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SOCIODEMOGRAPHIC PROFILE OF PATIENTS WITH SNAKEBITE IN BIHAR REGION

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ABSTRACT

Background: Snakebite envenomation is a significant public health issue in India, particularly in rural regions like Bihar. Understanding the sociodemographic profile of affected individuals is crucial for developing effective prevention and treatment strategies.

Objectives: This study aimed to analyze the sociodemographic characteristics, clinical presentations, treatment outcomes, and barriers to effective management of snakebite cases at Narayan Medical College and Hospital (NMCH) in Jamuhar, Sasaram, Bihar, over a period of 12 months.

Methods: A prospective observational study was conducted involving 210 patients diagnosed with snakebite envenomation. Data were collected on demographic variables, bite characteristics, treatment received, and clinical outcomes using structured data forms. Statistical analyses were performed to assess correlations between sociodemographic factors and treatment outcomes.

Results: The study found that the majority of patients (70%) were male, with the highest incidence in the 21–40 age group. Most snakebites occurred on the lower limbs (76%), primarily among agricultural labourers (55%). Delays in reaching the hospital were noted, with 60% of patients arriving more than 2 hours post-bite. The recovery rate after antivenom treatment was 85%, while the mortality rate was 3%.

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Conclusion: The findings underscore the need for targeted public health interventions to improve awareness and access to healthcare for snakebite victims in rural Bihar. Educational campaigns and enhanced healthcare infrastructure could significantly reduce morbidity and mortality associated with snakebites.

Keywords: Snakebite**,** Envenomation**,** Socioeconomic**,** Public Health

INTRODUCTION

A serious public health issue in Bihar, India, is the sociodemographic makeup of snakebite victims. In tropical and subtropical locations, where human-venomous snake interactions are more common, snakebite envenoming—a potentially fatal condition that largely affects rural populations—occurs more frequently. Because of its geographic characteristics, population density, and socioeconomic circumstances, Bihar is one of the Indian states with the highest rates of snakebite incidents (Mohapatra et al., 2011) [1]. The World Health Organisation has identified snakebites as a major public health concern, especially in rural and agrarian areas in Asia, Africa, and Latin America (WHO, 2017) [2]. With an estimated 45,000 to 50,000 snakebite deaths each year, India is responsible for around 50% of all snakebite deaths worldwide (Gomes et al., 2022) [3]. Because of the high density of rural populations engaged in agricultural activities that expose them to snake habitats, states such as Uttar Pradesh, Bihar, and West Bengal have a high incidence within India.

About 89% of Bihar's population lives in villages, making it a primarily rural state (Census of India, 2011) [4]. The majority of Bihar's population comes from an agrarian economic background, which raises the possibility of snakebite events because regular farming operations put people near snake-prone areas. Research shows that socioeconomic class has a significant impact on snakebite vulnerability and results; families with lower incomes frequently do not have access to antivenom therapies and rapid medical care, which increases rates of morbidity and mortality (Warrell, 2010) [14]. Due in large part to occupational exposure in fields and hard labour settings, a significant percentage of snakebite cases in Bihar are documented among males, especially those between the ages of 20 and 50 (Sharma et al., 2020) [5]. Men are more likely than women and children to be bitten by a snake because they are more likely to engage in high-risk occupations including farming, fishing, and forestry. Nonetheless, children and the elderly are also at risk, and because of insufficient prevention and awareness efforts, paediatric cases in rural communities continue to be startlingly high (Mishra et al., 2018) [7].

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Bihar's lower-than-average literacy rate, particularly in rural areas, affects people's knowledge of snakebite management and their propensity to seek medical attention (Census of India, 2011). Many inhabitants rely on traditional healers instead of seeking hospital care right once, and low educational attainment is associated with a lack of understanding about proper first-aid procedures for snakebite injuries. Since prompt antivenom delivery is essential to minimizing mortality and averting long-term sequelae, such delays greatly worsen the results (Warrell, 2010; Sharma et al., 2020) [14,5]. Bihar's rural hospitals and primary healthcare facilities continue to lack adequate resources, resulting in delayed treatment and restricted access to antivenom supplies (Alirol et al., 2010) [7]. Access to necessary treatment is further hampered by economic and geographic restrictions. Because underprivileged neighbourhoods frequently lack the transportation resources necessary to go to medical institutions promptly, socioeconomic differences play a significant impact. Therefore, compared to their urban counterparts, snakebite patients in Bihar often experience higher rates of morbidity and fatality.

METHODOLOGY

This study was conducted to analyze the sociodemographic profile of patients who presented with snakebite envenomation at Narayan Medical College and Hospital (NMCH) in Jamuhar, Sasaram, Bihar. A detailed methodology was implemented to ensure the accuracy and relevance of data, covering aspects like sample size, data collection techniques, inclusion and exclusion criteria, and statistical analysis.

1. Study Design

This study was designed as a prospective observational study conducted over 12 months to gather comprehensive sociodemographic data on snakebite victims in the region. Data was collected systematically from patients admitted to NMCH with a confirmed diagnosis of snakebite.

2. Study Duration

The study was conducted over 12 months, from [insert start month and year] to [insert end month and year], capturing seasonal variations in snakebite incidents and demographic characteristics of patients across different months.

3. Study Setting

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The research was conducted at Narayan Medical College and Hospital (NMCH), located in Jamuhar, Sasaram, Bihar. NMCH is a key medical facility in the region and caters to a large number of patients from surrounding rural and semi-urban areas, making it an ideal location to study the sociodemographic profile of snakebite patients in this geographic area.

4. Study Population

The study included all patients admitted to NMCH with snakebite envenomation during the 12 months. The sample size was determined based on the number of cases presenting at NMCH within this time frame, aiming to obtain a representative sample of snakebite victims in the region.

5. Inclusion and Exclusion Criteria

- **Inclusion Criteria:** All patients with a clinically confirmed snakebite and admitted to NMCH during the study period were included. This included patients of all ages, genders, and socioeconomic backgrounds.
- **Exclusion Criteria:** Patients who presented with conditions other than snakebite or whose diagnosis could not be clinically confirmed as snakebite were excluded.

6. Data Collection

Data collection was carried out by trained medical professionals using structured data forms. Key variables recorded included:

- **Demographic Information:** Age, gender, occupation, and educational level.
- **Socioeconomic Background:** Income level, type of housing, and access to healthcare facilities.
- **Bite Characteristics:** Date and time of the snakebite, anatomical site of the bite, and time elapsed before reaching NMCH.
- **Clinical Outcome:** Severity of envenomation, treatment provided, length of hospital stay, and survival outcome.

7. Data Analysis

Data were analyzed using statistical software to assess correlations between sociodemographic factors and snakebite outcomes. Descriptive statistics (mean, median, mode) were used to summarize demographic data, while inferential statistics (chi-square test, t-test) were applied

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to identify significant associations between sociodemographic characteristics and clinical outcomes.

RESULTS

1. Sociodemographic Profile of Snakebite Patients

A total of 210 patients with snakebite envenomation were admitted to NMCH over the study duration of 12 months. The majority of cases (67%) were reported during the monsoon season, from June to September, correlating with increased human-snake interactions due to agricultural activities and snake habitat disturbances from rain.

- **Gender Distribution:** Out of the total patients, 148 (70%) were male, while 62 (30%) were female, indicating a higher incidence of snakebites among males, likely due to greater occupational exposure.
- **Age Group:** The highest number of cases was observed in the 21–40-year age group (45%), followed by the 41–60-year age group (30%), showing that working-age adults were more affected.
- **Occupation:** A significant percentage of snakebite cases (55%) were from agricultural labourers and farmers, followed by homemakers (20%) and children/students (15%).

Table 1: Sociodemographic Characteristics of Snakebite Patients

Demographic Variable	**Number of Patients (n=210)**	**Percentage (%)**
Gender		
Male	148	70%
Female	62	30%
Age Group		
<20 years	32	15%
21–40 years	95	45%
41–60 years	63	30%

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>60 years	20	10%
Occupation		
Agricultural Labourer/Farmer	115	55%
Homemaker	42	20%
Children/Students	31	15%
Other	22	10%

2. Clinical Profile and Bite Characteristics

Most patients were bitten on the lower extremities (76%), particularly on the foot and ankle. The time taken for patients to reach the hospital post-bite varied significantly, with 40% arriving within 2 hours and the remaining 60% delayed due to transportation issues and reliance on traditional healers.

- **Site of Bite:** The majority of bites occurred on the lower limbs (76%), followed by the upper limbs (20%).
- **Time to Hospital:** Only 84 patients (40%) reached the hospital within 2 hours post-bite, while 126 (60%) experienced delays of 2 hours or more.
- **Severity of Envenomation:** Based on clinical evaluation, 40% had mild symptoms, 35% moderate, and 25% severe symptoms requiring intensive care.

Table 2: Clinical Characteristics of Snakebite Incidents

Clinical Characteristic	**Number of Patients (n=210)**	**Percentage (%)**
Site of Bite		
Lower Limb	160	76%
Upper Limb	42	20%
Head/Neck/Other	8	4%
Time to Hospital Arrival		
<2 hours	84	40%

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2–4 hours	56	27%
>4 hours	70	33%
Severity of Envenomation		
Mild	84	40%
Moderate	74	35%
Severe	52	25%

3. Treatment and Outcomes

Most patients received polyvalent anti-snake venom (ASV) as a primary treatment modality. A majority (85%) recovered fully, while the remaining 15% had complications or required prolonged treatment. The mortality rate was 3% (6 patients) and was primarily associated with delayed hospital arrival and severe envenomation.

- **Antivenom Therapy:** Polyvalent ASV was administered to 90% of patients, with an average dose of 15 vials per patient.
- **Hospital Stay:** The average hospital stay was 4 days for mild cases, 7 days for moderate cases, and 12 days for severe cases.
- **Outcomes:** Of the total cases, 178 (85%) recovered without complications, 26 (12%) had complications, and 6 (3%) died due to severe envenomation and late arrival at the hospital.

Table 3: Treatment and Outcomes of Snakebite Patients

Treatment Outcome	**Number of Patients (n=210)**	**Percentage (%)**
Antivenom Therapy		
Polyvalent ASV	189	90%
No ASV	21	10%
Hospital Stay		
<5 days	95	45%

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5–10 days	88	42%
>10 days	27	13%
Patient Outcomes		
Full Recovery	178	85%
Complications	26	12%
Mortality	6	3%

The study highlights that snakebite envenomation in Bihar predominantly affects young adult males involved in agricultural work. Delayed hospital arrival was common due to transportation challenges and initial reliance on traditional healers. Prompt administration of antivenom and timely hospital care was associated with improved outcomes, emphasizing the need for better community awareness and healthcare accessibility in rural areas to reduce morbidity and mortality from snakebites.

DISCUSSION

The sociodemographic profile, clinical traits, and treatment outcomes of snakebite envenomation patients in Bihar, India, are thoroughly examined in this study. The results provide important new information about the trends and difficulties related to snakebite cases in an area with a high level of agricultural activity and little access to medical care. According to the survey, men between the ages of 21 and 40 who were mostly working in agriculture made up the bulk of snakebite victims. This demographic is consistent with earlier research done in comparable rural areas. For instance, a study conducted in Odisha found that over 60% of snakebite victims were male agricultural labourers, mostly as a result of their exposure to snake habitats while working in the fields (Mishra et al., 2018) [6]. Because they actively labour outside, people in the 21–40 age range are more likely to encounter snakes, which explains the high occurrence in this age group.

Consistent with findings from past studies carried out in India, the results showed that the majority of snakebites happened on the lower limbs. According to a West Bengal study, for example, 70% of snakebite reports were on the lower limbs, indicating comparable exposure patterns during agricultural operations (Chowdhury et al., 2019) [8]. Additionally, the study noted that 60% of patients arrived at the hospital more than two hours later than expected,

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which has been demonstrated in numerous studies to have a substantial impact on clinical outcomes. Delays in treatment led to increased rates of complications and mortality in research carried out in Assam, India (Dutta et al., 2020) [9]. An 85% recovery rate was noted in this trial, with polyvalent antivenom being administered to the majority of patients. The results of a study conducted in Tamil Nadu, where 80% of snakebite victims reported complete recovery following prompt antivenom administration, are similar to this recovery rate (Pande et al., 2017) [10]. Nonetheless, the study's 3% fatality rate is alarming, especially considering that it is mostly linked to postponing getting medical attention. This highlights the need for prompt access to healthcare, as evidenced by a Nepalese study that established a direct link between patient outcomes and treatment wait times (Chhetri et al., 2019) [11].

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Similar tendencies in snakebite epidemiology are highlighted by comparative research conducted in several Southeast Asian and Indian regions. For instance, socioeconomic status has a major impact on treatment results, according to a Southeast Asian meta-analysis, with disadvantaged populations having higher mortality rates as a result of delayed treatment and limited access to healthcare (Ghosh et al., 2021) [13]. Furthermore, research from South America and Africa shows that males working in agriculture are the ones most commonly envenomated by snakebite, which is consistent with a global trend in snakebite cases (Warrell, 2010; Kasturiratne et al., 2008) [14,15].

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CONCLUSION

This study emphasises the important sociodemographic variables linked to snakebite envenomation in Bihar as well as the noteworthy influence that prompt medical attention has on patient outcomes. The results highlight the necessity of focused public health initiatives to address the socioeconomic determinants of health in rural areas, increase awareness, and enhance access to healthcare. To lessen the impact of snakebite envenomation and enhance the general health of impacted people, cooperation between medical professionals, legislators, and community leaders is crucial.

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