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MANAGEMENT OF A CASE OF VENOMOUS SNAKEBITE IN A CAPTIVE THOMPSON'S GAZELLE (*Eudorcas Thomsonii*)

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Abstract

Snakebite envenoming is an acute, life-threatening disease that affects humans and animals, including wild ones. Given the dearth of information on snakebites in Thompson's gazelles as well as in zoo animals, the present paper describes the successful management of a case of snakebite in a Thompson's gazelle in the Zoological Garden, University of Ibadan, Nigeria. The recently acquired Thompson's Gazella was suddenly found with a swollen face and bleeding from a spot on the face. A cobra was sighted close to the animal's enclosure. Blood sample was obtained for haematology and serum chemistry; however, serum chemistry was not analysed because there was severe haemolysis. Haematological blood picture revealed poikilocytosis marked by severe schistocytosis, thrombocytopaenia, and low packed cell volume. Polyvalent snake venom antiserum was promptly administered. Dexamethasone, diclofenac sodium, long-acting amoxicillin, and tetanus toxoid injections were also given. The bite site was properly cleaned after sedation with a 2% xylazine injection, and the animal was monitored for two weeks. All clinical signs subsided, the haematological profile returned to normal, and the patient survived; however, there was necrosis of the skin at the snake bite site. Prompt administration of snake antivenom saved the life of the animal, which is of conservation importance. The feral snake population in *ex situ* wildlife conservation environments needs to be controlled.

Keywords: Envenomation, Hematology, Snake antiserum, Thompson' gazelle

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Introduction

Thomson's gazelle inhabits the savannas and grasslands of East Africa, especially the Serengeti region in Kenya and Tanzania; hence, they are imported into Nigeria. It has a preference for short grassland with a dry, sturdy foundation, reflecting its narrow habitat preferences (Estes, 2012). Gazelles are mixed feeders (Estes, 2012). During the dry seasons, they consume more browse, including foliage from woody plants, bushes, and herbaceous forbs, compared to the wet seasons, when their diet is mainly fresh grasses (Kingdon, 1979). Cheetahs, the major predators of gazelles, are faster, but gazelles can outlast them in long chases and make quicker turns. Thomson's gazelles exhibit a noticeable behaviour of bounding leaps, referred to as pronking or stotting, to startle predators and demonstrate their strength (Estes, 2012).

Snakebite can be deadly for humans and animals—both domestic and wild (Bolon et al., 2021). Snakes play a crucial environmental role in the nation's wildlife areas and are mostly harmless. Snakes bite either to capture prey or in self-defence. Even though many of them are not venomous, there are a few that are (Velev et al., 2015). Animals are frequently at risk of being bitten by snakes when they graze, play, or hunt in gardens or dense bush areas (Garg, 2002).

Actraspididae, Viperidae, Colubridae, and Elapidae are the four families of venomous snakes found in Nigeria. But the most important species of snakes associated with envenoming in the country are the carpet viper (*Echis ocellatus*) and puff adder (*Bitis arietans*) belonging to the Viperidae family, and the black-necked spitting cobra (*Naja nigricollis*) belonging to the Elapidae family (Habib et al., 2001).

The diagnosis of envenomation in animals is a challenge due to owners and carers not recording the bite time or identifying the snake. However, while taking the history of the animal, veterinarians can use epidemiological data, like the presence of snakes in the area, and clinical signs to identify the species of snake and choose the best treatment option (Ferreira and Barraviera, 2004).

Clinical signs following a snakebite may be local and/or systemic. On the site of the bite, the local swelling, which spreads to the surrounding area, causes pain, redness, lymphadenitis, and lymphangitis. Systemic signs may occur early or later on and include gastrointestinal signs, hypotension, shock, cardiac and circulatory dysfunction, nervous and respiratory system dysfunction (Lervik et al., 2010), and anaphylactic reactions to venom proteins (Adukauskienė et al., 2011).

Animals that are poisoned by snake venom require immediate attention; however, inadequate or delayed treatment can lead to negative outcomes. There is a scarcity of literature data on snakebites in Thompson’s gazelles as well as in zoo animals; hence, the present paper describes a case of a snakebite in a Thompson’s gazelle in the Zoological Garden, University of Ibadan, Nigeria, and its management.

Case report

History

A distress call was received from the University of Ibadan Zoological Garden that a recently acquired (2 weeks earlier) 6-month-old female Thompson’s gazelle (a small fast antelope; *Eudorcas thomsonii*) weighing 10kg was suddenly found lethargic and bleeding from the face.

One of the zoo keepers revealed that a black cobra was sighted a few hours before he noticed the injury on the patient at a location close to the patient's enclosure. The Thompson's gazelle was in good health and had no history of clinical illness before this event.

Clinical examination and sample collection

The patient was physically restrained. Rectal temperature (39.2°C) and pulse rate (89 bpm) were obtained. The face was swollen and bloody (Figure 1); however, no fang marks were found on the face. A blood sample was obtained via jugular venipuncture and sent to the laboratory for haematology. Haematological parameters, including packed cell volume, fibrinogen, platelets, total white blood cells, segmented neutrophils, band neutrophils, lymphocytes, and monocyte counts, were obtained and compared with a range of reference values for Thompson gazelle documented by Wolfe (2015). However, there are no platelet count reference values for Thompson gazelle; hence, the platelet count reference values for Mountain gazelle were used (Hussein et al., 2009). A blood sample was also collected for serum chemistry but was not analysed because the serum obtained was reddish in colour, indicating severe haemolysis (Figure 2).

Figure 1: Swollen face with clotted blood (black arrow)

Figure 2: Serum sample showing severe haemolysis

Laboratory analysis

The haematological indices of the samples were analysed using standard methods. The packed cell volume was determined by the microhaematocrit method (Thrall and Weiser, 2002). The haemoglobin concentration was determined by the cyanomethaemoglobin method (Higgins et al., 2008). The red blood cell and total leukocyte counts were determined manually using a Neubaeur haematocytometer, while a thin blood smear was made on clean grease-free glass slides to study red blood cell morphology, and for manual differential leukocyte count and staining, it was made following the Leishman technique and enumerated by the meander counting method with appropriate stains to calculate the absolute lymphocyte count, absolute eosinophil count, absolute neutrophil count, and absolute monocyte count. The platelet count was done

following the Rees and Ecker direct counting method as adopted by Ihedioha and Agina (2014).

Laboratory result

The thin blood smear revealed the presence of poikilocytosis (misshaped erythrocytes), predominantly schistocytes (fragments of erythrocytes) (Figure 3). The haematological parameters revealed slightly decreased packed cell volume (40%) (normal value: 48.7 %) (Wolfe, 2015) and thrombocytopaenia (62 x 10^3/µL) (normal range: 147.6–430 x 10^3/µL) (Hussein et al., 2009).

A diagnosis of snakebite envenomation was based on the history, clinical examination, and laboratory results.

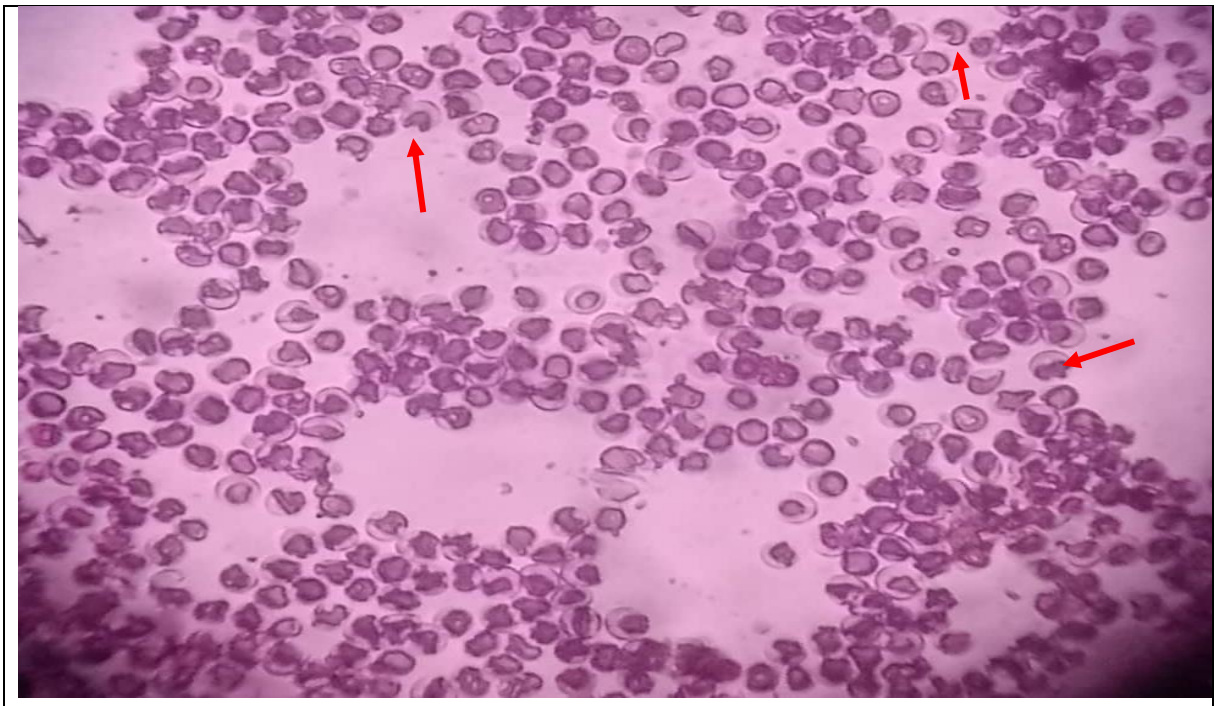

Figure 3: Thin blood revealed the presence of schistocytes (red arrows)

Treatment

Dexamethasone (Dexamethasone injection®, Salvavidas Pharmaceutical PVT LTD, Gujarat, India) was administered intramuscularly stat at 0.02mg/kg., 10ml of polyvalent snake venom antiserum (Snake Venom Antiserum I.P®, Vins Bioproducts Ltd., Telangana, India) was administered via slow intravenous route (bolus administration) stat., diclofenac sodium injection (Jawa diclofenac®, Jawa groups, Lagos, Nigeria) at 2mg/kg was administered intramuscularly stat., amoxicillin (Amoxicillin Bioveta®,10mg/kg, Bioveta, Ivanovice na Hané, Czech Republic) long acting injection at 10mg/kg was administered intramuscularly stat., and 0.5ml tetanus toxoid (Tetanus toxoid®, Zoetis Inc., Kalamazoo, USA) injection was administered intramuscularly stat.

Anaesthetic management

For proper cleaning of the snake bite region, the patient was sedated with 2% Xylazine (Xylased®, Bioveta, Czech Republic) at 0.05 mg/kg intramuscularly. The patient was placed in left-lateral recumbency. Intravenous fluid was administered at a rate of 10 mL/kg/hour over 2 hours. Sterile gauze soaked with

sterile fluid was used to gently clean the blood clot. A dilute povidone-iodine solution was used to clean around the swollen face. After an uneventful recovery, the patient was carefully monitored under close observation.

Outcome

Three days after treatment, the patient was active and feeding well (Figure 4). A blood sample, which was collected two weeks later, revealed normal haematological parameters. Thin blood smear revealed normal red blood cell shape (Figure 5). The sequelae of the snake bite resulted in the necrosis (turning black) of the skin at the site of the bite (Figure 6).

Figure 4: Patient recovered and feeding well

Figure 6: Necrosis (turning black) of the skin at the site of the bite (red arrow)

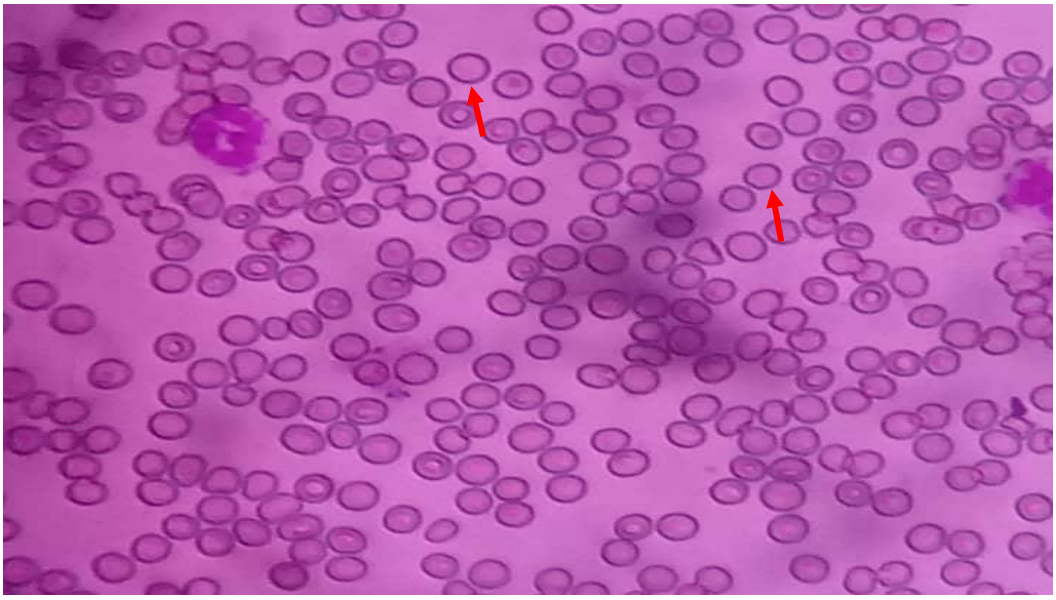

Figure 5: Thin blood smear revealed predominantly normal red blood cell shape (red arrow)

Discussion

Snakebite envenoming is a condition that can be life-threatening and is caused by toxins that are present in venomous snakes' bites. All the clinical signs and haematological changes in the present case returned to normal, and the patient recovered from the snake envenomation because of prompt and effective management.

The diagnosis of snakebite was made based on the case history, clinical signs, and laboratory findings. The bleeding and swollen face observed in this case are consistent with those previously described by Farooq et al. (2014) and Altuğ and İşler (2019). There were no fang marks found; they are more difficult to find in animals because of the hair. This is consistent with the report of Ježek et al. (2018), where fang marks were not found in a bitten cow.

Local swelling at the bite site is common and has been described in humans (Karlo et al., 2011; Garkowski et al., 2012) as well as in animals (Ugile et al., 2009; Ježek et al., 2018). The activity of the hyaluronidase enzyme in venom results in increased tissue permeability, and the capillary endothelium and basal membrane are destroyed by proteolytic enzymes (cytotoxic effect); thus, the capillary permeability increases and results in the occurrence of oedema (Adukauskienė et al., 2011).

The slight decrease in the packed cell volume, coupled with the reddish colour of the serum, is highly indicative of intravascular haemolysis. Intravascular haemolysis occurs after a snake bite due to the action of phospholipase A2, which is present in almost all snake venoms, and a basic protein called direct lytic factor, found only in elapid venoms (Casewell et al., 2014). The decreased platelet count may be due to: (a) toxin-induced damage to platelet precursors in the bone marrow; (b) platelet consumption during disseminated intravascular coagulation (DIC) or destruction during the intravascular coagulation initiated by the direct action of the venom (e.g., crotalocytin); (c) aggregation or peripheral sequestration of platelets at the wound site; or (d) a combination of these factors (Odeleye et al., 2004). Thrombotic microangiopathy (TMA), which is confirmed by the presence of thrombocytopaenia and microangiopathic haemolytic anaemia (MAHA), is an important but poorly understood complication of snakebite (Brocklebank et al., 2018; Noutsos et al., 2020). The thin blood smear in the present case shows poikilocytosis, marked by the presence of a lot of schistocytes, which are red cell morphological changes seen in MAHA. The presence of thrombocytopaenia and MAHA in the present case shows that the patient had TMA.

Serum chemistry was not done because the severe haemolysis seen in the obtained serum would give a false value to the biochemical parameters. Koseoglu et al. (2011) have established that haemolysis affects plasma and serum concentrations of a whole range of biochemical parameters.

Antivenom is the key treatment for venomous snakebites (Goswami et al., 2014). Antivenom is an immunoglobulin made from pepsin-refined F(ab)2 fragments of IgG, which is purified from the plasma or serum of a sheep or horse that has been immunized with snake venom (Deshpande et al., 2013). In this case, a polyvalent snake venom antiserum was administered to the patient because we were not sure of the snake species that bit the patient. Although the zookeeper claimed he saw a cobra snake

close to the enclosure of Thompson's gazelle, there is still a possibility that the cobra snake was misidentified. Lyophilized polyvalent anti-snake venom may lead to anaphylactic reactions at times (Rao et al., 2008); to overcome the untoward effect of antivenom, dexamethasone was given.

Diclofenac sodium was administered to alleviate pain, while tetanus toxoid and amoxicillin long-acting were given to prevent infections from tetanus spores and other bacteria that may have entered through a bite wound. Despite the snakebite, Thompson's gazelle was still able to struggle with the handlers, which prompted the use of xylazine as a sedative for proper restraint so as to clean the bite site with ease. The patient recovered from the snakebite, but there was necrosis of the snake bite site; although most snake bite lesions heal without any sequela, necrosis in the bitten area can occur (Hasan et al., 2013).

Though snakes are natural wild fauna in tropical environments and they perform a critical role within the ecosystem, they sometimes become invasive or pose a risk to humans and animals, both domestic and wild (Garg, 2002). There is therefore a need to adopt integrated approaches to control the feral snake population around animal enclosures and prevent encounters between snakes and wild animals of conservation importance. Such snake population control methods include clearing of bushes around protected areas and prey reduction (Engeman et al., 2018).

In conclusion, the Thompson gazelle, bitten by a snake, with clinical signs of bleeding and swelling on the face, was successfully treated by prompt administration of polyvalent snake venom antiserum, dexamethasone, diclofenac sodium, amoxicillin long-acting, and tetanus toxoid injections. It is recommended that some precautionary measures be adopted to control feral snake population around ex situ wildlife conservation environments by clearing of bushes around animal enclosures and reduction of potential prey population.

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