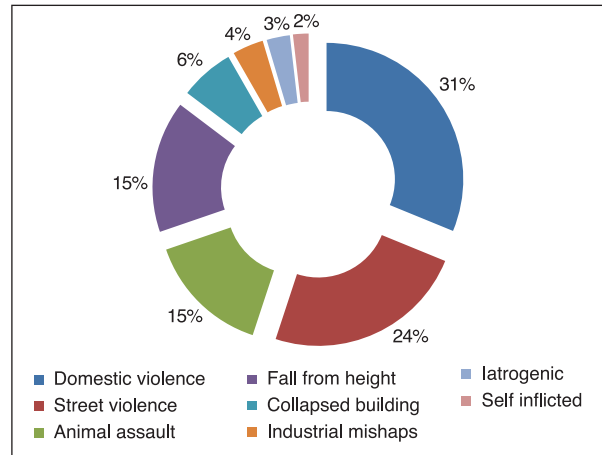


Chart 1: Aetiology of non-accidental TBI at MMSH, Kano



Figure 1a: Laceration during caesarean section extending to the dura and parenchyma



Figure 1b: An object driven into the skull of a child by a care-giver



Figure 1c: A nail being driven by a father



Figure 1d: A computed tomography image of a child being hit to the wall by a father



Figure 1e: Industrial mishaps due to child labour/negligence with a sharp object piercing the skull

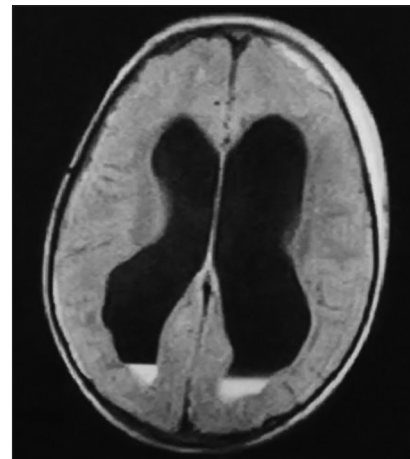


Figure 1f: Acute post-traumatic hydrocephalus secondary to frontal blow by a father

to severe to moderate liquorrhoea due to assaults with sharp objects, frontal blow and breach of the nasal floor, mastoid assaults with fractures resulting to the otorrhoea constituted 13 (11.9%) cases. There were 11 (10.1%) cases of post-traumatic sub-arachnoid haemorrhages and epidural haematoma was 5 (4.6%) while chronic abscess as a result of neglected penetrating injuries with foreign body *in-situ* was 3 (2.8%). There were 2 (1.8%) cases of acute post-traumatic hydrocephalus as a result of intra-ventricular haemorrhage. Peri-ventricular haemorrhage and pneumo-cephaly were 1 (0.9%) each [Chart 2].

In total, 98 (89.9%) patients were operated with various forms of non-accidental TBI.

Survival, mortality and morbidity from the non-accidental TBI in our centre are shown in Table 1, while nature of treatment carried out was shown in Table 2.

Sixteen ($n = 16$) (14.7%) patients had multiple surgeries which included series of ventriculoperitoneal-shunt insertions/ventricular drainage in 2 (1.8%), repeated dura-plasty in 3 (2.8%) and cranio-plasty in 8 (7.3%). Two (1.8%) girls and 1 (0.91%) boy who were involved in domestic violence and neglected developed brain abscess were operated serially.

Eleven (10.1%) children with various forms of contusion and concussion were managed conservatively.

Five ($n = 5$) (4.6%) died after surgery. Another child ($n = 1$) (0.9%) with multiple/poly-trauma as a result of the fall from height died from multiple injuries.

Four patients ($n = 4$) (3.7%) developed permanent neurological deficit secondary to post-traumatic infarction/atrophy of the brain tissues as a result of domestic neglect. Two children ($n = 2$) (1.8%) developed frontal lobe syndrome after surgery. There were 3 (2.8%) children

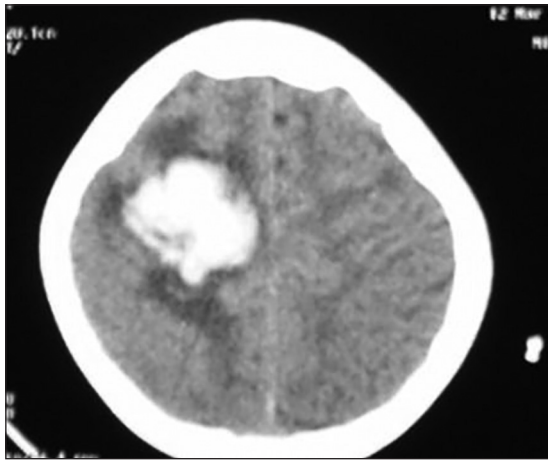


Figure 1g: Intraparenchymal haematoma secondary to an assault by a step-mother

Table 1: Outcome of non-accidental TBI at MMSH, Kano

Results	n (%)
Survived	93 (85.32)
Died	6 (5.5)
Permanent neurological deficits	4 (3.66)
Epilepsy	3 (2.75)
Frontal lobe syndrome	2 (1.83)
Blindness	1 (0.91)
Total	109 (99.97)

TBI: Traumatic brain injury; MMSH: Murtala Mohammed Specialist Hospital

Table 2: Treatments of non-accidental TBI

Treatments	n (%)
Conservative	11 (10.09)
Craniotomy	57 (52.29)
Cranioectomy	19 (17.43)
Cranioplasty	13 (11.92)
Duraplasty	7 (6.42)
VP-shunt insertion	2 (1.83)
Total	109 (99.98)

TBI: Traumatic brain injury; VP: Ventriculoperitoneal

with post-traumatic epilepsy and another child had total blindness. In total, there was 85.32% survival with satisfactory outcomes and 14.65% complications [Table 1].

DISCUSSION

Children and adolescents are vulnerable to various forms of trauma and TBI is among the worst with poor prognosis.^[9] The myriad of potential causes and inability to accurately predict the consequences of TBI in infants and young children is of major concern, especially in societies overwhelmed with increasing poverty, child abuse and neglects, forced unprotected child labour, limited child protection measures in association with societal negligence on childhood welfare could have dire consequences on the health of such children.

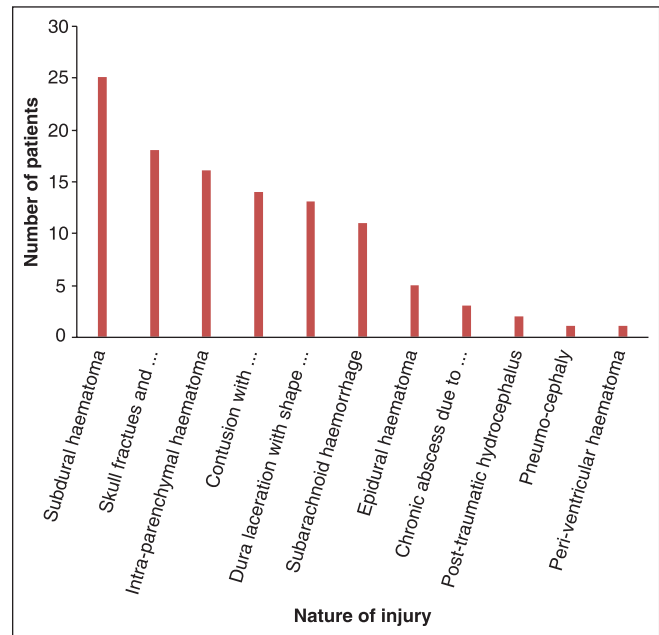


Chart 2: Nature of non-accidental TBI at MMSH, Kano

Aetiology of TBI varies with series reports on non-accidental causes in few selected studies,^[13-16] but none was attributed to severe abuse and neglect.

Chinda *et al.* elaborated on the epidemiology of TBI in children in North-Eastern Nigeria and found out that, child labour and the interstate religious discipleship were among the causes with assault to have constituted 2.2%, while Udoh and Adeyemo in their report attributed 7.1% of TBI to assaults and violence.^[4,7] Some reports on childhood death and morbidity due to domestic/street abuses and parental neglect with a high percentage of the death attributed to abusive head trauma.^[10-12] A survey from 23 states in USA found out that, among 49,947 child deaths, 30% had abusive TBI that accounted for 60% of the physical abuse.^[23]

There are reports on childhood TBI from African and other developing communities with a high rate of mortality and morbidity;^[2-7] however, distribution of TBI due to abusive trauma is not documented.

Our single unit experience showed that, 55.1% of non-accidental TBI was due to child abuse from domestic/street maltreatment, while 40.4% constituted neglects from parents/care-givers and child labour.

Documented evidence from other countries reflects on the incidences of child abuse and systemic evaluations to accurately ascertain victims of violence across systems or to address broader issues of risk factors and prevention.^[17-20] However, our literature search could

not find any within the African sub-region. Hence, there should be standards for investigations, reviews, and reporting non-accidental TBI in order to establish or rebut child abuse or any heinous crimes against children in such societies.

Reading *et al.* analysed child maltreatment in their report with the suggestion that, it should be recognised and considered as both a human rights violation and a global public health problem.^[21]

Though our report has limitations in generalising the situation of abusive TBI in children due to child maltreatment and neglect nationally since it represents data of a single unit tertiary care centre in a large metropolitan city. However, this could provide an opportunity for professional involvement and public health surveillance that could suggest means correctly to identify and respond to child labour, protection and maltreatment. In addition, there should be the standardized clinical approaches for early detection of TBI due to abuse and neglect as suggested by Acker *et al.* and Bailhache *et al.*^[22,23] especially in societies with limited child care and poor resources.

Thus, appropriate social, legal, medical and educational responses in keeping with community systems should be design and adopted for non-accidental TBI that could provide a research opportunity in child protection as seen in other communities with standard child protection laws.^[24,25]

CONCLUSION

Traumatic brain injury of non-accidental origin can have a devastating sequelae in societies overwhelmed with poverty and conflicts couple with poor medical and social services. Prompt professional care can enhanced and increase quality of life of the affected children. Paediatric surgical emergency centres should be improved with neurosurgical awareness and services. Human right activists should be incorporated in the management of non-accidental TBI.

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