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Demographic Profile & Pattern of Ocular and Adnexal Injuries from Sloth Bear Maul: a Study in Tertiary Centre of Bilaspur District, Chhattisgarh

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

This study was done in all cases of bear attacked patients admitted in our tertiary centre Chhattisgarh institute of medical science (CIMS) who suffered ocular and adnexal injuries. Sloth bear (*Melursus ursinus*) is found to be native in many forest areas of the state of Chhattisgarh including North Bilaspur Forest Division (Nbfd). The study was conducted in the department of ophthalmology, Chhattisgarh institute of medical science (CIMS) Bilaspur Chhattisgarh for the duration of 3 years (January 2018 to December 2020). All patients who were admitted in our institute with ocular and/or adnexal injuries from bear attack have been included in this study. 27 patients were attacked by sloth bear in the forest areas of Bilaspur division and referred to our tertiary centre. These patients had ocular and adnexal injuries. These bears were found roaming in the forest areas and also at places of human and animal habitats. 67% (18 of 27) patients were attacked in the forest areas, while some were attacked in the crop fields (15%), home courtyard (7%) and near water bodies (11%). Sloth bears are one of the most aggressive bears who have attacked human populations. The injuries cause severe visual loss and disfigurement to eyeball and adnexa. Proper measures are needed to be implemented to prevent such cases in future.

Keywords: Sloth bear; adnexal injuries; animal habitats; ocular injury.

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1. INTRODUCTION

Sloth bear (*Melursus ursinus*) is found to be native in many forest areas of the state of Chhattisgarh including North Bilaspur Forest Division (Nbfd) [1]. These forest areas of Nbfd includes Marwahi and Pendra range. Sloth bears are also habitats of Koriya and Korba districts of the state of Chhattisgarh. These forest areas are tropical, dry and deciduous. They have patchy and fragmented areas with agricultural field, and also have villages with higher number of human and cattle population in outer protected parts of the forest. Largest population of sloth bear in India (about 10,000) [1] has been reported in these forests (Pendra-Marwahi, Korba and Koriya districts are one of them having bears in higher numbers). These forest areas have hillocks and boulders which offers den sites for the bears [2].

The sloth bears are medium sized species with weight of 55 to 145 kilograms and height of 4.7 to 6.3 feet's (Fig. 1). They have strong claw nails of 3 to 4 inch and long incisors teeth's [3]. These bears have been found to be more active in winter season and in early morning hours during which they use to return in their den after spending time in crop fields and water resources [4]. Human population who habitats outside the protected areas of forest, use forest materials for their survival. They visit to forest for farming purpose, defecation, water collection and collection of firewood, mahua (*Madhuca longifolia*), bel (*Aegle maemelos*) and tendu (*Diospyros melanoxylon*) [1] and get encountered here by the sloth bears.



Fig. 1. Sloth bear (*Melursus ursinus*)

These sloth bears have been reported aggressive in nature and can attack humans without provocation. They have been found hidden behind trees or climbed over trees before attack and use their claws and teeth to attack. Humans can be attacked by a single bear or

group of bears. These attacks to human beings may vary from mild injuries to severe fatal trauma with many reported mortalities. Head, face and eyes have been found to be the most attacked parts of body in many of the injuries caused by bear encounter.

Ocular and adnexal injuries have been seen in many bear attacked patients. These injuries can involve various parts of eye including eyelid laceration, lacrimal apparatus laceration, degloving injuries of adnexa, fractured orbital walls, corneoscleral lacerations and even traumatic enucleation of eyes with optic nerve laceration. It can lead to severe visual loss and also disfigurement of eye and face. This study was done in all cases of bear attacked patients admitted in our tertiary centre Chhattisgarh institute of medical science (CIMS) who suffered ocular and adnexal injuries.

2. MATERIALS AND METHODS

Our study was conducted in the department of ophthalmology, Chhattisgarh institute of medical science (CIMS) Bilaspur Chhattisgarh for the duration of 3 years (January 2018 to December 2020). All patients who were admitted in our institute with ocular and/or adnexal injuries from bear attack have been included in this study. These Patients also had injuries to other body parts including: head, oro-maxillo-facial, ENT, neck, chest, abdomen or others. Proper history of the presenting illness was taken in terms of mode, time and place of attack & activity involved during the attack. Total number of bears involved was also noted.

Complete ocular examination was done including the type of injury, ocular segment involved, visual assessment, anterior segment and posterior segment examination. X-ray and CT scan of the orbits have been done to look for any bony involvement (fractures of orbital walls/soft tissue entrapments and optic nerve impingement from bony fragment). Patients were managed on the basis of the type of ocular injury. All those patients who had eyelid and canalicular laceration were managed by suturing with 5-0 vicryl and 5-0 silk sutures while those having tissue loss underwent reconstructive surgery. Patients who presented with corneal, scleral or corneo-scleral laceration were repaired with 10-0 nylon suture under poor or nil visual prognoses. Those having fractures of the orbital walls were referred to oculoplastics surgeon for further management. All patients received anti-rabies

vaccine as per schedule and rabies immunoglobulin. Those having injuries to other body parts were managed by the concerned departments.

Inclusion criteria: All patients of bear attack with ocular or adnexal injuries.

2.1 Exclusion Criteria

- 1) Attack from other animals
- 2) Patients with bear attack not involving ocular or adnexal area.

3. RESULTS

In our present study from January 2018 to December 2020, total 27 patients had been admitted in the tertiary centre Chhattisgarh institute of medical science (CIMS) Bilaspur, CG.

In all of the 27 patients was from bear claw nails either attacked from front or behind the patients. The bears were found to be hidden either behind the trees or climbed over trees before attack so they were not visible to the patients. None of the patients had given history of injury from bear's teeth.

3.1 Time of Attack

Out of these 27 patients, 11 (40.74%) persons had been attacked in the early morning hours of

4 am to 7 am, while 13(48.15%) patients had been attacked in the evening hours of 6 pm to 9 pm. Only 3 (11.11%) patients were attacked in night time of 10pm to 2 am.

3.2 Place of Attack

All patients were residents of forest areas of Bilaspur division (Pendra-Marwahi, koriya and korba) and had been referred from these places. The distribution of locations at which patients had been attacked is shown in Table 1.

3.3 Human Activities at the Site of Attack (Table 2)

Majority (48.15%) of patients (13 of 27) attacked have visited forest area for collection on firewood, mahua, tendu and bel. Two patients were attacked when they were sleeping at open areas of house. Three patients got injured while protecting their cattle from bear attack.

3.4 Demographic Profile of Patients (Table 3)

Majority of the affected patients were males (81).Major age group affected was young adults of 31 to 60 years age group (13 of 27).

Table 1. Locations of bear attack

Place	Number	%
Forest	18	67
Crop fields	4	15
Home courtyard	2	7
Near water bodies	3	11
Total	27	100

Table 2. Activities at site of bear attack

Activity	Number	%
Forest material collection	13	48.15
Water collection	2	7.41
Defecation	2	7.41
Farming	5	18.51
Sleeping at home	2	7.41
Cattle places	3	11.11
Total	27	100

Table 3. Age and gender distribution of patients with ocular and adnexal trauma from bear attack

Age (years)	Number of patients (%)	Male	female
<30	4(15)	4(15%)	0
31-60	13(48)	10(37%)	3(11%)
>60	10(37)	8(30%)	2(7%)
total	27(100)	22(81%)	5(19%)

3.5 Parts of Ocular and Adnexa Involved (Table 4)

Face has been seen to be the most common part attacked in encounters with sloth bears. Ocular and adnexal involvement has been seen from

eyelid lacerations and corneo-scleral perforations to even complete enucleation of eyeball with optic nerve avulsion. These injuries have even caused complete loss of vision in the affected eye.

Table 4. Ocular and adnexal parts injured in bear attack

Part involved	Number	%
Laceration of eyelids.	11	40.74
Laceration of Eyelid and lacrimal apparatus	12	44.44
Eyelid avulsion	4	14.82
Corneal tear with prolapsed uvea.	3	11.11
Corneo-Scleral tear with prolapsed uvea and vitreous	9	33.33
Traumatic enucleation with optic nerve injury	3	11.11



Fig. 2. Eyebrows with eyelids laceration from bear attack



Fig. 3. Corneo-scleral laceration with eyelid laceration from bear attack



Fig. 4. Traumatic auto-enucleated eye with optic nerve avulsion from bear attack



Fig. 5. Eyelids avulsion both eye and traumatic enucleation left eye with fracture floor orbit from bear attack



Fig. 6. Right eyelid multiple laceration(sutured) with fracture floor and medial wall of orbit

Table 5. Visual acuity of the affected eye from bear attack

Visual acuity	Number	%
6/6 to 6/12	5	18.51
6/18 to 6/36	7	25.93
6/60 to hand movement	3	11.11
Perception of light	5	18.51
No perception of light	7	25.93
Total	27	100

3.6 Orbital Involvement

out of 27 patients in our study 4 patients had orbital floor fracture. And 3 patients had medial orbital wall fracture. None of the patients had roof and lateral wall fractures of orbit. All patients with orbital wall fractures were referred to higher centre for management.

3.7 Visual Acuity

Vision of the injured eye was severely affected in cases of corneo-scleral tear with prolapsed uveal tissue and vitreous ranging from 6/60 to no perception of light. Also cases of traumatic enucleation have no perception of light. 25.93% of patients suffered from no perception of light in the affected eye (Table 5). While 18.51% patients had visual acuity reduced to only perception of light. 11.11% of patients had retained visual acuity of 6/60 to hand movement. Cases having better visual acuity were those who had involvement of ocular adnexa only and they had either immature senile cataract or corneal opacities.

4. DISCUSSION

In our present hospital based study, 27 patients were attacked by sloth bear in the forest areas of Bilaspur division and referred to our tertiary centre. These patients had ocular and adnexal injuries. All of the 27 patients were attacked by the claws of bear. Sloth bear were found to be hidden either behind the trees or climbed over trees before attack. 48.15% (13 of 27) of patients were attacked in the evening hours of 6 pm to 9 pm followed by 40.77% (11 of 27) patients in the morning hours of 4 am to 7 am.

These bears were found roaming in the forest areas and also at places of human and animal habitats. 67% (18 of 27) patients were attacked in the forest areas, while some were attacked in the crop fields (15%), home courtyard (7%) and near water bodies (11%). Majority of the patients (48.15%) were attacked while they visited forest

for collection of firewood, bel, mahua and tendu leaves (Table 2).

Apart from this, some were attacked while they went for water collection, defecation, farming and protecting cattle from the attacks. Due to higher outdoor activities males (81%) have been attacked more than females (19%). Age groups of 31-60 (48%) years have been affected more followed by 37% of people beyond 60 years (Table 3). Attacks from bear have seen to cause severe injuries to body parts including blinding ocular and adnexal trauma. In our study 11% of cases suffered from traumatic enucleation of eye with optic nerve injury leading to disfigurement and complete visual loss of the affected eye.

All patients suffered Eyelid injuries with lid avulsions in 14.82% patients and 44% of patients had injuries to lacrimal apparatus along with eyelid injuries. 33% patients had corneo-scleral tear with prolapsed vitreous and uveal tissue (Table 4). 15 of 27 patients suffered severe visual loss (Table 5).

Some cases of injuries from bear attack have been reported previously. Patil SB *et al* in 2015 reported 48 cases that were attacked by sloth bear in central india [5]. Out of these 48 patients, facial injuries were seen in 36 patients of whom 12 patients had eyelid injury and 4 had eyeball injuries. Four patients underwent enucleation surgeries due to severe ocular trauma.

Nath A *et al* in 2020 have studied pattern of bear attack and behavior in Himalayan region [6]. They found most of patients were of low socioeconomic status. Highest incidence of attack was seen from June to December. Majority of patients suffered from injuries of face and neck. in his study.

Bhat TA *et al* reported 21 patients suffering upper limb and facial injuries from bear attack [7]. These patients underwent multiple orthopedic surgeries following bear encounter.

Bear attacks has been seen in other areas of the world also. Frank RC et al in 2006 has reported 7 cases of bear attacks who suffered from various types of injuries including lacerations, fractures and tissue avulsions [8]. These areas have habitat of grizzly bears. Post operative complications like infections and psychological trauma.

In a study done by Penjor et al from 2015 to 2019 in Bhutan. It has habitats of sloth bear and Himalayan black bear [9]. They have reported 34 patients who got attacked from bear and suffered injuries to various body parts. They found face to most common affected part in injury including 85% of cases.

Shah AA et al in 2010 has described patterns of Bear maul maxillofacial injuries in Kashmir [10]. They found 200 cases of bear attacks by Asiatic Black bear. Out of 200 cases 159 were males. Majority of cases were of age group 30-40 years (110 of 200) followed by 40-60 years (55 of 200). Facial injuries were most commonly (161 of 200 cases) found out of which 13 patients suffered orbital wall fractures compared to 7 patients in our study.

5. CONCLUSION

Sloth bears are one of the most aggressive bears that have attacked human populations. These attacks may be a result of invasion of humans to their forest habits. They have large claws which are used to injure. These injuries can be lethal and person may suffer mortality. Face is the most common site which got injured. Ocular and adnexal injuries have been seen in majority of cases from eyelid lacerations, eyelid avulsions, and corneo-scleral tears to traumatic enucleation. These injuries cause severe visual loss and disfigurement to eyeball and adnexa. Proper measures are needed to be implemented to prevent such cases in future.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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