Prevalence and pattern of maxillofacial injuries and treatment outcome after bear attacks in Jharkhand population

ABSTRACT
Introduction: Sloth bear, a native species of Indian subcontinent, has a population estimate of 1200–1500 in Jharkhand. Human habitats in proximity to forest reserve cause frequent human–bear interactions and thus bear attack injuries. Face is the most common site affected. This is a prospective study performed to evaluate the incidence and pattern of maxillofacial trauma after bear attack and the outcome of the treatment provided to them.

Materials and Methods: Patients with bear attack injuries reporting to the outpatient department were recruited for the study. The incidence was recorded in terms of time, month, and site. Details of maxillofacial wounds and fractures were noted. The variables used to analyze the outcome of the treatment were ugly scar, facial asymmetry (eyelid, nose, cheek, and lips), facial nerve paralysis, loss of vision, and alopecia.

Results: Majority of the cases were reported in April and March. Victims were from Ranchi 4 (26.6%), Gumla 3 (20%), Lohardaga 2 (13.3%), Latehar 2 (13.3%), Simdega 1 (6.6%), Ramgarh 1 (6.6%), Khunti 1 (6.6%), and West Singhbhum 1 (6.6%) districts of Jharkhand. Zygoma (10) was the most affected fractured bone, followed by frontal (9) and mandible (6). Minor ugly scar was found in 14 (93.3%) of the patients, postoperative facial deformity in 12 (80%), unilateral facial paralysis in 2 (13.3%), and alopecia patch in the scalp in 1 (13.3%).

Conclusion: Spring and early summer are the breeding seasons of sloth bears in Jharkhand. Mahua petal which attracts the wild bear falls from trees during these months causing such human attacks. Loss of vision describes the mutilating nature of bear attack.

Keywords: Bear attack, fracture, Jharkhand, maxillofacial injuries

INTRODUCTION
Humans are persistently encroaching into the habitat of wild animals. Increased proximity of humans and wildlife has led to increased human–wildlife interactions. Of the many wild animal–human conflicts known in the state of Jharkhand such as tiger, elephant, and bear, the latter is the most feared one. There are eight different species of bears that are found on the earth, of which four – Asiatic black bear, Himalayan brown bear, Malay sun bear, and sloth bear – are found in India.[1] The sloth bear is a myrmecophagous bear species native to the Indian subcontinent. The state of Jharkhand is one of its prominent territories and the only bear species found in its forest reserve areas. The approximate range of sloth bear habitat spreads to 15,000 km² in the state. It is presumed that the average number of bears is 8–10/100 km² in the state.[2]

As per the estimate of the forest department, number of sloth bears in Jharkhand could be between 1200 and 1500.[3] Bears

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use their arms more than their jaws to attack their victims. Their heavy arm can produce power up to 100 Newton and cause injuries varying from small abrasion to mutilating and fatal injuries.[14]

Bear encounters can be categorized as sudden, provoked, or predatory. Sudden encounters are purely coincidental, such encounters are usually defensive, whereby the bears try to protect their cubs or their food or their territory. Provoked encounters occur with hunters and wildlife photographers. Predators attack where they see victims as their food source.[14] Cranio-maxillofacial region is the most common and vulnerable site which gets affected during the bear attack. With the above background, a prospective study was done to evaluate the incidence and pattern of maxillofacial trauma after bear attacks in Jharkhand and the outcome of the treatment provided to them.

MATERIALS AND METHODS

Patients reporting to the department of oral and maxillofacial surgery or central emergency with maxillofacial injuries due to bear attack in the time period from June 2018 to May 2020 were included in the study. The present study was initiated after ethical clearance from the institutional ethical committee (Memo no-62, IEC, RIMS). The incidence of bear attack was recorded in terms of time, month, and site. A comprehensive history was taken from all the patients with the help of their attendants, including the circumstances which led to their encounter. Soft-tissue injuries and skeletal injuries in the facial region were evaluated. Routine investigations including computed tomography of the face with three-dimensional reconstruction were done in all patients. All the details of the maxillofacial wounds and fractures were noted in a pro forma specially designed for the study.

Any airway complications were dealt with by providing proper resuscitative measures, including tracheostomy (if needed). Anti-rabies vaccination (according to the WHO regimen) and a tetanus toxoid injection were given to all the patients. In the operating theater, the wounds were thoroughly cleaned and surgical debridement and exploration were done. Minor lacerations were closed primarily whereas complex wounds with soft tissue defects closed secondarily with local flaps. The bony fracture was treated with open reduction and internal fixation except for grossly comminuted fractures. Patients were followed on a regular basis after being discharged from the hospital. Secondary surgeries were done, if deformity and esthetic correction were required. During the follow-up, outcome of the treatment was analyzed clinically through parameters such as ugly scar, facial deformity (eyelid, nose, cheek, and lips), facial nerve paralysis, loss of vision, and alopecia. Scar was rated in terms of the Visual Analog Scar scale of 0–10 (excellent to poor).[15] Any scar which has rating of ≥1 but <10 after 6 weeks of incidence was noted as minor ugly scar.

All the primary and secondary variables were noted and subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) software, IBM, Endicott, New York, USA. Z-test was performed, and P value was calculated and found significant if P < 0.05.

RESULTS

A total of 15 cases of bear attack injuries with maxillofacial trauma were reported during the study period. Among them, 11 were males and 4 females, and the age ranged from 16 to 53 years with a mean age of 34.2 years.

- Monthly distribution – Majority of the cases were reported in April 5 (33.3%), followed by March 4 (28.5%), and were found to be statistically significant at P = 0.01 and 0.03, respectively. The remaining distribution was May 2 (14%), June 2 (14%), August 1 (7%), and October 1 (7%) and was found to be statistically nonsignificant.
- Time distribution – All the occurrences were reported in daylight, with most of the attacks in the morning accounting for 9 (60%) cases, followed by 5 (33.3%) cases in the afternoon and 1 (6.6%) case in the evening.
- Demographic distribution – Victims were from Ranchi 4 (26.6%), Gumla 3 (20%), Lohardaga 2 (13.3%), Latehar 2 (13.3%), Simdega 1 (6.6%), Ramgarh 1 (6.6%), Khunti 1 (6.6%), and West Singhbhum 1 (6.6%) districts of Jharkhand [Figure 1].
- Facial bone distribution – Zygoma was the most commonly affected bone ten (66.6%), followed by frontal 9 (60%), mandible 6 (40%), maxilla 4 (26.6%), orbit 4 (26.6%), and nasal 2 (13.3%) patients, respectively, which was found to be statistically nonsignificant at P > 0.05 [Table 1].
- Treatment outcome – Minor ugly scar was found in 14 (93.3%) of the patients, postoperative facial deformity in 12 (80%) in which eyelid was involved in 2 (13.3%), nose in 3 (20%), cheek in 6 (40%), and lips in 1 (6.6%).

Table 1: Site of distribution of affected facial bones

| Site      | Number of patients affected (%) | Z   | P  |
|-----------|---------------------------------|-----|----|
| Zygoma    | 10 (66.6)                       | 1.44| 0.07|
| Orbit     | 4 (26.6)                        | −0.66| 0.25|
| Frontal   | 9 (60)                          | 1.09| 0.13|
| Nasal     | 2 (13.3)                        | −1.36| 0.08|
| Maxilla   | 4 (26.6)                        | −0.66| 0.25|
| Mandible  | 6 (40)                          | 0.03| 0.48|
patient. Four (26.6%) victims had loss of vision on one side, two (13.3%) had unilateral facial paralysis, and one (13.3%) had alopecia patch in the scalp [Table 2].

DISCUSSION

In India, bear attacks are reported in many states and union territories from Kashmir to Karnataka and from Mizoram to Madhya Pradesh. The characteristic of sloth bear which is found in Jharkhand is different from other bear species found elsewhere in the country. Furthermore, due to the uniqueness of ecology and weather of Chota Nagpur Plateau, they have developed distinctive feeding and breeding habits compared to other bear species. Their attack pattern is also unique, and it is one of the most feared wild animals causing human causalities in this part of the world. Out of the 34 forest divisions in Jharkhand, sloth bears are found in 24 of them. The reserved forest areas of the state have sufficient sloth bear habitat which may sustain substantial sloth bear population.

In our study, it was found that most of the attacks were seen in early summers, followed by monsoon and winters. The month of March and April showed the maximum number of attacks accounting for 53.3% of total encountered cases, and it was statistically significant. Sloth bears breed during spring and early summer and give birth nearly the beginning of winter. Furthermore, in these 2 months, Mahua (Madhuca longifolia), a type of tree typically found in Jharkhand and surrounding states, sheds petals. Mahua petal attracts both the wild bear and local villagers to collect them, thus resulting in bear–human encounters. In two of our reported cases, victims went to the forest in search of Mahua. Ratnayeke et al. reported an increased number of sloth bear attacks during early summers in Sri Lanka. In contrast, Singh et al. found an increased sloth bear attack in winters in Central India. We noted that all the attacks occurred in daylight, 10 (66.6%) in the morning, and 5 (33.3%) in the afternoon. Bargali et al. also had similar observations while studying sloth bear attacks in Chhattisgarh.

Table 2: Complications seen after providing treatment to victims of bear attack

| Treatment outcome | Number of patients affected (%) |
|-------------------|--------------------------------|
| Ugly minor scar   | 14 (93.3)                      |
| Facial deformity  | 12 (80)                        |
| Eyelid            | 2 (13.3)                       |
| Cheek             | 6 (40)                         |
| Nose              | 3 (20)                         |
| Lips              | 1 (6.6)                        |
| Loss of vision in one eye | 4 (26.6) |
| Facial paralysis  | 2 (13.3)                       |
| Alopecia          | 1 (13.3)                       |
Sloth bear uses both the claws and teeth to attack the victims. Robert Armitage Sterndale, in his book “Mammalia of India” (1884), wrote “the victim being often terribly disfigured even if not killed, as the bear strikes at the head and face.” Face is the most common site which is affected during the sloth bear attack. Our study showed that zygoma was the most commonly affected facial bone (66%) which may be attributed to the fact that the zygomatic bone is more prominent in the facial skeleton, followed by frontal (60%), mandible (40%), maxilla (27%), and orbit (13%). A study conducted by Tirpude and Gupta found that 92% and 84% of the victims had injuries on the scalp and face, respectively. Similarly, Rayamajhi et al. (2015) in Nepal found that the majority of the victims had facial fractures (58.8%) and zygoma was the most frequent bone involved. The predominance of head and facial injuries during the sloth bear attack can be explained based on structural differences in comparison to other bear species. Sloth bears are smaller in size and have long claws and a powerful and thick tail. Hence, when they attack, they stand on their forelimbs, take support from the thick tail and use the claws to have a high ground of attack. During encounters, humans are in the erect position and being shorter than the bear in front of them, have their heads, and face in a very vulnerable position to sustain a blow.

Due to the mutilating nature of the bear attack, most of the patients who got the treatment had some form of permanent damage on their faces. Shear force generated by bear causes crushing injuries in bones, resulting in comminuted fracture and occasionally avulsion of the fragment facial bone. During open reduction of the fractured site, deformity cannot be avoided due to continuity defect. Facial disfigurement was seen in 80% of the patients, with cheeks (40%) accounting for the majority of the patients in our study. Rayamajhi et al. (2015) reported that 11 out of 17 patients required secondary correction surgeries after bear attack.

Minor ugly scar was the most common complication accounting for 93.3% of the victims. Patch loss of hair was found only in one patient in the scalp, and it was mild and manageable. Eye is the most susceptible sensory organ during a bear attack, and our study noted 26.6% victims with loss of vision in one eye. Rayamajhi et al. (2015) had a similar number of observations in Nepal, with 23.3% of the victims...
having unilateral vision loss. On the contrary, Patil et al. in Central India found only 6.6% of victims with blindness.[4,15] Unilateral facial nerve involvement was noted in 2 (13.3%) patients after 1 month of follow-up. Visceral injuries caused by bears were deep which led to severe facial disfigurement. Shah et al. (2020) noted the pattern of bear attack in Kashmir in which 12.94% of patients had visceral injuries.[6]

CONCLUSION

Decreasing habitat of animals, encroachments of humans in the forest, and uncertain nature of wild animals causes more frequent human–animal encounters. The sloth bear attack is different from other wild animals as the face is the most common targeted part during its attack. Restoring functional occlusion and providing esthetical appearance in the survivors remains a big challenge not only to the maxillofacial surgeons but also to plastic surgeons and otolaryngologists.

Declaration of patient consent

The authors declare that they have obtained consent from patients. Patients have given their consent for their images and other clinical information to be reported in the journal. Patients understand that their names will not be published and due efforts will be made to conceal their identity but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Sahajpal V, Goyal SP, Jayapal R, Yoganand K, Thakar MK. Hair characteristics of four Indian bear species. Sci Justice 2008;48:8-15.
2. Kumari A. Jharkhand Awarded for Bear Population Management. Ranchi: Times News Network; 11 Jan 2013. Available from: https://economictimes.indiatimes.com/news/environment/flora-fauna/jharkhand-awarded-for-bear-populationmanagement/articleshow/17974489.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst. [Last accessed on 2020 May 14].
3. Dey S. Five Sloth Bears Rescued from a Village in Deoghar. Ranchi: Hindustan Times; 14 Aug 2014. Available from: https://www.hindustantimes.com/ranchi/five-sloth-bears-rescued-from-a-village-in-deoghar/story-Jr6JpcPq5gbMfueqboMPK.html. [Last accessed on 2020 May 14].
4. Rayamajhi S, K KC, Shrestha JM, Lohani I. Pattern of bear maul injuries in tertiary hospital in Nepal: Demographic, management and outcome. J Soc Surg Nepal 2015;18:17-22.
5. Shah AA, Mir BA, Ahmad I, Latoo S, Ali A, Shah BA. Pattern of bear maul maxillofacial injuries in Kashmir. Natl J Maxillofac Surg 2010;1:96-101.
6. Kachhawaha S, Singh S, Srivastava M. Clinical management of heat stroke in a sloth bear (Melursus ursinus). Intas Polivet 2015;16:175-6.
7. The Telegraph. New Delhi: The Telegraph Online Edition; 01 May 2017. Available from: https://www.telegraphindia.com/india/bears-amp-humans-fight-forflower/cid/1519904. [Last accessed on 2020 May 14].
8. Ratnayeke ST, Van Manen F, Pieris R, Varapragasam SJ. Challenges of large carnivore conservation: Sloth bear attacks in Sri Lanka. Hum Ecol 2014;42:467-79.
9. Singh N, Sonone S, Dharaiya N. Sloth bear attacks on humans in central India: Implications for species conservation. Human Wildlife Interact 2018;12:338-47.
10. Bargali HS, Akhtar N, Chauhan NP. Characteristics of sloth bear attacks and human casualties in North Bilaspur Forest Division, Chhattisgarh, India. Ursus 2005;16:263-7.
11. Sterndale RA. Natural History of the Mammalia of India and Ceylon. London and Calcutta: Thacker, Spink & Co; 1884. p. 62.
12. Tirpude VS, Gupta BB. A study on bear mauling in tertiary care unit of central India. J Dent Med Sci 2018;17:01-4.
13. Finn F. Sterndale’s Mammalia of India. A New and Abridged Edition, Thoroughly Revised and with an Appendix on the Reptilia. Ch. 5. Calcutta and Simla: Thacker, Spink & Co; 1929. p. 60-2.
14. Patil SB, Mody NB, Kale SM, Ingole SD. A review of 48 patients after bear attacks in Central India: Demographics, management and outcomes. Indian J Plast Surg 2015;48:60-5.