



"AN OBSERVATIONAL STUDY DESIGNED TO OVERVIEW THE OUTCOME OF MANAGEMENT OF RESPIRATORY FAILURE DUE TO NEUROPALYTIC SNAKE ENVENOMATION IN CRITICAL CARE SETUP OF BURDWAN MEDICAL COLLEGE AND HOSPITAL DURING ONE YEAR(2018- 2019)"

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ABSTRACT

Background: West Bengal is well known for large number of snake bite deaths every year. The systemic effects of venom of elapidae snakes (cobra & krait) are predominantly neurotoxic, often causing respiratory failure and requiring mechanical ventilator support along with the conventional anti-venom therapy. In this background, the present study, done in the critical care unit of Burdwan Medical College within August 2018 to July 2019, was aimed to observe the various effects of neuromuscular snake envenomation on patients' respiratory system as well as to observe the outcome of the management of respiratory failure in such patients.

Methods: Provisionally diagnosed and symptomatic patients, after being transferred to CCU (BMCH) from emergency department or from General Medicine Ward were assessed and put on Mechanical Ventilator (Type- PURITAN BENNETT 840). Initially continuous mandatory ventilation (CMV) mode was used; patients were gradually switched to synchronized intermittent mandatory ventilation (SIMV) with pressure support as neuromuscular recovery occurred. A Short T-piece trial was given and patients were extubated if the recovery was adequate. However, anti snake venom (polyvalent) were used routinely in all patients (for each patient, not exceeding the dose of 30 vials, each vial containing 10 ml of ASV). The demographic data were planned to be compared in respect to age and sex distribution. The amounts of ASV infused (in terms of vials in each patient) were also plotted in a frequency distribution curve. The frequency of ventilator- modes used (invasive / non-invasive/ both) were also studied. The "bite- to- antivenom" time gaps were compared. The mean durations of treatment with mechanical ventilator and their outcomes (expressed in three variables: 1. cured and discharged, 2. delayed recovery, 3. Death) were also thoroughly studied.

Results: Among total 160 victims admitted within the specified time period, maximum number of patients are within 11 to 40 yrs of age and predominantly male (64%). The mean value of the vials used was 18.48 per patient, more needing invasive ventilation than non-invasive ventilation (45% versus 36.25%) and the mean value of ventilation required was 44.63 hours. It was also evident that if the ASV started early after bite, the durations on mechanical ventilation reduced significantly. The cure (& discharge) rate was as high as 75% and the death rate was 6.3%.

Conclusion: It has been shown through this one year observation in this particular critical care set up, that mechanical ventilator support along with ASV therapy and supportive care in ICU was the mainstay of management in the patients with respiratory failure due to neuromuscular snake bites around this area of the rural Bengal.

The outcome of the management by ventilators was excellent if started in time and given adequately.

KEYWORDS : neuromuscular snake bite, mechanical ventilation support, antivenom therapy, respiratory failure.

INTRODUCTION:

West Bengal is well known for large number of snake bite deaths every year. The systemic effects of venom of elapidae snakes (cobra & krait) are predominantly neurotoxic, causing a selective neuromuscular block, affecting mainly the muscles of eyes, tongue, throat and chest leading to respiratory failure (1,2).

The toxins present in neuromuscular snake venom, acts on presynaptic and synaptic sites. The polyvalent anti-snake venom which is helpful in reversing the synaptic blockade cannot reverse the presynaptic block. If respiratory failure occurs, these patients require mechanical ventilator assistance for a variable period of time along with supportive measures. (3, 4)

In the CCU of Burdwan Medical College, most of the cases admitted are neurotoxic snake bites from the above mentioned two commonest varieties of snakes.

OBJECTIVES:

1. To observe the effects of neuromuscular snake envenomation on patient's respiratory system.
2. To observe the outcome of the management of respiratory failure due to neuromuscular snake envenomation.

METHODS:

This study was conducted at the Critical Care Unit (CCU) of Burdwan Medical College & Hospital (BMCH), after taking ethical committee clearance and Patients' consent.

All consecutive patients seen during one year period (August 2018-July 2019), between the age 11-70 years of either sex, who required mechanical ventilation for respiratory muscle paralysis, secondary to snake envenomation, were included.

Snake bite victims with mild neuromuscular weakness not requiring ventilator assistance, as also patients with systemic manifestations other than neuromuscular (coagulopathy, renal failure etc), were excluded from the study.

Study parameters: Detailed history and physical examination, including onset and nature of symptoms, site of bite, time of bite, general and systemic manifestations, and types of ventilatory management were recorded for each patient.

Patients after transfer to CCU (BMCH) from emergency department or from General Medicine Ward were assessed and put on Mechanical Ventilator (Type PURITAN BENNETT 840).

Laboratory investigations performed at admission included ABG analysis, ECG, Chest X-Ray, serum biochemistry, hemogram and coagulation profiles.

Initially, Continuous Mandatory Ventilation (CMV) was used; patients were gradually switched to synchronized intermittent mandatory ventilation (SIMV) with pressure support as neuromuscular recovery occurred.

Weaning was accomplished by gradual reduction of SIMV

rate & the level of pressure support, once adequate respiratory effort had appeared. A short T-piece trial were given and patients were extubated if the recovery was adequate.

Some of the patients started receiving anti-snake venom (ASV) in the emergency and general ward, while others received ASV after their transfer to CCU. ASV was administered according to the institutional protocol starting with 10 vials (polyvalent ASV, each vial containing 10ml) initially and gradually increased. However, total dose of ASV didn't exceed 30 vials per patient.

In spite of the best effort in CCU (BMCH), a few number of the patients succumbed to death and another small group of patients developed ventilator related or other complications which needed prolonged ventilatory support, as well as prolonged morbidity.

RESULTS:

a) 160 victims were admitted for the ventilatory management after snake bite in CCU of BMCH during the one year period of study.

Their age ranges from 11-70 years of which maximum numbers of patients are between the ages of 11-40 years (124 patients).

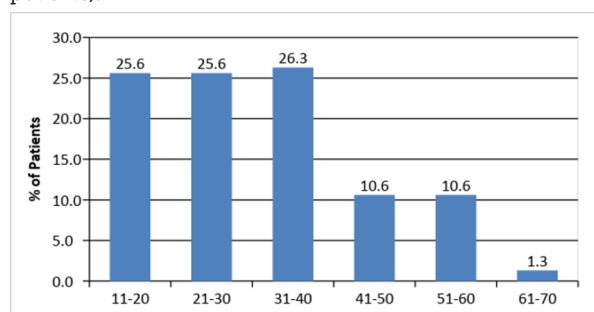


DIAGRAM 1

b) Male patients were around 64% among those who were treated.

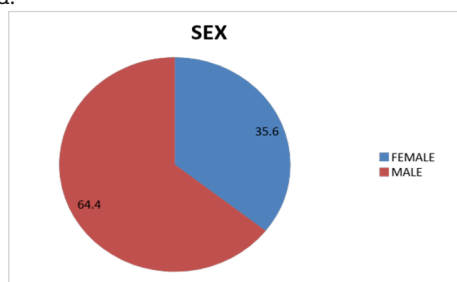


DIAGRAM 2

c) The mean value of the vials of ASV infused for each patient comes to 18.48 vials (each vial containing 10ml of polyvalent ASV)

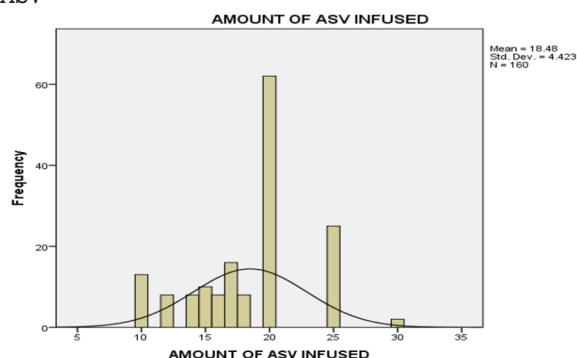


DIAGRAM 3:

Descriptive Statistics : Table 1

	N	Minimum	Maximum	Mean	Std. Deviation
AMOUNT OF ASV INFUSED	160	10	30	18.48	4.42

d) The patients were mechanically ventilated by either invasive (45%), non-invasive (36.25%) or both (18.75%).

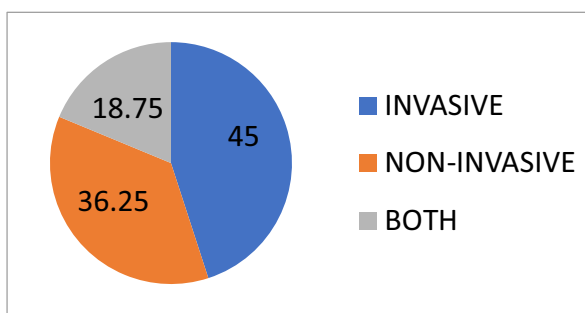


DIAGRAM 4

e) The patients received mechanical ventilation for variable periods, of which minimum period of ventilation comes to 12 hours and maximum being 288 hours with a mean value of 44.63 hours

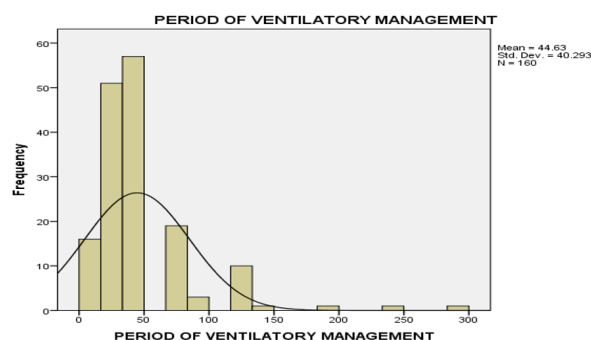


DIAGRAM 5:

f) It has been seen that the time of bite to starting of ASV determines the duration of ventilatory management.

In patients where ASV was initiated within 3 hours of bite, duration Of ventilatory stay was 36 hours, whereas if ASV was initiated after 12 hours it led to Prolonged ventilator stay upto 5 days or even death.

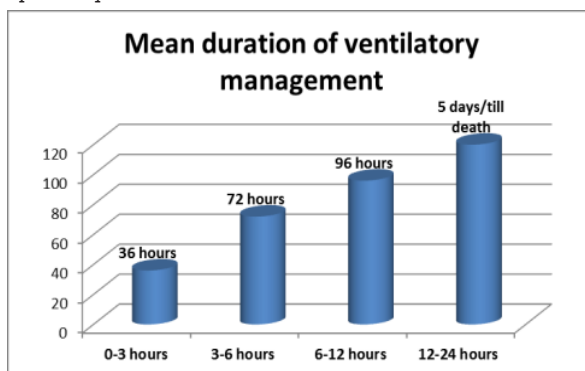


DIAGRAM 6:

g) 75% of treated patients are presumably cured and discharged, 18.8% patients have got a delayed recovery from ventilator support (>48 hours) and 6.3% patients succumbed to death.

DISCUSSION:

Among the 160 patients, admitted for mechanical ventilator

management after neurotoxic snake bite , majority of the patients falls below the age group of 40 years and most of the patients were male(64.4%).This data justifies the more incidence of snake bites in outdoor working male populations in rural areas of Purba Bardhaman.

Severity of the envenomation and progression to respiratory failure is related to several factors such as dose of venom injected , species and size of snakes , condition of fangs and whether the snake has recently fed or injured , potency of venom and anatomic location of the bite.⁽³⁾

Each of these factors could not be investigated due to the lack of proper history, evidence and logistics. However, delay of treatment (i.e the time-gap between the bite and the starting of ASV infusion) has been recorded in each case and it has been evident in the result of the present study that this time-gap contributed to the amount of respiratory failure, systemic complications as well as the incidence of death.

There were variations of type of ventilator management and the amount of ASV required for each patient. The duration of ventilator management needed was also having large amount of variations, possibly due to those aforesaid factors.

Nevertheless, it was clearly evident that early and proper ventilator support gave encouragingly good outcome in patients with respiratory-failure due to snake bite in the CCU of BMCH.

Few investigations have also advocated the use of neostigmine as a supportive management in these victims, however there is no consensus on the routine use of such drugs, because the anticholinesterases will only act on the post-synaptic toxins and are not effective against the toxins acting pre-synaptically. Also, they are not useful if administered late, as binding of toxin to Acetylcholine receptors becomes relatively irreversible with time.⁽³⁾ Hence, our institutional protocol excludes the use of neostigmine in such patients.

CONCLUSION:

- To conclude,it has been shown through this one year observation, that mechanical ventilator support along with ASV therapy and supportive care in ICU is the backbone of management in the patients with respiratory failure due to neuromuscular snake envenomation.
- The outcome of the ventilator management is excellent if started in time and given adequately.

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