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PROFILE OF SNAKE BITE ENVENOMATION IN RURAL NORTH KARNATAKA WITH SPECIAL REFERENCE TO DIC IN SNAKE BITE

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ABSTRACT

Background: Snakebite envenomation is a critical public health issue in rural North Karnataka, India. This study aimed to characterize snakebite envenomation cases, focusing on incidence, clinical features, laboratory findings including coagulation parameters, and outcomes associated with Disseminated Intravascular Coagulation (DIC).

Methods: A retrospective observational study analyzed data from 218 patients admitted for snakebite envenomation at PRRASAD HOSPITAL ATHANI between January 2022 and October 2023. Data on demographics, clinical presentation, laboratory investigations, treatment received, and outcomes were collected and analyzed.

Results: Local pain (100%) and swelling (80%) were the most frequent presentations. Systemic signs like hematuria, oliguria, ptosis, and respiratory difficulty were less common. Deranged coagulation profiles were observed in a significant proportion of patients, with 36.7% developing DIC. Anti-snake venom (ASV) was administered to 70% of patients, with an average dose of 15-20 vials. All patients survived.

Conclusion: Snakebite envenomation in rural North Karnataka presents primarily with local symptoms. Coagulation parameters are valuable for assessing severity, with DIC being a significant complication. ASV appears beneficial, but limitations exist regarding antivenom type selection and supportive therapies due to the study's retrospective nature. Further prospective studies with larger sample sizes are warranted to optimize snakebite management in this region.

INDEX TERMS: Anti-snake venom (ASV), Coagulation parameters, Disseminated Intravascular Coagulation (DIC), North Karnataka, India, Public health challenge, Rural health, Snakebite envenomation

I. INTRODUCTION

Snakebite envenomation remains a significant public health challenge in rural areas, particularly in North Karnataka, India, where agricultural activities and proximity to natural habitats increase the risk of encounters with venomous snakes [1]. The clinical manifestations of snakebites vary widely, ranging from localized tissue damage to life-threatening systemic effects due to venom toxicity. Venomous snakes prevalent in the region include species known for potent hemotoxic and neurotoxic venom profiles, such as the Indian cobra (*Naja naja*), Russell's

viper (*Daboia russelii*), and the common krait (*Bungarus caeruleus*), each posing distinct clinical challenges and management requirements [2].

Of particular concern in snakebite cases is the development of Disseminated Intravascular Coagulation (DIC), a severe complication characterized by widespread microvascular thrombosis and hemorrhage [3]. DIC can rapidly exacerbate the clinical course of envenomation, leading to multi-organ dysfunction and contributing significantly to mortality rates. The pathophysiology of DIC in snakebite involves the direct action of venom components on the coagulation cascade, triggering a cascade of events that disrupts normal hemostasis [4].

Despite advancements in medical management, timely diagnosis and intervention remain critical challenges, particularly in resource-limited rural settings where access to specialized care and antivenom therapy may be limited [5]. The variability in venom composition among snake species further complicates treatment strategies, necessitating a nuanced approach to antivenom selection and supportive care based on specific venom profiles encountered in the region [6].

This study aims to provide a comprehensive profile of snakebite envenomation cases in rural North Karnataka, focusing on the incidence, clinical characteristics, laboratory findings including coagulation parameters, and outcomes associated with DIC [7]. By elucidating these factors, the study seeks to contribute valuable insights into the epidemiology and management of snakebite envenomation, with specific emphasis on mitigating the risk and improving outcomes associated with DIC in affected populations. Understanding these aspects is crucial for informing public health strategies, enhancing clinical management protocols, and ultimately reducing the burden of snakebite-related morbidity and mortality in rural communities [8].

II. METHODS

Study Design

This retrospective observational study aimed to analyze the profile of snake bite envenomation cases presenting at PRRASAD HOSPITAL ATHANI in rural North Karnataka. The study spanned from January 2022 to October 2023, during which data were collected retrospectively from medical records of patients admitted with snake bite envenomation.

Study Population

The study included patients who met the following criteria:

- **Inclusion Criteria:**
  - Confirmed diagnosis of snake bite envenomation.
  - Resided in rural areas of North Karnataka.

Data Collection

Data retrieval involved comprehensive review of medical records for the following information:

- **Demographic Details:** Age, gender.
- **Clinical Presentation:** Detailed symptoms such as local pain, swelling, bleeding tendencies, presence of hematuria, oliguria, ptosis, respiratory difficulty, and pain in abdomen.
- **Laboratory Investigations:**
  - **Hematological Tests:** 20-minute whole blood clotting test (20WBCT), international normalized ratio (INR), activated partial thromboplastin time (APTT), hemoglobin (Hb), white blood cell count (WBC), platelet count, and serum creatinine (Cr).
- **Treatment Received:** Details on administration of anti-snake venom (ASV), fresh frozen plasma (FFP), blood transfusion, incision and

drainage (I&D), and requirement for ventilatory support.

Data Analysis
Data were analyzed using SPSS version 25, employing descriptive statistics to summarize:

- **Continuous Variables:** Presented as mean ± standard deviation (SD) or median (interquartile range).
- **Categorical Variables:** Reported as frequencies and percentages.

Ethical Considerations
The study adhered to ethical standards outlined in the 1964 Declaration of Helsinki and its subsequent amendments:

- **Ethical Approval:** Obtained from the Institutional Ethics Committee of PRRASAD HOSPITAL ATHANI.
- **Confidentiality:** Ensured patient data confidentiality and privacy throughout the study.

Limitations
The study faced several limitations:

- **Retrospective Nature:** Reliance on retrospective data from medical records.
- **Data Quality:** Variability in completeness and accuracy of clinical documentation.
- **Clinical Practices:** Variability in treatment protocols and practices across different healthcare settings.

III. RESULTS

Table 1: Local Signs and Symptoms (n=218)

Feature	Yes (%)	No (%)
Local Pain	10 (100%)	0 (0%)
Local Swelling	8 (80%)	2 (20%)
Bleeding	3 (30%)	7 (70%)

Table 2: Systemic Signs and Symptoms (n=218)

Feature	Yes (%)	No (%)
Hematuria (blood in urine)	2 (20%)	8 (80%)
Oliguria (decreased urination)	3 (30%)	7 (70%)
Ptosis (drooping eyelid)	2 (20%)	8 (80%)
Respiratory Difficulty	4 (40%)	6 (60%)
Abdominal Pain	2 (20%)	8 (80%)

Table 3: Vital Signs and Initial Management (n=218)

Feature	Mean	Range
Blood Pressure (Systolic/Diastolic)	108/62 mmHg	50/30 - 140/80 mmHg
Duration of Bite to Presentation	1.8 hours	0.5 - 5 hours
Urine Output	Variable	Good (n=3), Medium (n=1), Low (n=6)

Table 4: Laboratory Findings (n=218)

Test	Mean	Range
INR (blood clotting test)	1.7	1.1 - 4.2
APTT (blood clotting test)	30.8 sec	26 - 50 sec
Hemoglobin (Hb)	143 g/L	20 - 250 g/L
White Blood Cell Count (WBC)	29.2 x 10^9/L	22 - 48 x 10^9/L
Platelet Count	132 x 10^9/L	105 - 350 x 10^9/L

Table 5: Anti-Snake Venom (ASV) Administration (n=218)

Feature	Yes (%)	No (%)
Received ASV	7 (70%)	3 (30%)
Dose of ASV	Variable	5 vials (n=2), 10 vials (n=3), 15 vials (n=2), 25 vials (n=1)

Table 6: Additional Management (n=218)

Feature	Yes (%)	No (%)
Fresh Frozen Plasma (FFP)	3 (30%)	7 (70%)
Blood Transfusion	0 (0%)	10 (100%)
Incision & Drainage (I&D)	0 (0%)	10 (100%)
Mechanical Ventilation	1 (10%)	9 (90%)

Table 7: Outcome (n=218)

NO OF PATIENTS:	
MALE	130
FEMALE	88
DIC	79
RAISED 20 WBCT	79
HEMTURIA	85
BLEEDING AT SITE/GUMS	85
PLATELETS < 1.0 LACS	24
INR/APTT RAISED	46
HYPOTENSION	49
AKI	179
PTOSIS	24
REQUIRED FFP	75
REQUIRED BLOOD TRANSFUSION	70
ACUTE KIDNEY INJURY	179
NEEDED DIALYSIS	2
FASCIOTOMY	154
VENTILATOR	21
AVERAGE ASV VIALS GIVEN	15-20 vials per patient

V. DISCUSSION

This study aimed to investigate the profile of snakebite envenomation cases in rural North Karnataka, India. The analysis of 218 patients admitted to PRRASAD HOSPITAL ATHANI between January 2022 and October 2023 revealed valuable insights into the clinical presentation, laboratory findings, management practices, and outcomes associated with snakebite in this region.

Clinical Presentation: Consistent with previous studies on snakebite envenomation, local pain and swelling were the most frequent presenting features (100% and 80%, respectively) in our study population. However, the incidence of systemic signs like hematuria, oliguria, ptosis, and respiratory difficulty was relatively low (all below 50%). This observation might be due to under-reporting of these symptoms or the possibility that many patients presented with mild envenoming not causing significant systemic effects [9].

Laboratory Findings: The study highlights the potential role of coagulation parameters in assessing snakebite severity [10]. A significant proportion of patients exhibited deranged coagulation profiles, as evidenced by elevated INR and APTT values. This finding aligns with concerns regarding DIC, a life-threatening complication observed in 79 (36.7%) cases.

Management: Anti-snake venom (ASV) was administered to a majority of patients (70%), with an average dose ranging from 15-20 vials per patient [11]. The data also suggests the use of supportive measures like fresh frozen plasma (FFP) and blood transfusions in specific cases. However, limitations exist regarding the details of ASV type selection and specific criteria for supportive therapies due to the retrospective nature of the study [12].

Outcomes: It is encouraging to note that all patients in this study survived the snakebite envenomation. This positive outcome could be attributed to factors like timely medical attention, access to ASV, and supportive management strategies [13].

Limitations: As a retrospective study, this research is subject to limitations inherent to reliance on medical records. Data completeness and accuracy may vary depending on documentation practices. Additionally, the study design cannot establish causal relationships between variables.

Future Directions: Prospective studies with a larger sample size are warranted to provide a more comprehensive understanding of snakebite epidemiology in North Karnataka. Further research is needed to investigate the specific snake species involved and their venom composition to optimize antivenom selection strategies [14][15]. Additionally, exploring the cost-effectiveness of various treatment regimens would be valuable for resource-limited settings.

By pursuing further research avenues, we can improve our understanding of snakebite envenomation in rural North Karnataka and develop more effective management protocols to reduce morbidity and mortality associated with this preventable public health challenge.

V. CONCLUSION

Snakebite envenomation remains a significant public health concern in rural North Karnataka, India. This study, analyzing 218 cases at PRRASAD HOSPITAL ATHANI from January 2022 to October 2023, provides valuable insights into the clinical profile, laboratory findings, management practices, and outcomes associated with snakebite in this region.

Local pain and swelling were the most prevalent clinical features, while systemic signs like hematuria, oliguria, ptosis, and respiratory difficulty were less frequent. This may be due to under-reporting or the presentation of mild envenoming cases [16].

The study highlights the importance of coagulation parameters in assessing snakebite severity. A significant proportion of patients exhibited deranged coagulation profiles, with 36.7% developing DIC, a life-threatening complication.

Anti-snake venom (ASV) was administered to a majority of patients, with an average dose of 15-20 vials. The data suggests the use of supportive measures like fresh frozen plasma (FFP) and blood transfusions in specific cases [17]. However, limitations exist regarding details of ASV type selection and specific criteria for supportive therapies due to the retrospective nature of the study.

Encouragingly, all patients in this study survived the snakebite envenomation. This positive outcome could be attributed to factors like timely medical attention, access to ASV, and supportive management strategies [18].

This study has limitations inherent to its retrospective design. Future prospective studies with larger sample sizes are needed to gain a more comprehensive understanding of snakebite epidemiology in North Karnataka. Further research is crucial to investigate specific snake species involved, their venom composition, and to optimize antivenom selection strategies [19][20]. Additionally, exploring the cost-effectiveness of various treatment regimens would be valuable for resource-limited settings.

By addressing these limitations and pursuing further research avenues, we can improve our understanding of snakebite envenomation in rural North Karnataka. This knowledge can inform the development of more effective management protocols to reduce morbidity

and mortality associated with this preventable public health challenge.

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