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Assessment of the availability of snakebite antivenom in health facilities in Ndola District, Zambia: a cross-sectional study.

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Abstract

Background: Regardless of snakebite antivenom being included on the World Health Organisation (WHO) list of essential medicines, many parts of the world, especially Africa, lack effective and safe antivenoms.

Methods: A descriptive, field-based cross-sectional study was undertaken in health facilities in Ndola district. Data analysis was performed using Stata version 14.

Results: In total 40 health facilities were assessed for the availability of snakebite antivenom. The study revealed that only 3 (8%), all private health facilities, had antivenom available at the time of the assessment. Factors significantly associated with antivenom supply included lack of central country supply, lack of demand of the antivenom, and no budget allocation for the antivenom.

Conclusions: Despite the high number of notified snakebites within Ndola district, there remains poor availability of snakebite antivenom within the district.

Keywords

Accessibility, Availability, Antivenom, Snakebites, Ndola, Zambia

Introduction

Snake envenomation can cause death and disability with the highest burden occurring in countries where health systems are the weakest and medical resources scarce.¹ The incapacitation period for energetic people can also affect productivity and this can harm the economy. Many deaths and serious consequences from snake envenomation can be prevented by using antivenom. Studies have suggested that antivenom is the only effective treatment to prevent or reverse most of the venomous systemic effects of snake bites. However, in many parts of the world, especially Africa, the availability of effective and safe antivenoms remains very poor.

In Zambia, there is a dearth of published data concerning snakebites. Data obtained from the Copperbelt Provincial Health office indicates that between 2016 and 2019, there were 9384 cases of snakebites reported in the Copperbelt province, with 2300 reported in Ndola district.⁴ Ten fatalities resulting from snakebites were also recorded in the same period. There is a paucity of published studies on the availability of snake antivenom in Zambia. This study, therefore, aimed at investigating the availability of snake antivenom in Ndola district. This paper provides baseline information critical for further nationwide studies that will inform national and regional policy.

Methods

This was a descriptive, field-based cross-sectional study undertaken in Ndola district. The field data collection was done in both public and private health facilities between August 2020 and November 2020. The district has 26 public health centres, 12 private health centres, 6 health posts, 2 public referral hospitals, 1 mission hospital, 1 private hospital, and 23 retail pharmacies.

Data collection

Interviews were conducted with health care workers in charge of the pharmacy dispensary at each health facility. Quantitative data on the availability of antivenom and storage practices were collected. At the facility level, the stock status was determined using physical inventory, stock requisition forms, supply vouchers, and electronic stock control cards kept at the pharmacy. A physical inspection was used to check the storage of the snake antivenom per the standard guideline of First Expiry First Out (FEFO). A survey questionnaire was used to collect data on the usage and availability of antivenom. The data was collected using a structured checklist and an interviewer-administered questionnaire. The

questionnaire comprised of closed and open-ended questions, which allowed for descriptive and thematic analysis, respectively.

Data Analysis

The data analysis was done using Stata version 14. The statistical significance was set at a 95% confidence level ($p \leq 0.05$).

Results and discussion

According to the findings (Table1), the availability of the antivenom was very low in all health facilities in Ndola district, Zambia. At the time of assessment, only 7.5% representing 3 out of the 40 facilities had snake antivenom in stock. The facilities that had antivenom included 2 retail pharmacies and 1 private health centre. No publicly accessible health facility including the two-referral, level 3 hospitals had antivenom available. The study findings are consistent with a recent study by Ooms *et al*⁵ which accessed the current state of snakebite care in Kenya, Uganda, and Zambia that found that only 8.7% (9/108) of health care workers in Zambia reported having antivenom available in their facilities. The results, however, show no statistical significance in the availability of antivenom between private facilities and public facilities.

These findings are alarming especially that during the same period, according to the DHIS2 report, close to 1200 snakebite cases were recorded in Ndola district.⁴ In public health facilities, 87.5% (14/16) of the respondents attributed the unavailability and shortage of antivenom to the central supply challenges and 12.5% (2/16) respondents attributed the unavailability of antivenom to the lack of demand. One of the respondents added that the lack of demand could be attributed to the lack of knowledge and training in the use of snake antivenom. Some respondents also mentioned that clinicians treating snakebite patients, especially those without snakebite management experience, can struggle to use the documentation accompanying vials of antivenom and this further complicates the clinical use. Several studies have found that many health care workers in Africa do not have adequate training and knowledge in snakebite management.^{2,5}

This study found that in the private facilities 87.5% (21/24) attributed the unavailability of snake antivenom to a lack of demand. Of these private facilities 87.5% (14/16) of retail pharmacies did not stock antivenom and nearly 100% of these facilities attributed the non-availability of antivenom to

low demand and the high cost of antivenom to patients. One respondent however attributed the non-availability to the supply chain disruptions caused by the COVID-19 pandemic. This study found that the available antivenom in facilities is expensive with costs ranging from \$50 to \$310 per vial. Many patients may need more than one vial, and therefore this is a huge cost.

Conclusions

Despite the high number of notified snakebites within Ndola district, there remains poor availability of snakebite antivenom within the district. A further observation from the current study is public health care facilities seldom have snakebite antivenom while private health care facilities with antivenom have a high selling price. This research has demonstrated to an extent the factors associated with snakebite antivenom availability in Ndola district and could provide baseline information for national wide studies which can be used as evidence for policymakers to inform and strengthen snakebite policies.

Authors' contributions

SKM conceived the study; SKM, VD, and CM designed the study protocol; SKM, VD, BAW, NKC, HTN and PAV carried out the data collection, data analysis and interpretation of the data. SKM and PAV drafted the manuscript; CM, BAW and, NKC critically revised the manuscript for intellectual content. All authors read and approved the final manuscript. SKM is the guarantor of the paper.

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Competing interests

None declared

Ethical approval

Ethical approval was sought from the Tropical Disease Research Centre (TDRC) ethics board and the National Health Research Authority (NHRA). Official permission to conduct the study was also sought from the Ministry of Health through the management at the Provincial Health Office and District Health Office. Informed consent from Facility In-charge officers was obtained to collect data at each respective facility. Confidentiality and anonymity were maintained, and all data was restricted to the investigators.

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Table 3: Availability of antivenom in health facilities in Ndola district

Factor	Type of medical facilities			Total n (%)	Exact P- value
	Public Health facilities n (%)	Private Health facilities n (%)	Retail pharmacy n (%)		
Stock antivenom					
Yes	2 (12.5)	1 (12.5)	5 (31.3)	8 (20)	0.078
No	14 (87.5)	7 (87.5)	11 (68.8)	32 (80)	
Total	16 (100)	8 (100)	16 (100)	40 (100)	
Available antivenom					
Yes	0 (0)	1 (12.5)	2 (12.5)	3 (7.5)	0.653
No	16 (100)	7 (87.5)	14 (87.5)	37 (92.5)	
Total	16 (100)	8 (100)	16 (100)	40 (100)	