Bedside intubation with the maintenance of mechanical ventilation via Ambu bag saved the life of a severe neurotoxic venomous snake bite patient in a remote district hospital in Bangladesh

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Title Page

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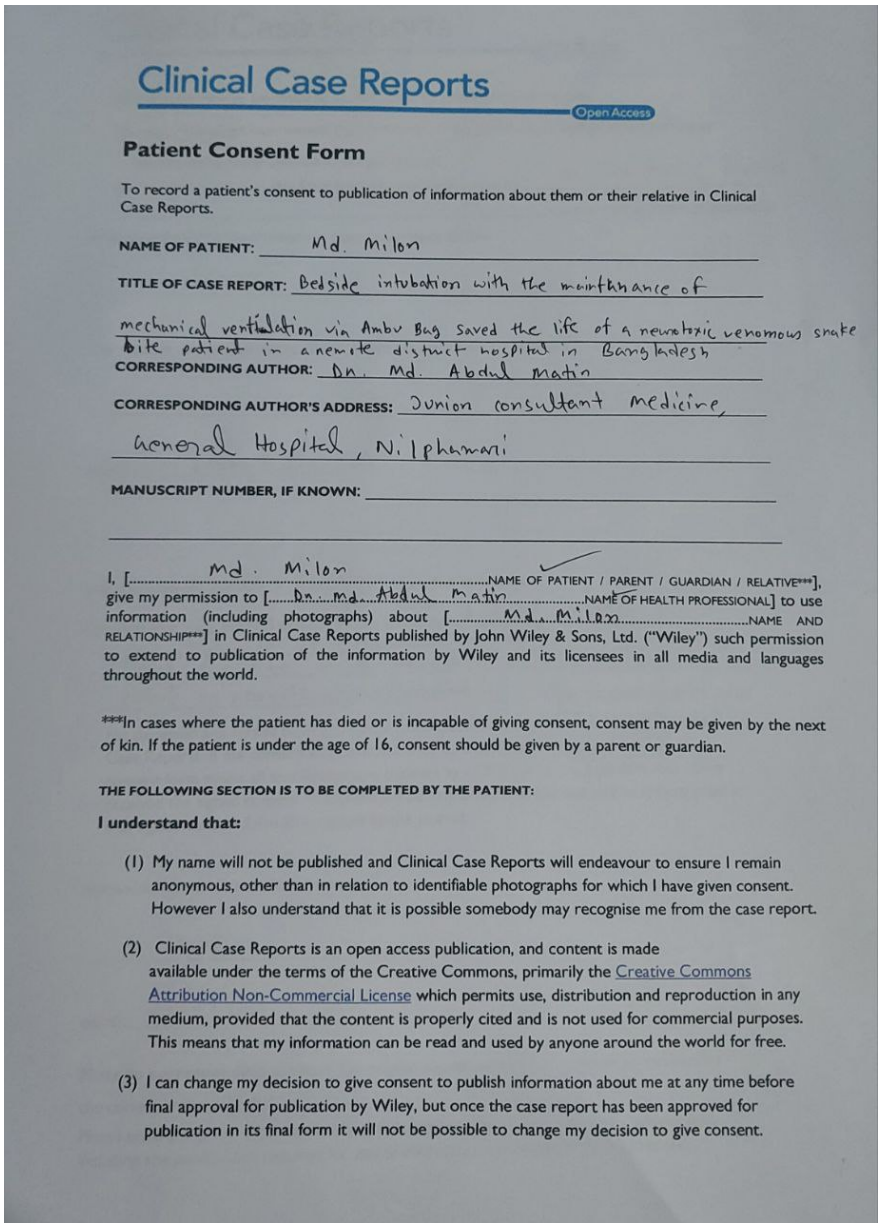
Title Page



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CORRESPONDING AUTHOR'S ADDRESS: Junion consultant medicine, General Hospital, Nilphamari

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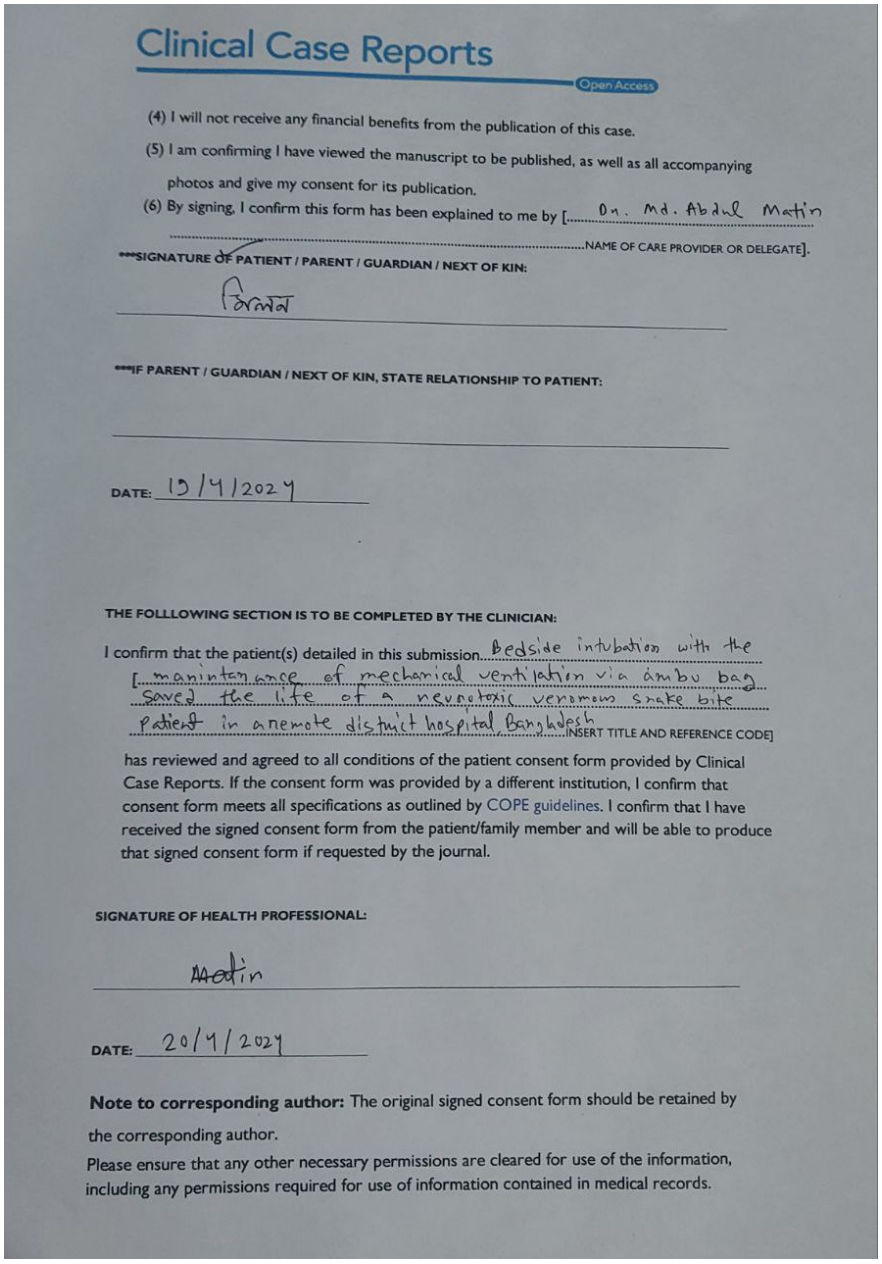

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Introduction

The snake bite is the leading toxin-related injury in Bangladesh, causing significant mortality and morbidity, particularly in rural regions (1). A comprehensive community-based survey conducted in Bangladesh documented an annual incidence of 700,000 snake bites, resulting in 6000 fatalities (2). In our country, there exist five snake groups that hold significant medical importance, namely the cobra, krait, Russell's viper, green pit viper, and sea snake. The predominant species responsible for venomous bites in our country are cobras and kraits. The bulk of poisonous bites are caused by kraits, accounting for 77.78% of cases, followed by cobras at 22.23% (3). Neurotoxicity is the primary characteristic of these venomous snakes, with respiratory failure being the primary cause of mortality after envenomation (2).

Kraits typically engage in nocturnal biting behavior upon entering residences in pursuit of sustenance (4).

Most of the bites took place during the nighttime while the victims were sleeping on the floor (5). Historically, snakebite cases have been addressed by traditional healers, known as Ozhas, employing non-scientific approaches that frequently result in adverse consequences for the affected individuals (1).

The venoming caused by these snakes is a critical medical situation that poses a serious risk to life. It necessitates the use of specific antivenoms and other interventions, including immediate assisted ventilation in cases of respiratory paralysis (6). Hence, the presence of endotracheal intubation and artificial breathing facilities is essential for the thorough and comprehensive treatment of neurotoxic snake bite (7).

In developing-country rural areas, the absence of quick access to life-saving anti-snake venom serum (ASVS) and mechanical ventilation for respiratory support leads to increased case fatality rates (8).

Case History/examination

Md. Milon, 35 years old, married bakery worker, hailing from Thakurgaon, came to the Emergency Department of the General Hospital, Nilphamari on 9th October (Monday), 2023 at 9:30 AM, complaining of a bite by an unidentified snake to his right foot near the little toe. at 3.00 am on 9th October when he was sleeping in a tin shed house nearly 07 hours ago from the time of examination. At that time, he woke up from sleep and saw that there was bleeding from the bite site, but he did not see anything in the room. After about half an hour of biting, he develops pain in the bitten site as well as severe headache, and bodyache. He was treated by a local traditional healer (Ojha) with scratching of the bitten site. As there was no improvement with this treatment, he ligated the right leg with rope in three areas and visited Thakurgaon district hospital. In the Emergency department of Thakurgaon District Hospital, ligature by rope was removed and two firm tourniquets were given with roller bandages. After that, he was referred to Nilphamari District Hospital due to a lack of antivenom.

On examination, the patient was altered conscious; pulse 88/min, regular, blood pressure 120/80 mmHg, respiratory rate 25breath/min, oxygen saturation 98% in room air, bilateral partial ptosis, broken neck sign was present, pupils are normal reacting to light and the chest was clear on auscultation, simplified snakebite severity score was grade 3. The local examination of her right foot showed no swelling, bruise, redness, hotness, or tenderness and no other local features of envenomation. After clinical examination, blood samples were taken for a bedside 20 min whole blood clot test, and it was negative.

Methods (Differential diagnosis, investigations and treatment)

We prepared the antivenom, injectable anti-neurotoxic drugs (Neostigmine), atropine, adrenalin, chlorpheniramine, and hydrocortisone. In the meantime, within 10-15 minutes of clinical examination, patients' breathlessness increased and became unconscious. Oxygen saturation suddenly fell to 40%, and severe bradycardia (heart rate <40b/min) developed. Then the patient was intubated at the bedside with the help of an anesthesiologist and ventilation was maintained with an Ambu bag, then the 1st dose of the polyvalent snake antivenin containing ten vials was given by intravenous infusion with ready of the bed-side anti-anaphylactic measures. Injectable subcutaneous Neostigmine 2.5 mg along with intravenous Atropine 1.2 mg was given for neurotoxic features. As there was no satisfactory improvement after 1st dose, we gave the 2nd dose of antivenom containing another 10 vials after 1 hour of 1st dose. We made a call to the Intensive Care Unit (ICU) of Rangpur Medical College Hospital (RpMCH) for a bed and then referred to RpMCH for ICU support with maintaining ventilation by Ambu bag which was 55 km away from Nilphamari.

The patient was received at the ICU of RpMCH on 9thOctober 2023 and they continued the treatment for venomous snake bite with neurotoxicity and respiratory failure. Investigation reveals complete blood count- Hemoglobin 13.6 gm/dl, Erythrocyte sedimentation rate 12 mm in 1st hour, total white blood cell count 8.6×10^9/L, neutrophil 66%, platelet count 261×10^9/L. Liver function tests showed serum alanine aminotransferase 24 IU, serum aspartate aminotransferase 45 IU, Prothrombin time 15 sec, Activated Partial Thromboplastin Time 26 sec, serum Creatinine 1.00 mg/dl, serum Cardiac troponin- I <0.01 ng/mL, random blood glucose was 122 mg/dL. Urine analysis showed normal physical, biochemical, and microscopic examination and its amount was 2300 mL/day. They managed the patient with synchronized mechanical

ventilation and subcutaneous injection of Neostigmine 3mg and intravenous atropine 1.2mg 4 hourly along with other supportive management. The 3rd dose of polyvalent snake antivenin containing another 10 vials were administered intravenously with ready of the bedside anti-anaphylactic measures on the same day. The patient was maintaining mechanical ventilation for the next 72 hours.

Conclusion and Results (Outcome and follow-up)

On the third day, 11th October 2023, the patient regained her full consciousness, pulse was 80/ min, regular, blood pressure 120/80 mmHg, and extubation was done successfully. After extubation, oxygen saturation was 97% with 10 liters of O_2, then gradually reduced O_2 inhalation to 2 liters over the next 48 hours, then maintained 91-94% without O_2. He shifted to the medicine ward from the ICU on 12th October 2023 with stable vital signs. The patient remained fully conscious with stable vital signs in the ward for 4 days. He was discharged on 17th October 2023 with hemodynamically stable physical signs.

Discussion

Snakebite continues to be an undervalued factor contributing to unintentional fatalities in Bangladesh. The annual mortality rate resulting from snake bites in rural Bangladesh is 6041(2). Numerous misconceptions and fallacies surrounding snake bites contribute to a postponement in the admission to the emergency department of the affected individuals. Neurotoxic snake bites are strongly linked to a high mortality rate caused by rapid respiratory failure, particularly in rural regions (9).

The neurotoxic snake bite case resulted in the occurrence of type II (hypercapnic) respiratory failure. The occurrence of severe neuromuscular paralysis and poor ventilation was attributed to the impact of the snake's toxin, which targeted the neuromuscular junction (10,11).

A patient who has been bitten by a snake necessitates immediate emergency care, administration of antivenom, and appropriate respiratory support with mechanical ventilation. These interventions have the potential to enhance the patient's prognosis and reduce fatality rates (12). This patient came to our hospital with severe neurotoxic features and impending respiratory failure. We managed the patient with supportive measures, antivenom, and bedside ventilation maintained by Ambu bag and then transferred to the ICU with Ambu bag which was 55 km away from our hospital. After 4 days of mechanical ventilation support in the ICU and 5 days of medical management in the ward, the patient was survived and discharged from the hospital without any complications.

The timely identification, prompt delivery to medical facilities, and effective therapy of neurotoxic snake bites are crucial factors in attaining favorable outcomes. The recommended treatment protocols for venomous snake bite patients include antivenom and anti-acetylcholine esterase (causative therapy), prophylactic infections of the bitten limb (additional therapy), and ventilator support (supporting therapy). These interventions are essential in preventing respiratory failure and saving the life of the patient (13). Implementing ventilatory care can be straightforward and has proven to be lifesaving (14). In case of a venomous snake bite where severe neurotoxic features including respiratory muscle paralysis occurred, immediate initiation of mechanical ventilation even at the bedside for respiratory support along with other management can save many lives.

Authors contribution

Dr. Md. Abdul Matin: Conceptualization, writing – original draft; Dr. Sarwar Alam Sobuj: investigation, supervision; Dr. Prity Saha: supervision; Dr. Chowdhury Adnan Sami: writing –review & editing.

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Figure:

Figure 01: Affected leg site

Figure 02: Intubation and ventilation by Ambu bag