Snakebite envenomation is a worldwide problem, which is an important cause of death in the developing countries and still remains a neglected public health problem. Children sustain more severe toxicity from envenomation compared to adults and thus have different outcomes. **Objectives:** This study was carried out to review the demographics, risk factors, interventions, and outcomes of snakebite victims in the pediatric age group in Enugu, Southeast Nigeria, to improve the existing database.  

**Materials and Methods:** This was a descriptive, retrospective study conducted at the children emergency room (CHER) of Enugu State University Teaching Hospital (ESUTH), Enugu. The admission records of all the children that were admitted into CHER of ESUTH over a 5-year period (January 2012 to December 2016) were reviewed. Analysis was mainly descriptive. Frequency distributions of all relevant variables were reported as tables and prose. Test of significance for discrete variables was done using the Chi-square test. \( P < 0.05 \) was regarded as statistically significant.  

**Results:** There were 5182 admissions with 13 cases of snakebite, giving a prevalence rate of 0.25%. Late presentation was significantly associated with longer duration of hospitalization \( (P = 0.026, \chi^2 = 4.952) \). Five (30.8%) patients had complications distributed as follows: one gangrenous limb \( (7.7\%) \), one necrotic ulcer \( (7.7\%) \), and three compartment syndromes \( (23.1\%) \). Prehospital visit interventions included visit to the native doctor, local incision, application of herbs, tourniquet, and black stone application. One of the patients died, giving a case fatality rate of 7.7%.  

**Conclusions:** The prehospital emergency interventions given to snakebite victims still reflect practices that are harmful. It is possible that the majority of snakebite cases in our environment do not present to the health facilities. More efforts are required to improve the health-seeking behavior and emergency interventions for snakebite victims.

**Keywords:** Children, Enugu, Nigeria, snakebites
increased venom: body mass ratio compared to adults and thus have different outcomes. However, the majority of studies have been done in adult snakebite victims and very few in children. Hence, this study was done to review the ages, pattern of presentation, interventions, complications, and outcome of admission in patients of snakebite in the pediatric age group in Enugu, Southeast Nigeria, to improve the database of pediatric snakebite victims.

**MATERIALS AND METHODS**

This was a descriptive, retrospective study conducted at the children emergency room (CHER) of Enugu State University Teaching Hospital (ESUTH), Enugu. It is a tertiary health facility in the Southeast region of Nigeria. It provides all levels of health care, and it is open for 24-h service. Children from the age of 1 day to 18 years were seen in CHER. The unit caters to patients from all parts of the region and beyond and includes direct presentations, and children referred from the institution's outpatient departments as well as referrals from other primary and secondary health facilities within the region.

The admission records of all the children that were admitted into CHER of ESUTH over a 5-year period (January 2012 to December 2016) were reviewed. Ethical approval for the study was obtained on the 17th of December 2018 from Enugu State University Teaching Hospital Ethics Committee ESUTH/CMAC/RA/034/ Vol. 11/54. Data extracted from the records included age, sex, date of presentation, presenting symptoms and signs, treatment and complications, duration of admission outcome, and time of death.

Data were entered, and statistical analysis was performed using the SPSS Statistics software version 19 (IBM Corp, Armonk, NY, USA, 2011). Analysis was mainly descriptive. Frequency distributions of all relevant variables were reported as tables and prose. Test of significance for discrete variables was done using the Chi-square test. A value of $P < 0.05$ was considered as statistically significant.

**RESULTS**

During the study period, there were 5182 admissions of which 13 cases of snakebite were recorded, giving a prevalence rate of 0.25%. Six of them were males giving a M: F ratio of 1:1.2. The children's ages ranged from 7 years to 17 years, with a mean age of 12.4 ± 2.8 years. Majority (76.9%) of the children were from the lower socioeconomic class (SEC), whereas 23.1% each were from the upper and lower SEC. Those residing in the urban areas comprised 46.2%, while those from semiurban and rural areas were 15.4% and 38.5%, respectively. Most (84.6%) of the snakebites cases occurred during the rainy season (April to October). Most (84.6%) bites occurred around the homes with only one case (7.7%) each occurring in the farm and school. The incidents occurred mostly at nights (84.6%) among the reported cases, and in all the cases, the species of snake was not identified.

The lower limbs were more common sites for snakebites (69.3%) when compared to the upper limbs. The clinical features of the affected children are shown in Table 1. Pain was present in all the patients.

In terms of envenomation, three (23.1%) of the cases did not show signs of envenomation, while four (30.8) showed features of severe envenomation. Among the remaining children, one (7.7%) and five (38.5%) presented with mild and moderate features of envenomation, respectively.

Four (30.8%) of the patients presented <2 h of the snakebite, whereas nine patients (69.2%) presented after 2 h.

Prehospital interventions included visit to the native doctor, local incision, application of herbs, tourniquet, and black stone application (Table 2).

Hospital treatment received by the patients is shown in Table 3. Of the eight that received anti-snake venom, three (37.5%) had allergic reaction.

### Table 1: Clinical features present in the children following the snakebites

<table>
<thead>
<tr>
<th>Clinical features</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>13 (100.0)</td>
</tr>
<tr>
<td>Swelling</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Fever</td>
<td>9 (69.2)</td>
</tr>
<tr>
<td>Abnormal bleeding</td>
<td>5 (38.5)</td>
</tr>
<tr>
<td>Ptosis</td>
<td>-</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>-</td>
</tr>
<tr>
<td>Shock</td>
<td>-</td>
</tr>
</tbody>
</table>

### Table 2: Prehospital intervention

<table>
<thead>
<tr>
<th>Prehospital visit intervention</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local incision</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Tourniquet application</td>
<td>9 (69.2)</td>
</tr>
<tr>
<td>Black stone application</td>
<td>6 (46.2)</td>
</tr>
<tr>
<td>Application of herbs</td>
<td>7 (53.8)</td>
</tr>
<tr>
<td>Visit to native doctor</td>
<td>7 (53.8)</td>
</tr>
</tbody>
</table>
Five (38.5%) of the patients had complications distributed as follows: one gangrenous limb (7.7%), one necrotic ulcer (7.7%), and three with compartment syndrome (23.1%). Nine patients (69.2%) recovered and were discharged, whereas three (23.1%) of the patients left against medical advice. There was only one case of death, giving a case fatality rate of 7.7%. The patient died from massive bleeding and compartment syndrome.

The mean duration of hospitalization was 3.2 ± 3.44 with a range of 1–11 days. Late presentation (≥2 h) was significantly associated with the longer duration of hospitalization ($P = 0.026, \chi^2 = 4.952$). Table 4 shows the time of presentation compared to the duration of hospitalization.

## DISCUSSION

The incidence of snakebite in this study is low and similar to 1.5/1000 reported in Northwestern Nigeria. However, only 8.5% of snakebite victims attend hospitals in Nigeria; therefore, underreporting could be a major factor in our center as most of the patients usually resort to local treatment and may never present to the hospital. The mean age group affected in our study population was the school age group. This age group is adventurous, and unsuspecting children are commonly exposed to snakebites. It has been observed that during rainy season toads and frogs tend to emerge in greater numbers from their hibernation and more snakes prey on them, explaining why there are more cases of snakebites during rainy seasons as was also observed in our study. It is not surprising that more of the affected children in our study belong to the lower SEC. Although most of the studies reviewed did not strictly classify their patients along socioeconomic profile, the documented environment where such bites occurred was typical of habitats for the low socioeconomic population. A study by Omogbai et al. on snakebites in Nigeria showed that more than half of the bites occurred in the bush and such unprotected environs are more likely to be found around the low socioeconomic homes. Poor illumination in such homes may explain why more cases of snakebites occurred at night as was observed in our study. More cases in our study came from the urban areas compared to the rural area. It is not surprising as the study center is located within the metropolis and draws majority of its patients from the urban dwellers. In addition, urban dwellers are more informed and are more likely to present to hospitals for orthodox medical care than the rural dwellers who live in villages distant from the hospital and are more likely to patronize traditional healers. It was observed in our study that the lower limbs were more common sites for snakebites. The fact that most individuals will favor exploring things on the ground with their lower limbs could explain this observation.

The use of local incision, tourniquet, black stone, and herbal remedies seem to be widely practiced in our environment. These practices have been shown to be unhelpful and may even worsen the patient’s condition. More than half of the children were taken to the traditional healers before presentation, which is a reflection of the traditional beliefs and health-seeking behavior of the people. Similar practices can be seen in rural Kenya. In our environment, the offending snake is not usually identified resulting in the use of polyvalent antivenin and also poor epidemiologic documentation.

The low case fatality documented in this study is in consonance with other studies within the tropics and the globe. A study in Makurdi, Benue State by Idoko and Ikwueke, documented a case fatality as low as 5.7% in 175 cases. In Zaria, Kaduna State of Nigeria, Ogala, and Obaro, documented a case fatality as low as 3.9% while in Arizona, the United States of America, and in Northern Taiwan similar studies have recorded no mortality among the victims of snakebite. Researchers have attributed the low case fatality in the tropics to the possibility that snakebites in the tropics are mainly “escape bites” which are associated with low volume envenomation as opposed to “business bite” associated with injection of larger volumes of venoms. For our study, other
possible reason could be that our center is a tertiary emergency care facility is poised to offer adequate and immediate care necessary to save the victims.

CONCLUSIONS

There is a low prevalence of snakebite in children in our environment. The prehospital emergency interventions given to snakebite victims still reflect the practices that have been discouraged in snakebite victims.

Financial support and sponsorship

This study was self-funded.

Conflicts of interest

There are no conflicts of interest.

REFERENCES