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Venomous Snake Bite in Children: A Case Report from Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author BIAI wrote the first draft of the manuscript. Authors BIAI, CO and EO managed the literature searches and made critical revisions of the manuscript. All authors read and approved the final manuscript.

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Case Study

ABSTRACT

Venomous snakebite is a commonly encountered pediatric emergency especially in regions of slums, villages, and forests. It presents with varying clinical features leading to morbidity and mortality. Children are more prone to complications as a result of their physiological vulnerability. Mortality is also higher in them because the amount of toxin absorbed per kilogram body weight is more amongst the children than in adults. We report a case of a 7-year-old girl in Benin City, Nigeria who was managed for Disseminated Intravascular Coagulopathy (DIC), necrotizing fasciitis and compartment syndrome following a snakebite. She required blood transfusion for the DIC, fasciotomy for compartment syndrome and skin grafting for the extensive ulcers which are all features of severe envenomation. We conclude that accurate diagnosis and prompt management of complications can save life.

Keywords: Venomous snakebite; complications; exchange blood transfusion; skin grafting; children; Nigeria.

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1. INTRODUCTION

Venomous snakebite is a serious pediatric emergency commonly encountered in slums, villages, and forests in tropics and subtropical regions of the world [1,2]. Most snakebites are caused by non-venomous snakes. Only 15% of the approximately 3,000 known species of snakes found globally are considered dangerous to man [3]. True incidence of snake envenomation is unknown due to under-reporting, however estimates are put to exceed 5 million annually [1]. Approximately 100,000 of these develop severe complications [1]. In rural Nigeria alone, an estimated incidence of 500 bites and 50 deaths/100,000 population has been reported with the savannah region bearing the greatest burden of snakebite [4]. The carpet viper (*Echis ocellatus*), black-necked spitting cobra (*Naja nigricollis*) and puff adder (*Bitis arietans*) are the most important species associated with envenomation in Nigeria [4].

In developing countries, most individuals bitten by snakes first consult traditional healers before visiting a medical center [5]. In Nigeria, only 8.5 percent of snakebite victims present at hospitals [4]. The clinical manifestations of snake bites may vary across a wide spectrum ranging from asymptomatic to death as a result of severe systemic manifestations [6]. Asymptomatic cases are usually from a non-poisonous snake bite. Clinically, cases of snakebite presents with symptoms restricted to the site of bite such as pain and local tissue swelling and systemic symptoms ranging from neurotoxicity (posies, respiratory failure, coma), extensive cellulitis and necrosis to disorders of the haematologic system such as Disseminated Intravascular Coagulopathy (DIC) and acute renal failure [7]. As a result of their physiological vulnerability, children are more prone to complications. Also, since the amount of toxin absorbed per kilogram body weight is more in children than in adults, mortality is higher in the former [8,9]. We present the case of a child who was bitten by a suspected carpet viper and developed complications including tissue necrosis, compartment syndrome and DIC.

2. CASE REPORT

OT, a 7-year-old girl, was brought to the Children Emergency Room (CHER) of the University of Benin Teaching Hospital (UBTH) on the 7th of March, 2016 with complaints of swelling of the left leg and bleeding from the left foot which

occurred following a snake bite on the same foot 16 hours prior to presentation. She was bitten while on her way home through a bushy path when she mistakenly stepped on the snake. It happened at about 20.00 hours and there was no electricity supply at the time; as is usually the case in many developing countries like Nigeria. This made the area dark. It was only after the bite and her shout that her mother pointed out the torch on her mobile phone and saw the snake crawl into the nearby bush. The snake was described as large and long, black in color. Other details such as the shape of the head or the characteristics of the skin could not be gotten as the snake rapidly disappeared into the bush. Following the bite, a tourniquet improvised with a piece of clothing was immediately applied above the ankle. Her foot was subsequently washed and some incision marks were made with a razor blade on the affected foot. She also received some oral medications from a patent medicine dealer, the names of which parents were unaware of. About 30 minutes after the bite, swelling of the foot was noticed. It started from the site of the bite and gradually increased upwards. Two hours later, bleeding was noticed at both the site of the bite and the points where incision was made. Following persistence of bleeding and leg swelling with associated blisters, she was brought to our facility. She is the second of a set of twins. Both parents are married and mother is a petty trader while father is a commercial taxi driver. The average family monthly income is 20,000 Naira (55 USD).

At presentation, she was anxiously looking and in painful distress, with the left foot wrapped in blood-soaked piece of cloth. She was pale, afebrile and not dehydrated. She weighed 22kg and had a height of 124 cm which were normal for age. She had a pulse rate of 158 beats/min and a blood pressure of 90/50 mmHg. She was also tachypnoeic with a respiratory rate of 54 breaths/min. Examination of the lower limb showed massively swollen left lower limb extending from the feet to the thigh. The dorsum of the foot had multiple blisters of various sizes largest measured 8 by 4 cm. Multiple fang marks with bold oozing out from them were noted. Blood was also seen at the multiple incision marks made on the foot. Ecchymotic patches were seen on the left popliteal fossae and also on the anterior proximal 3rd of the left thigh.

A diagnosis of severe envenomation with disseminated intravascular coagulopathy secondary to snake bite was made. The culprit

was suspected to be from the Viperidae family. Full Blood Count showed a leucocytosis of 21000 cells/ μ l and thrombocytopenia of 14200/ μ l. Her packed cell volume (PCV) was 25%. Bedside whole blood clotting time exceeded 20 mins. Prothrombin time was 17 seconds, while Activated partial thromboplastin time was 44 seconds which were essentially normal when compared with the control. The Serum electrolytes, urea, and creatinine were essentially normal.

She received 10mls of polyvalent anti-snake venom, anti-tetanus serum, intravenous vitamin K, intravenous ampiclox and pentazocine. She was also transfused with 500 mls of fresh whole blood.

By the second day, her leg was still swollen and increasing in size. She was still bleeding from puncture sites. On examination, she was in painful distress and was febrile. The left lower limbs were swollen and taut. The blisters had ruptured with surrounding skin appearing necrosed. There was marked tenderness. The dorsal pedis pulse was not palpable. An assessment of necrotizing fasciitis and compartment syndrome was made and after review by the Plastic Surgery Unit, an emergency fasciotomy (Fig. 1) and wound debridement was done, following which an above knee POP back slab was applied to the left lower limb. She was also placed on daily wound dressing with normal saline and Honey. She also received a second dose of Anti-snake venom. On account of the emerging DIC, and unavailability of fresh frozen plasma in our facility, she had an

exchange blood transfusion (EBT) with two units of fresh whole blood.

By the third day of admission, bleeding from puncture site had subsided, pain was controlled and she was making adequate urine, however, she still had a fever. Evidently, this was because she was not receiving the prescribed antibiotics as parents were unable to procure the medications due to financial constraints. Examination of the wound showed with necrotic tissues. Repeat FBC showed thrombocytopenia of 6200cells/ μ l, PCV was 30% other parameters were normal. Repeat serum electrolytes, urea, creatinine, PT, PTTK were all normal. Daily wound dressing and parenteral antibiotics were continued.

By the 8th day, the wound had increased in size, with sloughs and necrotic tissue. The ulcer extended from the dorsum of the foot to the lower 3rd of the leg, the site of fasciotomy. The dorsal pedis pulse was palpable. A swab was taken from the ulcer for microscopy culture and sensitivity and based on the result, antibiotics were changed to ceftriaxone. She also had bedside debridement. When wound had fully granulated, she subsequently had to suture of fasciotomy site and Split-Thickness Skin Grafting of the ulcer on the 29th day on admission (Fig. 2). The donor site was her right thigh. On the second-day post op, she received a unit of blood for a PCV of 19%. She had a good graft take and was discharged on the 14th-day post op. She spent a total of 44 days on admission. The follow-up period was essentially uneventful. Fig. 3 shows the site of snakebite a year after the incident.



Fig. 1. Granulated extensive ulcer and fasciotomy site pre-op



Fig. 2. Sutured fasciotomy site and skin grafting immediate post-op



Fig. 3. Photograph of healed site taken a year after snakebite incident (8th March, 2017)

3. DISCUSSION

Generally, it is said that snakes attack humans when provoked. They are known to be more afraid of man than vice-versa. The circumstance under which the bite occurred in the current case revealed that the snake was provoked. After the victim was bitten, a wide spectrum of clinical manifestations began to unfold confirming envenomation. Studies have documented usual places of snake bite incidents to be homes, walking path, bush and farm [4,10]. Our patient became a victim along a walking path. Whereas snakebite is noted in all age groups, the vast majority are young males [11]. The predominance of male victims suggests a special risk of outdoor activity [12]. The current case, however, did not fall into this category. The site of bite of our patient was her feet which is the

commonest site of snake bite [10] and it occurred within the commonest period (18h00 to 24h00) of snake bite incidents [10]. The patient was from a low socio-economic class as has been proven by multiple studies on snakebite globally to be a key risk factor. Poverty leads to limited access to secure dwellings, clothing (especially footwear) and other amenities, such as indoor sanitation, lighting, and services such as transport and health care [13,14].

The delay in presentation to hospital that occurred in the current case was due to the fact that they first went to a patent medicine dealer for some medication. Financial constraint may also have contributed to this since access to healthcare in Nigeria is still mainly out-of-pocket driven. In developing countries, delay in presentation to hospital is common for many

reasons. Osmani and co-workers noted that majority of snakebite subjects presented late because of self-medication, prior visits to local practitioners, long distance and transportation difficulties [15]. On the contrary, majority of the patients with snake bite arrived fairly early to a rural hospital in north-central Nigeria despite the fact that they were from locations far away from the hospital and had poor means of transportation [10]. The health facility had free antivenom available for use for the community dwellers. The author concluded that when patients know where they could obtain free or affordable quality care, they see to it that they access the care [10].

The amount of venom injected into the subcutaneous tissue or systemic circulation of the individual mainly determines the clinical presentation observed [16]. In majority of cases, local manifestations such as swelling, local bleeding and pain are usually observed, and was seen in the current case, while the more serious systemic manifestations usually occur in fewer patients [17,18]. In addition to the aforementioned the present case had spontaneous systemic bleeding which is not uncommon [19]. The clinical features observed in the present case fits into that of the Viperidae family which are primarily cytolytic and haemotoxic. The venom of *Echis ocellatus*, the most likely culprit, is known to contain hemorrhaging (a prothrombin-activating procoagulant) and cytolytic fractions causing hemorrhage, incoagulable blood, shock, and local reactions including necrosis [20]. As was noted in the present case, it causes tissue necrosis, damaging blood vessels with vascular leakage allowing serum to escape into the surrounding tissues and subsequent oedema. The damaged vascular endothelium stimulate excessive micro-intravascular clotting resulting in consumptive coagulopathy (DIC) [21,22].

The traditional methods of tourniquets use, making incisions and washing of the wound as a form of first aid, which was carried out by the child's parents, must be discouraged. Tourniquets are traditionally used to stop venom flow but their use increases the risk of ischaemia, necrosis and loss of limb as well as give a false sense of security. Making of incisions increases the risk of infection and of severe bleeding as clotting mechanism is ineffective. More so, no venom is removed by this method. Washing the wound, on the other hand, increases the flow of venom into the system by stimulating the

lymphatic system [3]. The single most important first aid measure is probably the immobilisation of the bitten limb [4]. Nonetheless, overemphasis on first-aid can be dangerous because its value is debatable and too much valuable time is wasted in its administration. The emphasis for treatment should be placed on prompt and adequate medical management [23]. This makes the bite-to-hospital time very crucial. In a study carried out in north-central Nigeria, it was documented that the longer the bite-to-hospital time, the higher the extent of morbidity experienced by patients bitten by carpet viper [10]. This was in spite of the administration of monospecific antivenom. Other complications associated with late presentation to hospital after venomous snake bite include renal failure, prolonged periods of incoagulable blood after initiating antivenom, multiple bleeding sites, requirement for higher volumes of antivenom, need for blood transfusion, development of local sepsis, need for surgical intervention, longer duration of hospital stay and permanent disabilities in some victims [15,24-26]. The best outcomes are attained if the victim presents to the hospital soon after the bite [10].

The treatment of snake envenomation is principally centred on the administration of antivenom with the intention of reversing venom-induced effects [27-29]. Other treatment modalities meant to reduce the concentration as well as the effects of the toxin such as exchange blood transfusion (EBT), as was used in this case, are also relevant. The process of EBT with fresh whole blood was also meant to replace platelets and clotting factors to prevent persistent coagulopathy. Fasciotomy was done to prevent compartment syndrome while a split-thickness skin graft was to ensure proper healing of the extensive ulcer. These modalities were employed to get a favourable outcome despite glaring challenges. Similarly, in their study involving 15 patients with snake bite over an 18-month study period, Fadare and Afolabi [30] recorded no mortality. They concluded that although the management of snake bite in Nigeria is hampered by unavailability of specific antivenom and other supportive measures like clotting factors and cryoprecipitate, it is possible to have good outcomes despite the many challenges encountered by health care personnel [30].

4. CONCLUSION

In conclusion, venomous snakebite in children with associated complications is a problem in

Nigeria. Accurate diagnosis and prompt management can save life. Active prevention of contact (e.g. use of appropriate footwear, snake-proofing dwellings and improved lighting at night) [31] as well as educational programmes which detail prevention strategies will go a long way in reducing the risk of snakebite.

CONSENT

As per international standard or university standard, the patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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