Original Article

Characteristics and Outcomes of Non-accidental Visceral Injuries Among Children: Five Years' Experience of National Data in Saudi Arabia

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Abstract:

Background and Aim: Child maltreatment is a major global public health concern. Non-accidental visceral injury (NAVI) is a type of injury that is deliberately inflicted to human body, resulting in injury to internal organs, which considered as child abuse. This study aimed to identify the prevalence of NAVI and determine the characteristics of non-accidental injuries among children in Saudi Arabia (SA).

Method: A cross-sectional study was conducted based on the National Family Safety Registry (NFSR), which consists of 62 child-protection centres among health sector in SA. A total of 30 children with NAVIs were registered in the NFSR from April 2017 to March 2022.

Results: The childrens' mean age was 6.5±4.7 years.There was a sharp increase in NAVI cases over the five-year period, particularly after 2020, from two cases per year in 2017 to nine cases in 2021. NAVI predominantly affected children aged 5-10 years (40.1%). Lung injury was the most common form of NAVI, accounting for 23.3% of the cases. As a consequence of NAVI, 2 of the victims has died and 7 of them had deteriorated health status.

Conclusion: NAVI in children in SA is a significant problem. This study provides important information on the socio-demographic characteristics and injury patterns of children with NAVI. This information can help develop prevention and intervention strategies to reduce the incidence of NAVI among children in SA.

Keywords: child maltreatment, Non-accidental-visceral injuries, National Family Safety Registry, physical abuse, and violence.

Introduction:

Child maltreatment is a major public health concern worldwide. This phenomenon could be defined as any type of abuse for children younger than eighteen years, and consist of physical, sexual, emotional, or neglect[1]. The World Health Organization reports that an estimated 1 billion children worldwide experience violence yearly[2]. Physical abuse is one of the most prevalent forms of child maltreatment, and it has unwanted consequences. Child maltreatment can result in physical complications, including bruises, cuts, fractures, and internal injuries; or psychological complications, such as anxiety, depression, and post-traumatic stress disorder[3]. All these factors increase morbidity and mortality rates, with some studies reporting mortality rates of up to 10% in physically abused patients[4]. A study conducted in Saudi Arabia reported that the prevalence of child maltreatment, including physical abuse, emotional abuse, neglect, and sexual abuse, was approximately 38.8%. The prevalence of physical abuse, specifically in Saudi Arabia, ranges from 11.5% to 37.3%, with a mortality rate of 6.2%[5]. An example of NAVI is Abdominal injuries: contusion, laceration, rupture of solid or hollow viscera and Thoracic injuries: lung contusions, chylothoraces, cardiac lacerations, rupture[6]. NAVI victims are at risk of severe complications such as organ failure, sepsis, and long-term disability. Therefore, it is a severe form of child abuse associated with a high mortality rate, with up to 50% of the cases resulting in death[7]. While no child is blamed for experiences of abuse or neglect, studies have shown that the risk increases in children with special health needs or disabilities, especially in low-income families[8]. Accurately estimating the global prevalence of NAVI is challenging; however, studies have reported rates ranging from 2.5% to 8%[9]. Moreover, in United Kingdom, the prevalence of Abusive non-accidental visceral is not specified. However, they have highlighted the importance of screening tests to detect abdominal injuries in abused children[10].

Despite the importance of this issue and its profound consequences, there are limited number of international and local studies on NAVI that highlighted this aspect of child maltreatment. The aim of this study is to identify the prevalence of NAVI accidents, clinical traits (demographics and injury patterns), and final health status (morbidities, fatalities, hospitalisations, and dispositions) in children in Saudi Arabia.

Methods:

Study design and participants:

This descriptive cross-sectional study based on the records of registered cases in the National family safety Records (NFSR). The NFSR is a database of child abuse cases presented to health facilities across Saudi Arabia. This design accessed a readily available cohort of cases collected over the past five years, including their characteristics and clinical details. Cases were extracted from 62 child-protection centres representing the governmental health sector in Saudi Arabia. A total number of 30 cases with NAVIs due to abuse were reviewed and documented in the NFSR from April 2017 to March 2022. All patients under 18 years of age, of both

sexes, and registered in the past five years with evidence of NAVIs were included in this study. Through this data we will cover the study objectives by capturing the prevalence of NAVI and describing the characteristics of the victims.

Measures:

After getting approval on the research manuscript from Institute Review Board (IRB), The NFSR authorities were approached through the research coordinator by initiating an electronic request in the NFSP electronic portal. Once reviewing the request by the NFSR team, they will retrieve the requested information officially through correspondence from NFSR department and give them to the researcher. After that the electronic charts were reviewed by the principal investigator (PI) to make sure his request is accomplished.

Data of children with NAVIs were including all variables with primary and secondary outcomes. The data collection instrument included categorical variables, including the victim's sex, caregiver's relationship with the victim, parents' information, abuse information, socio-demographic characteristics of victims and offenders, current health status of the victim, perpetrator's sex, marital status, employment, education level, health condition, and relationship with the victim; numerical variables, including the victim's age, length of hospitalisation, and perpetrator's age; and outcome variables, including the prevalence of NAVIs, organ(s) affected by NAVIs, victim's disposition, length of hospitalisation, and discharge status.

Statistical Analysis

The data of children with NAVIs were described, including patterns of injuries, socio-demographic characteristics, and abuse outcomes, using frequencies and percentages for categorical data and means and standard deviations for numerical data. An appropriate standardised test was performed using the Statistical Package for the Social Sciences (SPSS) software to determine the co-association from the test of central tendencies. Chi-square or Fisher's exact test was used to assess the relationship between the injury type and the patient's characteristics. Confidence intervals were computed, and a p-value < 0.05 was considered statistically significant.

Ethical Considerations

Information obtained from a secure and confidential database was encrypted and was not leaked to any individual; therefore, informed consent was not required. Ethical approval was obtained from the Institutional Review Board of King Abdullah International Medical Research Centre, Riyadh, Saudi Arabia (No#NRC22R/155/03).

There is no direct benefit or harm to the researchers or individuals; however, the results of published data will be communicated to the policymakers for the formulation of appropriate rules and regulations. Subjects' privacy and confidentiality are assured, no identifiers will be collected, and all data will be kept in hard and soft copies in a secure place within the National Guard Health Affairs (NGHA) premises.

Results

Table 1: Demographic information on the victims of non-accidental visceral injury (n=30)

	Number (%)
Age	
Mean (year)	6.5±4.7
Sex	
Male	12 (40.0)
Female	18 (60.0)
Living arrangement	
Both parents	24 (80.0)
Single parent	6 (20.0)
Victim's health before abuse	
Healthy	24 (80.0)
Chronic illness	2 (6.7)
Unknown	4(13.3)
Previous history of abuse	
Yes	7 (23.3)
No	14(46.7)
Unknown	9 (30.0)
Alleged perpetrator known	
Yes	24 (80.0)
No	6 (20.0)
Victim's admission	
Ward	14(46.7)
Emergency room/Clinic	8 (26.7)
Intensive care unit	7 (23.3)
Mortuary	1 (3.3)
Victim's final health status	
Well	15 (50.0)
Deterioration of health status	7 (23.3)
Unknown	6 (20.0)
Dead	2(6.7)

Table 1 shows the socio-demographic characteristics of the NAVI victims, including age, sex, living arrangements, previous history of abuse, and final health status. The participant's mean age was 6.5±4.7 years, and 40% were male. More than three-quarters (80%, n=24) of the participants lived with both parents, while 20% had a single parent. Nearly one-quarter (23.3%, n=7) of the victims reported having experienced previous abuse. Almost half (46.7%, n=14) of the participants were admitted to the hospital ward, (26.7%, n=8) to the emergency room/clinic, and (23.3%, n=7) to the intensive care unit. Regarding final health status, nearly a quarter (23.3%, n=7) of the victims reported deterioration of their health status, and (6.7%, n=2) died.

Table 2: Anatomical location of non-accidental visceral injury!

Visceral injury	Number (%)
Lung	7(23.3)
Liver	6 (20.0)
Small intestine	4(13.3)
Pancreas	3(10.0)
Stomach	2(6.7)
Kidney	2(6.7)
Scrotum	1 (3.3)
Vagina	1 (3.3)
Heart	1 (3.3)
Multiple sites	3(10.0)

Percentages may not add up to 100 because of rounding

There was a sharp increase in NAVI cases over the five-year period, particularly after 2020, from two cases per year in 2017 to nine cases in 2021 (Figure 1). (Figure 2) shows the year-to-year variation in NAVI rates calculated from child population data ranging from 1.9 to 8.3 per ten million population between 2017 and 2021, indicating that the injury rates varied widely per year.

NAVI predominantly affected children aged 5-10 years (40.1%), followed by children aged <5 years (33.3%) and >10 years (16.6%) (Figure 3). Lung injury was the most common form of NAVI, accounting for 23.3% of the cases, followed by injury to the liver (20%), small intestine (13.3%), and pancreas (10%). **(Table 2)**

Figure 1: Estimated number of cases of non-accidental visceral injury (2017-2021)

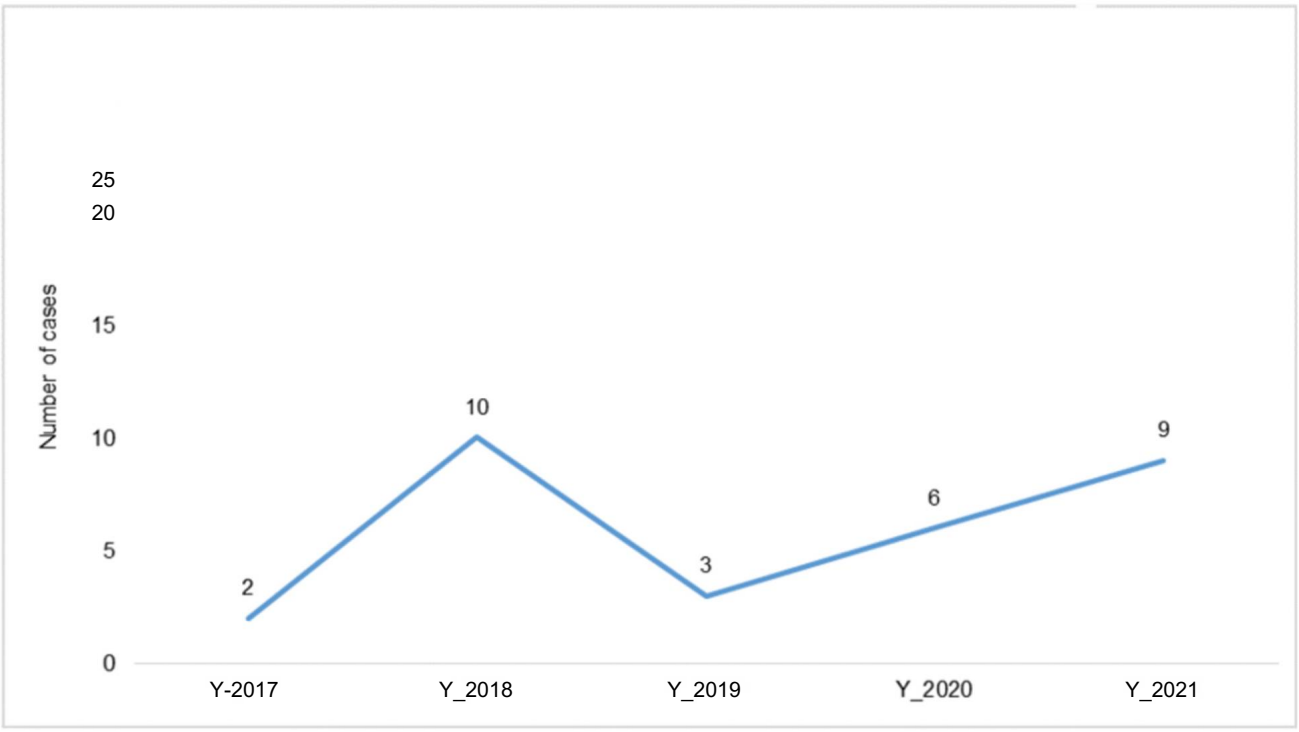


Figure 2: Estimated rates of non-accidental visceral injury (2017-2021)

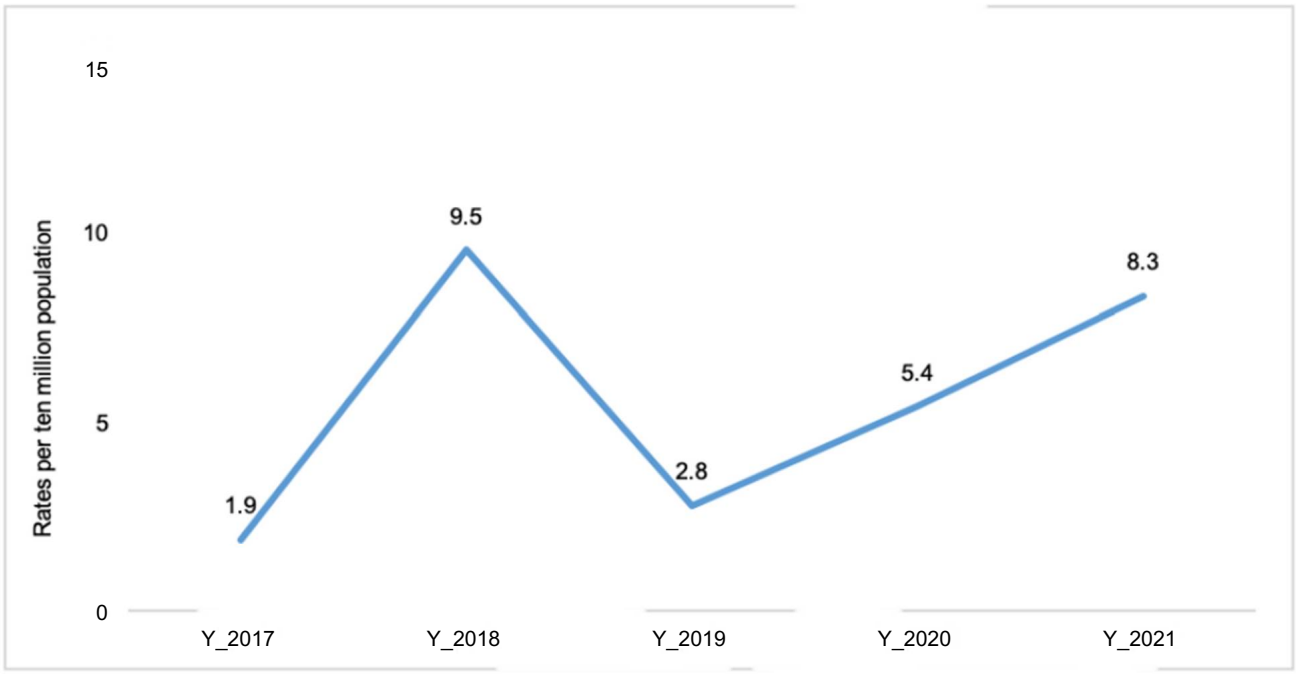
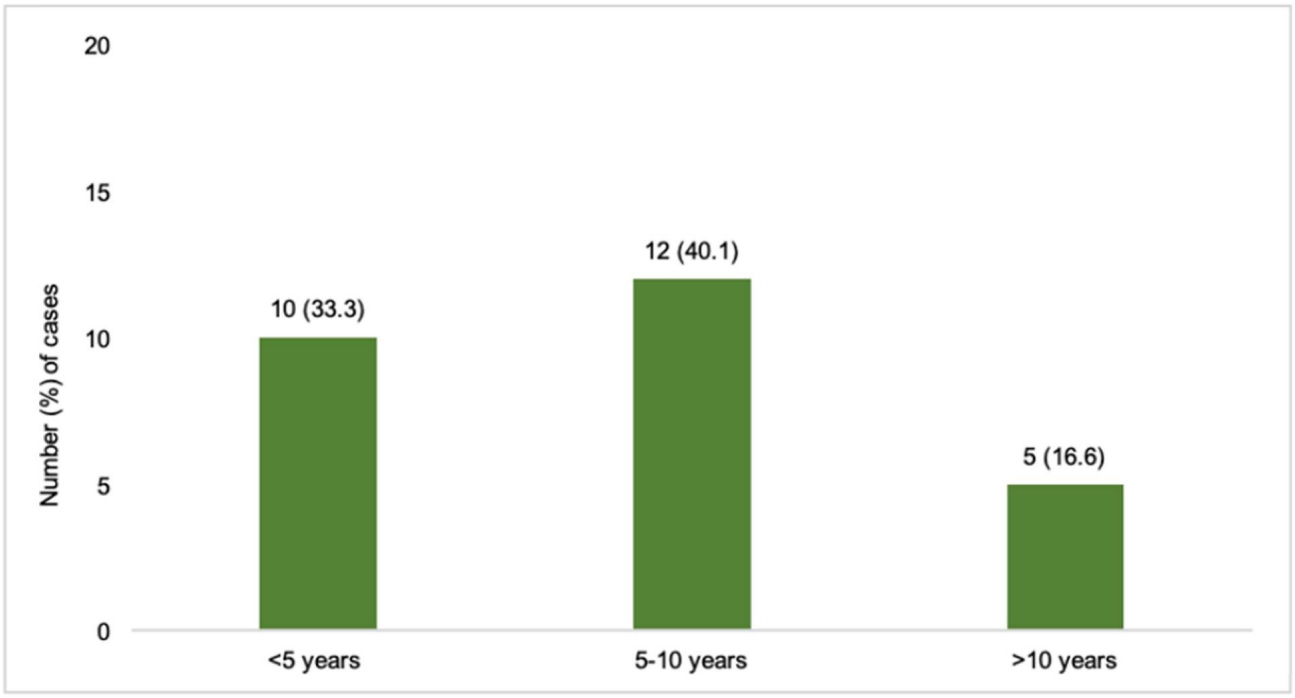


Figure 3: Age distribution in years for non-accidental visceral injury cases[1]



[†] *Percentages may not add up to 100 because of missing data*

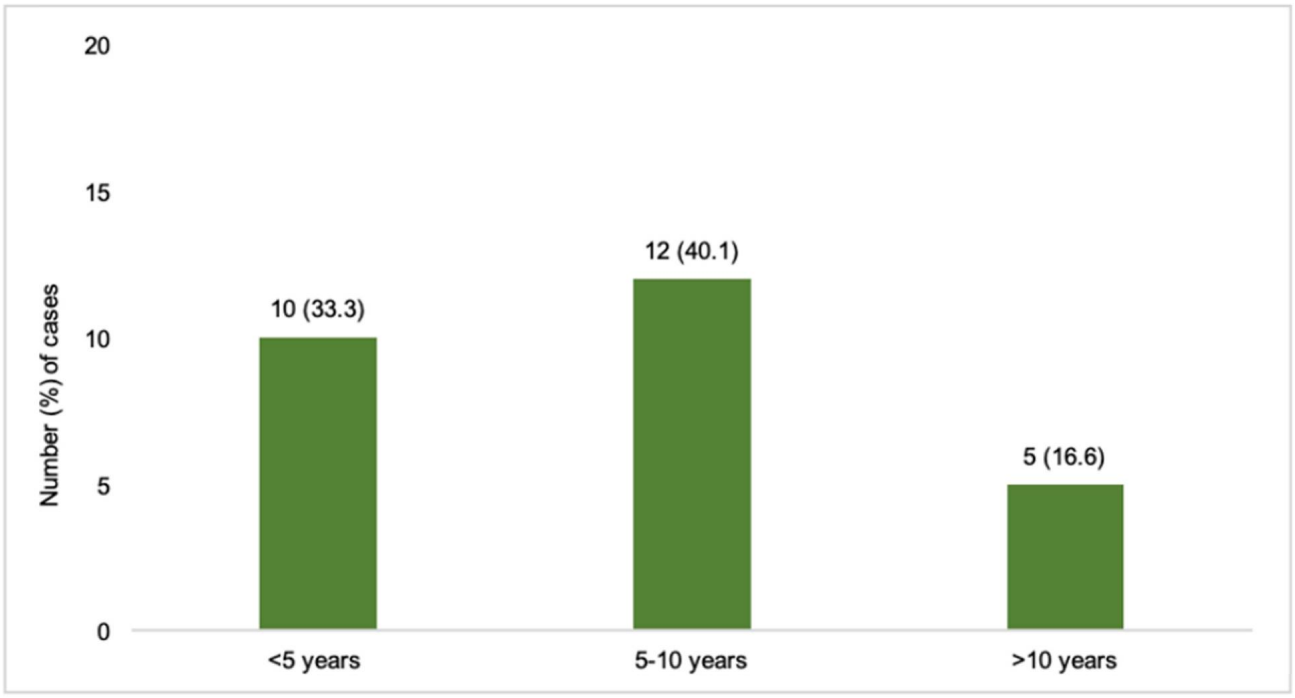
Table 3: Characteristics of the known perpetrators of non-accidental visceral injury (n=24)[f]

	Number (%)
Relationship with victim	
Both parents	2 (8.3)
Father	5 (20.8)
Mother	5 (20.8)
Sibling	6(25.0)
Others (e.g., relatives)	6(25.0)
Age group (year)	
≤18	8(33.3)
19-30	7 (29.1)
31-40	6 (25.0)
41-50	3 (12.5)

	Number (%)
Sex	
Male	15 (62.5)
Female	9(37.5)
Marital status	
Married	10(41.6)
Single	10(41.6)
Divorced	3 (12.5)
Separated	1 (4.2)
Level of education	
Illiterate	3 (12.5)
Elementary school	4(16.7)
Intermediate school	3 (12.5)
High school	13 (54.1)
Higher education	1 (4.2)
Employment status	
Employed	7(29.1)
Unemployed	6 (25.0)
Student	6 (25.0)
Housewife	5 (20.8)
Health condition	
Healthy	20 (83.3)
Chronic illness	2(8.3)
Addict	2(8.3)

[†]*Percentages may not add up to 100 because of rounding*

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41-50	3 (12.5)

Among children who had experienced NAVI, siblings were the perpetrators in 25% of the cases, followed by fathers (20.8%), mothers (20.8%), and both parents (8.3%). One-third (33.3%) of the perpetrators were ≤18 years old, followed by the age groups 19-30 years (29.1%), 31-40 years (25%), and 41-50 years (12.5%). More than half (62.5%) were males, and (41.6%) were married. Regarding the perpetrators' highest level of education, over half (54.1%) had completed high school education, followed by elementary school (16.7%) and intermediate school (12.5%) education. Nearly one-third (29.1%) of the perpetrators were employed, and most (83.3%) were healthy **(Table 3).**

Discussion

Child physical abuse, especially those leading to visceral injuries in victims, is a serious issue that may be easily missed, as not all victims exhibit external signs that indicate physical abuse. Therefore, awareness of the variability in the presentation of visceral injuries would facilitate early diagnosis and better outcomes[11]. The incidence of physical abuse in Saudi Arabia has increased, as previously assessed over three periods, 2000-2004, 2005-2006, and 2007-2008, with 14, 16, and 35 reported cases, respectively[12]. The present study showed a variable increase in incidence: two cases per year in 2017, rising to nine cases in 2021. This sharp increase in numbers of NAVI cases could be related to multiple reasons; such as increase public awareness and health practitioners toward abuse cases, which in turn increases the reporting practices. Moreover, during this five years, there has been an announcement of "Protection against abuse" law that led people to be more conscious about abuse and as consequence increases the reported cases. Similarly, the rate of NAVI cases has a spike increase after 2017 that might be associated with increased number of child protection centers in the healthcare sectors and increase in public awareness campaigns.

The mean age of the victims was 6.5±4.7 years, which differs from the mean age of 2.1 years and 14±2 months reported in international studies[13]. We noticed that visceral injuries tended to show a slight female predominance, whereas other non-accidental injuries were occurred more frequently in males[14]. In addition, 54% of NAVI cases presented at Children's Hospital in Denver, USA, between 1996 and 2002 were females; however, the incidence of non-visceral cases in males was higher (59%)[15]. Similar findings in Saudi Arabia showed a male predominance (59%) in non-accidental fracture incidence[16].

Upon analysing the characteristics of the known perpetrators in the NAVI, we found no similar published data for comparisons; therefore, we compared it with the profile and family structure of child abuse and neglect cases in general. Half (49.9%) of the known perpetrators were one or both parents, while the other half were siblings and other relatives. These results likewise those of studies conducted in the United Kingdom [17]. In the United States, parents were mostly the offenders[18]. In the present study, males comprised the majority of perpetrators

(62.5%), and 62.4% of all abusers were less than 30 years old, similar to international data[17]. Moreover, more than half (54.1%) of the perpetrators had a high school degree, whereas only one had a higher education level. There are significant variations in the literature regarding the association between the perpetrators' levels of education and child abuse. Different studies have suggested that child abuse is often perpetrated by those with limited education or no high school degree[19,20]. Another study showed that child abuse is more common among highly educated perpetrators[21]. However, one study concluded that there was no definite relationship between these variables[22]. Our results showed that 29.1% of the perpetrators were employed, which is consistent with data found in national and international studies[21,23].

This study revealed that nearly half (46.7%) of the victims were admitted to the hospital ward because of NAVI. A study in 2019 that came to a similar conclusion stated that most children who had experienced current or previous physical or visceral abuse were admitted to wards[24]. Regarding clinical and emergency check-ups, only 26.7% of the cases in the present study required such care before discharge. In contrast, a study published in 2012 reported that more than half (57%) of the children with NAVI required only clinical visits or emergency care units [2S]. Nearly a quarter (23.3%) of the victims in this study experienced a deterioration in their medical status, consistent with the findings of previous studies. A study published in 2012 revealed that two-thirds of the victims had pre-existing chronic health issues, and their secondary health status worsened because of maltreatment and abuse[24]. Additionally, this study reported a 6.6% mortality rate due to NAVI, which is significantly lower than that in international records (53%)[14].

Our data showed that the lungs and liver were the most commonly affected organs, accounting for 23% and 20% of the cases, respectively. The high rates of liver injuries were consistent with those of previous studies that reported that fiver injuries comprised almost two-thirds of all hospitalisations due to NAVI[26,27]. However, as most of the studies were concerned with intra-abdominal injuries only, the rate and percentage of lung injuries were not assessed, considering the lung as an intra-thoracic organ. Another study reported that the duodenum was the most injured intra-abdominal organ and showed a certain level of variability among the most affected organs[28]. Pancreatic injuries were found in 10% of cases in this study, which is lower than the 17% reported in a case series[29]. Kidney injuries were less frequently reported, accounting for 6.7% of all cases, although other studies have reported higher percentages of renal injuries in abusive abdominal trauma, ranging from 19% to 25% [26,29].

This study has some limitations. First, the sample size was relatively small, which may have affected the generalizability of the findings. Second, the investigation was limited to information included in the National Family Safety Registry (NFSR), which may not have provided a complete picture of NAVI among children in Saudi Arabia.

Finally, missing data were reported throughout the data collection process, which may have influenced the accuracy and completeness of the results.

Conclusions

This study provides important information on the socio-demographic characteristics, injury patterns, and perpetrators of NAVd in children. The results highlighted that NAVI predominantly affects children aged 5-10 years, with lung and liver injuries being the most common, and that the victims' siblings and parents were the most common perpetrators. This study provides valuable insights into the characteristics and outcomes of NAVI in children in Saudi Arabia. Moreover, the trend of increasing number of NAVI cases over the five years was significant, which might continue to persist in the coming years. As a results of this study further research to establish a comprehensive understanding of NAVI is demanding. Due to that its essential to develop some effective prevention strategies to address this important public health issue and reduce the incidence of NAVI in children.

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Declarations

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Conflict of interest: None declared

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