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A Study of Morbidity and Burden of Stray Dog Injuries in Children: An Institutional Experience

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ABSTRACT

Introduction: Dog bite injuries are common in developing countries. Most of the reported cases in western countries are domesticated dog bite injuries while in developing countries it is stray dog attacks that are more common. We aim to study the morbidity due to stray dog injuries, their surgical management in severe cases and suggest preventive strategies to curb this widely prevalent menace.

Methodology: Data all of consecutive cases of dog bite injuries based on selected criteria treated at a tertiary care centre were collected. Emphasis was upon the cases that were severe and requiring surgical repair in operating room. All the data collected were analyzed and evaluated.

Results: Nineteen children with dog bite injuries treated between January 2019 to June 2022 of which nine cases underwent surgical procedures in operating room. All the children were attacked by stray dogs and six of them were attacked by packs of stray dogs. The mean duration of hospitalization was around 6 days with a range of 4 days to 9 days. Days of absenteeism in school ranged from 4 days to 10 days with a mean of 7 days. The economic burden to the family due to the hospitalization ranged between 1200 INR to 2700 INR with a mean of 1800 INR.

Conclusion: Dog bite injuries account for a large portion of preventable injuries in children. Prompt medical attention is required in all the cases. Many may require surgical management specially involving group of dogs. Both active and passive immunization helps prevent wound infection and suture breakdown. Apart from physical, psychological impact they cause economic impact also on the healthcare system as well as the involved families. Much attention is required towards prevention of these injuries. We recommend introduction of awareness programs regarding engaging with dogs in school curriculum. Civic bodies need to bring in stringent protocols for managing stray dogs. We recommend NGO should help set up shelter homes to keep the stray dogs off the streets and help navigate their vaccination drive. Preventing such injuries is the only way to prevent morbidity and burden due to dog bite injuries.

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Introduction

Dogs form an integral part of the society and our homes. Stray dogs are becoming a menace [1]. The reported incidence of dog bite injuries is 12.9 per 10000 population in western literature [2]. It is the most common type of animal bite cases reported. Children are more prone to dog bite injuries than adults [3]. In the year 2019, according to the ministry of health government of India, there were 72,77,523 cases of dog bite injuries reported in India. The same was 46,33,493 in 2020 and 17,01,133 in 2021. There were many cases of deaths also reported among them. These numbers are just the ones which are reported

at a government treatment facility excluding the ones treated at private institutions [4]. These injuries can be devastating at times when packs of dogs attack an infant. Deaths due to such cases are also reported [5]. These injuries can be prevented by creating awareness and taking steps to reduce the stray dog menace [6]. This study aims to describe severe cases of dog bite injuries, their management and prevention.

Methodology

Data of all the cases of dog bite injuries treated at our centre were reviewed and those severe cases requiring surgical procedures in the operation theatre were

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included in this study. Parameters taken into consideration were age of the child, gender, location of bite, number of injuries, if attacked by single or pack of dogs and a stray dog or pet dog attack. Attention was also given to ascertain if these attacks were provoked or unprovoked and timing of bite. Finally, outcome of these cases were noted and analyzed. All the cases were treated at the Department of Pediatric Surgery at our institute between January 2019 to June 2022. Morbidity parameters included in the study were number of days of hospitalization, number of school days missed and its economic burden to the family *via* a questionnaire administered at the time of follow up.

Case reports

Case 1: 6 years female child attacked by group of dogs, came with multiple lacerated wounds on the scalp. The wounds were bone deep and few were wide gaping with loss of tissue exposing the underlying bone. She was managed conservatively and the wide gaping wounds needed tucking sutures. She was given local and Intravenous Immunoglobulin (IVIG) apart from Anti-Rabies Vaccines (ARV).

Case 2: Another 6 years female was attacked and mauled by group of dogs. She had severe loss of scalp tissue extending almost from the frontal hair line anteriorly to beyond vertex posteriorly. Medially and laterally it extended between the bi-parietal prominences. The underlying bone was exposed. There were multiple abrasions on the neck and skin-deep puncture wounds over the chest wall. Once stabilized, multiple burr holes were made in the exposed skull outer table and planned further for skin grafting once a good granulation bed was present. Received IVIG and ARV post exposure schedule.

Case 3: 11 years male child was referred with degloving injury to penis after being attacked by a dog. This child had complete circumferential degloving of the shaft skin. There was no urethral injury noted. Child underwent emergency surgical repair of the degloving injury. Child received ARV as per schedule.

Case 4: Nine years female child was attacked by group of dogs. She has multiple skin-deep puncture wounds on her left shoulder, right shoulder and arm, multiple abrasions over right thigh and a large laceration over the scalp. Local and Intravenous Immunoglobulins (IVIG) were administered and started on vaccination regimen.

Case 5: Six years male child attacked by a dog causing injuries to his penis and scrotum. He has a lacerated wound at the root of penis exposing the shaft of penis. The foreskin was blackened and edematous. The left scrotal skin was avulsed and the underlying testis was exposed. No urethral injury noted. Emergency surgical

repair was done. Started on post exposure vaccination schedule.

Case 6: Five years female child attacked by multiple dogs. There was 10 by 5 cm defect in the scalp with exposed underlying skull. After stabilizing the child, she was taken in the OT for scalp repair. She underwent multiple Z-plasty to ensure scalp cover was complete. Also received active and passive immunization.

Case 7: Eight years old male with complaints of dog bite over penile shaft. Degloving injury noted in mid shaft penis. No urethral injury seen. Underwent emergency repair of degloving injury. Immunoglobulin and vaccination were given.

Case 8: Ten years male child was attacked by multiple dogs with facial injuries. He has multiple abrasions over cheeks and nose. There was a large gaping lacerated wound extending from left angle of mouth towards angle of mandible. Not a through and through injury. Parotid gland was intact. Underwent repair of the injury with active and passive immunization. There was no salivary fistula noted in the post-operative period.

Case 9: Five years male child referred with history of being attacked by group of dogs. He has multiple injuries on the abdomen and chest. Facial injuries were note in the left tempero-parietal and forehead regions. Laceration over right buttock noted. Had a laceration in the left lumbar region through which omentum was seen herniating. Multiple small stab wounds noted in the right arm, right hypochondrium, left flank and right thigh. After initial stabilization, underwent exploratory laparotomy where jejunal perforation and contamination noted. Multiple muscle defects noted below the stab wounds over the abdomen. Underwent primary repair of jejunal perforation and repair of muscle defects. Received both immunoglobulin and ARV.

Results and Discussion

There were total of 19 cases of dog bite injuries treated during the time period of which nine required surgical procedure in the operating room who were selected for this study. The age of the children ranged between 5 years to 11 years with a mean of 7.3 years. There were 4 female and 5 male children. The nature and number of injuries are described case-wise below. Six of these 9 were cases where children were attacked by group of dogs. The rest of 3 cases were male children whose genitalia was attacked by a single dog. All the cases were stray dog attacks and none were by domesticated dogs. All these attacks were unprovoked and during the first 6 months of a calendar year. Most common time of attack was in the evening between 4 PM to 5 PM. The mean duration of hospitalization was around 6 days with a range of 4 days to 9 days. Days of absenteeism in school ranged from 4 days to 10 days with a mean of

7 days. The economic burden to the family due to the hospitalization ranged between 1200 INR to 2700 INR with a mean of 1800 INR.

Dog bite injuries in children continues to loom as a large chunk of public health problem, especially in children [6]. The various morbidity from dog bite trauma can include severe blood loss, large soft-tissue losses, lacerations, abrasions, infection and scars, both psychological and physical. Even though, mortality is quite less following dog bite injuries, several deaths continue to be reported every year, especially in infants and toddlers as a result of multiple dog maulings [7]. The primary objective of the present study was to characterize the nature and severity of dog bite injuries treated over a 1-year period at a large tertiary care pediatric surgical hospital with a specific intent to focus on the cases needing surgical intervention. We also intend to identify and fill lacunae in awareness of public education and injury prevention.

Pediatric dog bite injuries are preventable, yet they persist as a prevalent public health problem [8]. Children continue to be at much greater risk of sustaining a serious dog bite injury than adults. Facial injuries are the most commonly reported injury owing to the fact that head is disproportionately larger in children compared to adults [9]. Also limited motor response of these children to provide defense while under attack also makes them more vulnerable for injuries. A summary of location of injury is depicted in Figure 1.

The grievous nature of the injuries reported in this series poses a serious question mark on the current policy for stray dog management. Complete avulsion of the scalp, complete degloving injury to the genitalia and exploratory laparotomy following dog bite injury are very rare and even rare to find such case reports. These grievous injuries can be seen in Figure 2.

All the dog bite injuries were due to stray dogs and none

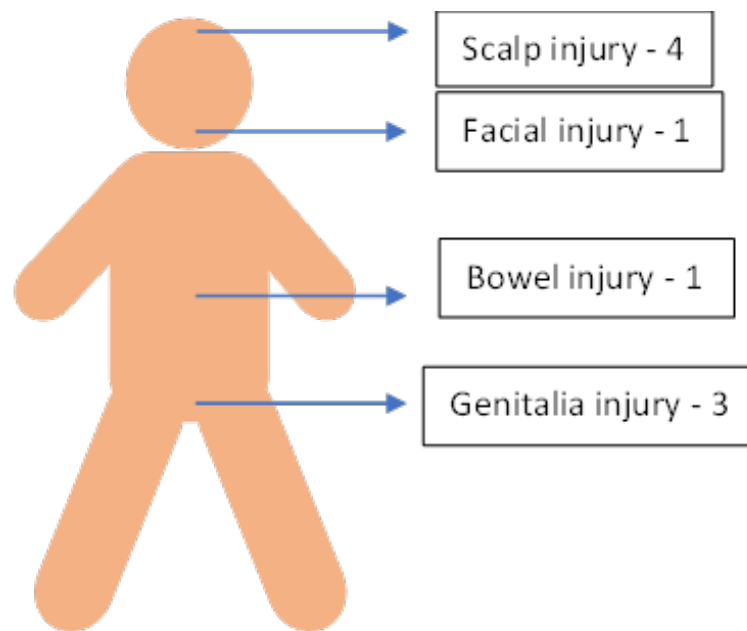


Figure 1. Showing summary of location of injury.

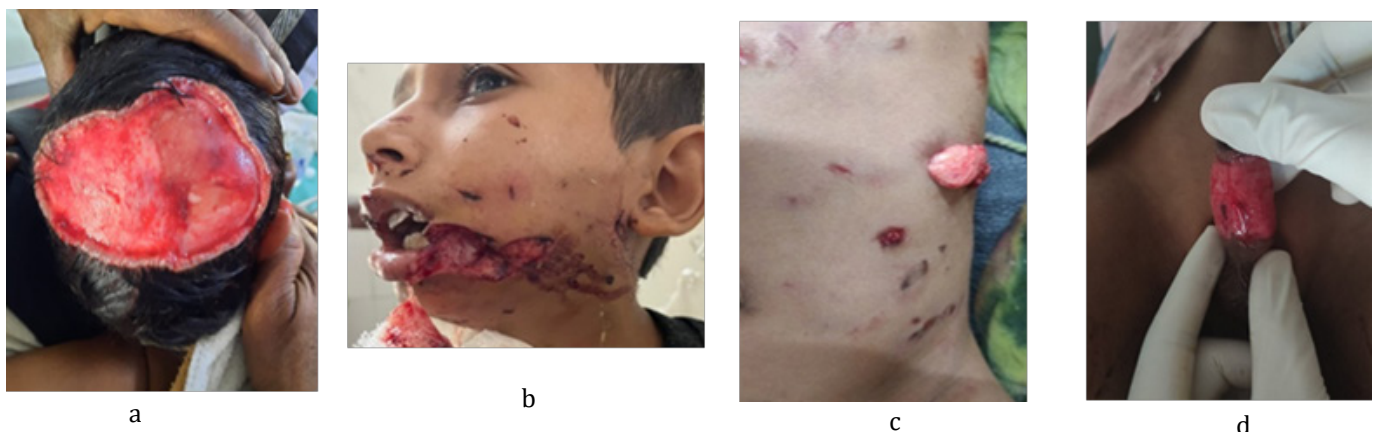


Figure 2. Showing injuries of different cases. **Note:** a. Scalp injury; b. Facial injury; c. Bowel injury; d. Genitalia injury.

by domesticated dogs. The most commonly reported time of attack was in the evening between 4 PM to 5 PM except in two cases where the attack was reported in the morning between 7 AM to 9 AM. All the cases were clustered during the first six months of the calendar year which is not a typical breeding season for dogs [10], hence the reason for unprovoked attacks cannot be attributed to breeding season. The most commonly involved site of injury was scalp seen in 4 cases followed by degloving injury of genitalia in 3 cases.

Cases 2 and 6 had severe injury and tissue loss over the scalp. Case two underwent multiple burr holes in the exposed scalp and skin grafting once a good granulation tissue bed was achieved. Case six underwent multiple Z-plasty for achieving complete skin cover. All the degloving injuries of genitalia in cases 3, 5 and 7 were managed by surgical repair. None of the cases had urethral injury noted during repair and in the follow up none had difficulty in micturition. Cases 1 and 4 had deep lacerated wounds over scalp which were repaired with loose tacking sutures. Case 9 required a laparotomy in view of exposed omentum from one the puncture wounds over abdominal wall. There was a jejunal perforation noted which was repaired primarily along with multiple muscle defects around other stab wounds. Apart from this case, we found 7 other cases in published literature [11-20], summary of which can be found in Table 1. All the cases received both active and passive immunization. There were no wound infection and surgery related complications noted in any child during 3 months post procedure period.

The physical and psychological consequences of being attacked by a dog or a group of dogs can be devastating [12]. The hospital resources are also utilized for their treatment which is completely avoidable by preventive measures. While some dog bite awareness is in existence, more attention is required to prevent such injuries. Dog bite prevention can be improved by age-appropriate educational measures. The public, dog owners and their children, should be familiar with the rules for engaging the dogs [13]. Society plays an important role in prevention of such injuries. Parents need to avoid letting children out alone, especially in post monsoon seasons which is a breeding season for dogs and schools should inculcate safety awareness program in their curriculum.

Apart from physical and psychological effects, there were economic burden as well due to these injuries. This was mainly due to the fact that the working person in the family could not go to his/her work due to the hospitalization of his/her ward. The mean hospital stay following surgical repair was 6 days. Due to this the mean economic loss to the family was 1800 INR since most of them were daily wage workers. While this economic loss was personal, the hospital also spent resources required in the Operation Theatre (OT) during their surgical repair which could have been better utilized as this could be easily preventable. The child also missed his school due to hospitalization and recuperating from surgery. Mean days of absenteeism from school was 7.

Table 1. Severe cases of dog bite injuries reported in literature with injury to hollow viscera.

Author and year	Age	Injury site	Viscera injured	Management	Outcome	Reference number
Garnik et al. 2023	2 years	Abdomen	Ascending colon	Primary repair	Wound dehiscence	[11]
Diau et al. 1995	1 year 7 months	Left flank	Ileum	Resection anastomosis	Uneventful recovery	[15]
Arif et al. 2006	7 years	Left neck	Esophagus	Primary repair	Uneventful recovery	[16]
Baeza et al. 2012	2 years	Abdomen	Stomach	Primary repair	Uneventful recovery	[17]
Mitul et al. 2015	2 years 3 months	Abdomen	Stomach	Primary repair	Uneventful recovery	[18]
Singh et al. 2018	6 years	Abdomen	Stomach	Primary repair	Uneventful recovery	[19]
Palmer et al. 2019	2 years	Scrotum	Small bowel (Inguinal herniation)	Resection anastomosis	Delayed leak requiring ileostomy and closure	[20]
Current study	5 years	Abdomen	Ileum	Primary repair	Uneventful recovery	-

A lot of public health money is being utilized for treatment of dog bite injuries which can be avoidable. This money and resources can be better utilized and directed towards treatment of other public health problems. Preventive strategies could be setting up Non-governmental Organizations (NGO) for stray dogs and vaccinating stray dogs. Sterilizing stray dogs could be the only method to keep the stray dog menace under check. According to a report, there are about 6.4 crore stray dogs in India. And the same report also says there are about 88 lakh stray dogs which are in shelter homes [14]. So, there is a huge need for NGO run dog shelter homes to tackle this fast-rising problem.

Conclusion

Dog bite injuries account for a large portion of preventable injuries in children. Prompt medical attention is required in all the cases. Many may require surgical management specially involving group of dogs. Both active and passive immunization helps prevent wound infection and suture breakdown. Much attention is required towards prevention of these injuries. We recommend introduction of awareness programs regarding engaging with dogs in school curriculum. Civic bodies need to bring in stringent protocols for managing stray dogs. We recommend NGO should help set up shelter homes to keep the stray dogs off the streets and help navigate their vaccination drive. Preventing such injuries is the only way to prevent morbidity and burden due to dog bite injuries.

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Conflict of Interest

None to declare.

Author's Contribution

Vinod Raj, Ram Mohan Shukla and Manoj Joshi designed the study; Vinod Raj, Manoj Joshi, Pooja Tiwari and Ram Mohan Shukla collected the data for the study, Vinod Raj, Shashi Shankar Sharma, Ashok K Laddha and Manoj Joshi analyzed the data; Vinod Raj, Manoj Joshi and Brijesh K Lahoti wrote the manuscript.

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