Perception ~~of~~ snakebite treatment among traditional healers in rural Bangladesh

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Abstract

Background

Snakebite envenoming is a major community emergency rural areas of the tropics. In Bangladesh, many victims seek treatment from traditional healers, often receiving harmful treatments rather than seeking medical treatment. This study explores healers' knowledge, attitudes, practices, and rehabilitation support among snakebite patients.

Methods

The participatory qualitative study, conducted in September–October 2021, explored traditional snakebite treatment practices in Bangladesh. In-depth interviews were conducted using snowball sampling. Trained anthropologists collected data following structured guidelines. Interviews were audio-recorded, transcribed, and analyzed inductively. Thematic analysis was performed by reviewing the transcripts rigorously.

Results

Traditional healers reported that snakebites were mostly non-venomous and perceived that deaths were rare under their care, attributing outcomes to fate and timely action. They identified snake types by seeing wound marks, symptoms, color descriptions, and folk tests. They usually

provided different treatments depending on their knowledge and circumstances when managing snakebite in patients who sought treatment. They used herbs, mantras, verses from holy religious books, blood-sucking, and tourniquets for managing the cases. Traditional healers' knowledge was inherited or learned from their mentors. Despite their declining social status and financial challengesduringrelated to providing treatment, many expressed interest in government training and standardized snakebite management.

Conclusions

Integrating traditional healers into formal health systems through structured training, standardized guidelines from appropriate authorities, and collaborative referral mechanisms may improve timely access to evidence-based care and reduce snakebite-related morbidity and mortality.

Keywords: Snakebite, 'Ozha', traditional healer, treatment, Snakebite management

Introduction

Snakebite envenoming is one of the crucial community emergencies, andis estimated to causeup to 138,000 fatalities and 400,000 disabilities out of the 5 million snakebites each year across the globe(1)(2). The world's greatest rate of snakebite deaths occurs in the South-East Asian region (3). Furthermore, South Asia alone accounts for roughly 70% of the world's yearly snakebite fatalities (4). In Bangladesh, a community-based nationwide survey of 2009 showed that there were 710,159 snakebite incidents, accounting for 6041 fatalities. Most snake bites occur during walking (30%) barefoot followed by sleeping (14%) on the floor.A total of54% of bites occurred during outdoor activities. Snakebite envenoming was identified as a leading cause of mortality during flood disasters in monsoon (5). Snakebite incidents in rural populations were around 11 times higher at risk than inurban populations (6).

Snakebite mainly affects in economically disadvantaged rural communities onevery continent (7).Among the victims, 94% (n = 84) came from poor socio-economic backgrounds, whose average monthly income was $57 (6).In 2017, the World Health Organization (WHO) declared snakebite to be a neglected tropical illness, placing a high premium on extensive intervention and study (8). Since snakebite envenomation affects not only the victims but frequently their entire family, especially in impoverished communities in low- and middle-income nations, the economic impact of snakebite envenoming is substantial in most countries (9)(10).

Snakebite was more prevalent among farmers (6). One early Bangladesh study provided further insignts into snakebite Most bites happen when a person is busy with their daily work (6)(11). Lower extremity snakebites account for 71% of the victims' total number of injuries, and 86% of the patients received some kind of care within two hours of the snakebite(12).

Despite Bangladesh havinga strong rural primary healthcare network, many people don’t use it appropriately forhealthcare. While suffering from any type of illness, most of the patients seek traditional or informal care before visiting a hospital (12). Even, the majority of snakebite victims prefer health seeking to traditional healers rather go to health facilities (13). Traditional faith healers used plants for the treatment of snakebite occurrence in Bangladesh (14). The mostcommon site of bite is the lower limb (35; 70%). A tighttourniquet was used in 45(90%) cases, and in 8(16%) cases the limb was immobilized (12). Snakebite patients preferred herbal medicines and visiting traditional faith healers before visiting health facilities (15). Among the victims, 18% (n = 15) sought treatment from registered medical professionals, whereas approximately 61% (n = 55) consulted traditional healers (6).

Potentially harmful approaches were commonly practiced in high proportion, such as making multiple incisions around the bite site, harmful application of tight tourniquets, and sucking

blood from the multiple cuts (12). Rural communities have relatively easy access to their neighboring traditional healers. The majority of medical professionals at subdistrict hospitals are accustomed to sending patients to more advanced facilities due to a lack of confidence or the necessary training to manage snakebite cases at the sub-district level(1). Although traditional healers may have had their own rituals, little is known about the attitudes towards the care and management of snakebite cases about the diagnosis and management of snakebite cases, even in places where the prevalence and effects of snakebite are well-known.

The aimof the study was to understand the knowledge, awareness, and perception of snakes, snakebites, theirmanagement, and treatmentimmediately after snakebite incidentin the rural areas of Bangladesh. It also explored the recommendations and government support for possible rehabilitation of traditional healers.

Methods

Study design

The participatory qualitative study was conducted in accordance with the specific objectives of the study. Therequired number of in-depth interviews (IDIs)was determined based on data satuarationachieved during data collection period.. Representation from each administrative area, known as a division, was considered while designing the sampling frame, and study participants were selected using snowball sampling techniques.

Study settings and period **:**

In total, 17 in-depth interviews (IDIs) were conducted through face-to-face or telephone interviewscdiscussionswith participants. Face-to-face interviews were conducted where feasible, while telephone interviews were used when physical access was difficult due tothe post-COVID-

19 situation.: We conducted interviews with three types of traditional healers; '*Ozha*', '*Kabiraj*' and '*Gunin*'; who usually provide services tosnakebite victims. Although their practices may overlap, they differ in their traditional knowledge, treatment approaches, and healing practices().A pre-designed checklist and guidelines were followed for conducting IDIs. Participants were selected from all eight divisions of Bangladesh; i.e., 8 divisions: Dhaka, Chattogram, Khulna, Rajshahi, Sylhet, Barishal, Rangpur, and Mymensingh.Data were collected during September-October 2021.

Moreover, all the qualitative data was collected by the anthropologists (including one of us, NCD) conversant with the technique of qualitative study. The IDI tool was administered with the intention to learn about the unique experiences of providing treatment services while visiting snakebite patients.

Ensuring data quality

Rigorous control measures and continuous supervision were implementdthroughout the data collection processto ensure data quality. Strong supervision and monitoring were carried out at all stages of the research, including selection of the core research team, development of the research proposal anddata collection tools and analysis plan, conducting training, pilot testing of the data collection tools, other way validation, fieldwork, and data collection. Researchers were directly involved in the data collection.

Data Analysis

The qualitative field team made audio recordingsand took field notes. If,in any case, the interview was not in the audio-recorded, the researcher tookdetailednotes, and after returning from the field, they expanded the notes in detail. Detailed field notes were taken important and relevant issues arose duringfield visits. All audio files were transcribed.. The researchers

reviewed every transcript and the field notes, then coded the datainductively, followed by conventional content analysis, in which codes were sorted into subcategories were grouped into categories, and categories were collated into themes. While sorting the codes, researchers discussed the coding until consensus was was reached among the team (16).

Ethical approval

The ethical clearance for this study was obtained from the National Research Ethics Committee (NREC) (Memo: BMRC/NREC/2022-2025/67). The participants in the study were informed that the data collected would be used only for research purposes. The anonymity of each interviewee was strictly maintained.

Findings

Perception of snakebite treatment by the traditional healers

Traditional healers claimed that 'no patient died' under their care throughout their professional careers.They believed that several factors contributed to this apparent success in treating snakebites, they believed. Firstly, most patients who seek treatment might be bitten by non-venomous snakes, allowing the traditional healer to provide immediate medication. They also believed that if a patient was bitten by a venomous snake, their fate restedon the time they hadleft. In that situation, they acknowledged to doctor could only save the venomous snakebite victim from death. One respondent mentioned,

> *"A victim who has been bitten by a venomous snake has a chance of survival as long as they have enough time. He will die, and no ojha or kobiraj [traditional healer] can save him. They can only be saved by a doctor."* [ID 20 traditional healer from Khulna district, Bangladesh]

Some traditional healers informed that in a few cases, patients died not only from the snakebite itself but also from excessive anxiety. When individuals were bitten by either venomous or non-venomous snakes, they often became nervous and agitated, leading to high blood pressure and even heart attacks. Here is a comment from one traditional healer,

> *"If people are bitten by a non-venomous snake, but they think that they are bitten by a venomous snake, and they must die. As a result, people become nervous and tense. Sometimes, this thinking may be caused by aheart attack"* [ID 28 traditional healer from Rajshahi district]

They perceived that non-venomous bites were more commonand than venomous bites, and therefore accounted for more of the patients they treated.

Some traditional healers pointed out that health centers were not available in all areas, so snakebite patients often had to travel long distances from their homes to seek treatment. Conversely, traditional healers were widely available, even making home calls upon request. This accessibility made it easy forsnakebite patients to seek treatment from them.

Symptoms of snakebite and its consequences

In identifying snakebites, the traditional healer relied on various symptoms, such as changes in blood pressure, the appearance of the wound, and the patient's physical condition. A few traditional healers also employed different methods to identify the type of snakebite. The primary indicator of venomous versus non-venomous snakebite was the appearance of the wound. Several traditional healers argued that venomous snakebite typically leaves only two puncture marks with a small gap between them, while non-venomous snakebites result in multiple teeth marks and scars on the skin.

Additionally, drawing on their experience in handling snakebite patients, they explained that the bleeding pattern differed between venomous and non-venomous snakebites. Venomous bites led to minimal bleeding with blood clotting quickly, whereas non-venomous bites caused profuse bleeding that increased gradually over time. Other symptoms of venomous snakebites included dizziness, nausea, blurred vision, excessive salivation, and numbness, whereas non-venomous snakebites caused ‘intense pain upon pinching the affected area’, some traditional healers mentioned.

Moreover, venomous snakebites typically result in swelling at the site of the bite, increased body temperature, drowsiness, and blue discoloration of the bitten area. Conversely, non-venomous snakebites usually manifest as bleeding from the wound.

Various methods were employed to identify snakebite patients, such as using chili or specific medicines. For example, some healers might administer red chili to the patient and observe their reaction; if the patient couldn’t taste the chili, it might indicate a venomous snakebite.

Additionally, certain medicines were said to change colourwhen applied to the snakebite wound, with different colors indicating the type of snakebite. As one participant described,

> *"I apply a specific medicine to the snakebite area. If the patient was bitten by a venomous snake, the area turns black, whereas it remains unchanged for non-venomous snakebites."* [ID 31 traditional healer from Satkhira district]

Knowledge on venomous and non-venomous snake types

According to traditional healers’ knowledge, most patients who seek treatment had been bitten by non-venomous snakes. Non-venomous snakes were more common than venomous ones. A

traditional healer described the proportion of patients who visited him for treatment immediately afterasnakebiteincident,

> *"If ten snakebite patients come to us, only two patients are bitten by venomous snakes among ten patients. Yet people are afraid of snakes because they don't want to die so early."*[IDI 34 traditional healer from Sherpur district]

When snakebite patients visited traditional healers for treatment, the healers initially inquiredabout the colour of the snake, as they believed they could identify the type of snake by its skin colour. Snakes had various colors and distinctive striped patterns.

> *"When snakebite patients come to us, we first ask them the name of the snake. If the patient cannot provide the name of the snake, we then inquire about the color of the snake. If the patient responds accurately, we can determine the type of snake."*[IDI 28 traditional healer from Rajshahidistrict]

A fewtraditional healers expressed that venomous snakes typically emerge from their hiding places at night in search of food, as they didn't feed constantly. They often moved around midnight when people were asleep, as the traditional healer perceived. If snakebite patients arrived at the traditional healer during the night, the traditional healer assumed that the victim had been bitten by a venomous snake. Conversely, non-venomous snakes are frequently seen during the day as they are more active in searching for food.

> *"At midnight, venomous snakes come out from their holes in search of food in residential areas. After eating, they may sleep on the road. If people step on them while crossing the road, they might get bitten."* [IDI 35 traditional healer from Sherpur district]

Knowledge on snakebite treatment service among traditional healers and their expertise

All traditional healers reported using various methods to treat snakebite patients. Some used herbal medicines that they prepared themselves by collecting herbs from nature and making tablets based on their own knowledge.

Others resorted to chanting ‘mantras’, either in their native language or another language, believing that this helped neutralize snake venom. Additionally, some healers used religious texts such as the Holy Quran, reciting verses and blowing on the patient, believingthat this alleviated the pain of the snakebite and the patient’s fear.

> *"I treat snakebite patients using verses from the Holy Quran in the name of Allah. By reciting these verses and blowing on the patient, they experience relief from the burning pain."* [IDI 23 traditional healer from Moulvibazar district]

A fewrespondents reported suckingblood from the patient’s wound, which, according to the them, provided relief. Following this treatment, one healeroffered milk tea to the patient before advising them to seek medical attention.

> *“When a non-venomous snakebite patient comes to me, I say, ’Don’t worry by the grace of God, but the patient still feels afraid. So, I recite Mantra to eliminate the patient'sfear, nothing else.”* [IDI 19 traditional healer from Dhaka district]

One traditional healer relied on a pill derived from a tree to treat snakebite,, while another kept a secret ointment at home and he applied it to the affected area. The latter also massaged the bite sitewith the ointment. The traditional healer did not share the name of atreefrom which the pill or ointment was made.

Some traditional healers administered iodine or an antiseptic to the bite site as first aid. Furthermore, some used a chicken and a blade in a unique method. They cut the snakebite area

with a blade and let the blood touch the chicken's anus. If the chicken died, they believed there was still snake venom in the patient's body. They repeated the process until the chicken no longer died, indicating the absence of venom.

Perception of snakebite treatment urgency and outcomes among traditional healers

Most traditional healers strongly believed in the urgency of treating snakebite patients as early as possible, as delays could lead to fatal consequences. They prioritize providing immediate care to patients, and if the patient's condition appears critical or deteriorates, they promptly refer them to a hospital.

> *"If a snakebite patient doesn't receive proper treatment within two hours, they will soon die from the venom. After two hours, I am unable to save the patient anymore."* [IDI 30 traditional healer from Rangpur district]

Furthermore, traditional healers exert every effort to treat snakebite patients to the best of their ability. However, they conceded that not all cases were the same, and despite their efforts, they might be unable to save every patient. They attributed this limitation to certain types of snakes, particularly venomous snakes.

> *"We endeavor to treat all types of snakebite patients in the name of Almighty. However, if someone is bitten by the venomous snake, neither I nor anyone else can provide treatment."*[IDI 26 traditional healer from Patuakhali district]

Despite receiving treatment at hospitals, some snakebite patients did not survive. A fewtraditional healers emphasized life on faith in the Almighty. They argued that people would live only for as long as their time allows. They perceivedmedical interventions as sometimes ineffective. Ultimately, they believed that life and death were predetermined by a superior power.

"I witnessed a doctor administer vaccines to a snakebite patient, but unfortunately, the patient passed away. Medicines do not always work, much like in cases of cancer. Death is inevitable, while medicine and treatment are mere acts of divine grace." [IDI 35 traditional healer from Sherpur district]

Some traditional healers observed that although some patients visited health centers, theyalso soughttreatmentfrom traditional healers. One traditional healer explained the situation,

"Actually,doctorsin the hospital didn't provide proper treatment to the patients who visit there. I think that they don't know how to manage snakebite victims. By seeing this type of careless treatment from the doctor, victimscall me to the hospital to visit there for providing them treatment againbeside the doctor's treatment." [IDI 19 traditional healer from Dhaka district]

Source of learning snakebite treatment and assessingexpertise:

Most traditional healers acquired their knowledge of snakebite treatment from their family members, including their fathers, mothers, grandfathers, and uncles, who had practicedbefore them. Additionally, some learned from neighbours who were also involved in this profession. One traditional healer shared the source from howhe learned the snakebite treatment,

"I learned about snakebite treatment from my father and grandfather, who used to treat snakebite patients. Living in a village with many venomous insects, I strive to serve the people with the knowledge I have acquired."[IDI 26 traditional healer from Patuakhali district]

Some learned snakebite treatment from their mentors or preceptors. They spent significant time accompanying their master (*Ostad*) or mentor to understand the intricacies of this profession.

"A few years ago, I observed one person, who became my mentor, performingcertain tasks in the water. When I inquired about his actions, he mentioned that he was an Ozha (traditional healer). Intrigued, I asked him to teach me the profession, and he graciously agreed to impart his knowledge. I spent over six months learning snake-related skills from him."[IDI 24 traditional healer from Moulvibazar district]

Furthermore, some traditional healerslearned this professionwhile residing in a place ina neighboring Indiaknown for spiritual teachings, where they trained under various masters. Additionally, some have learned through reading books or accessing information online. One traditional healer reported learning snake species names from Google.

Overall, traditional healers enjoyed a favourable reputation for their snakebite treatment skills, attracting many patients seeking their services.

Those who have faith in traditional healers' treatment abilities willingly sought care fromthem.

"People who trust me come to me for treatment, while those who do not believe in me do not seek treatment. I have been treating snakebite patients for a long time, and there is no record of any patient dying under my care, which is why people seek treatment from me." [IDI 27 traditional healer from Rajshahi district]

Seasonal variation in the frequency of snakebite patients

Traditional healers reported that snakebite incidents were more prevalent during the monsoon and summer seasons,. During the rainy season, swollen riverscause floods that force snakes to seek shelter in people's homes, resulting in a surge of snakebite cases.

"During the monsoon, water levels rise in rural areas, leading to floods. As a consequence, snakes seek shelter in homes and bite unsuspecting individuals, resulting in a significant increase in snakebite cases." [IDI 27 traditional healer from Rajshahi district]

The number of patientstreatedby traditional healers varied widely, with some treating only one or two patients daily, while others attend to more than ten patients on average each day during the rainy season. Geographical location played a crucial role in determining the frequency of snakebite cases, with areas prone to river flooding experiencing higher patient numbers.

Several traditional healers agreed that before the availability of snakebite injections, they treated a considerable number of snakebite patients daily. However, with the availability of medical facilities offering snakebite treatment, the number of patients seeking traditional treatment from Ozha had decreased significantly.

"Before the invention of snakebite injections, I used to treat at least one snakebite patient daily." [IDI 24 traditional healer from Moulvibazar district]

Traditional healers were wellknown within their communities be3cause of their long-standing practice of treating snakebite cases. They did not require extensive publicity, as their reputation preceded them. Patients and their families often had the traditionalhealers'contact information readily available and reached out to them in times of need.

Perception of 'tourniquet' treatment

All traditional healers reported that they advised people to apply a tourniquet immediately after a snakebite occured. They believed that failure to apply a tourniquet promptly would result in the rapid spread of snake venom throughout the patient's body. Furthermore, they asserted that if a

tourniquet was not applied immediately after a snakebite, the venom would travel through the bloodstream, potentially reaching the brain and causing death.

> *"Immediate application of a tourniquet is crucial after a snakebite. If the tourniquet is not applied promptly, the snake venom will circulate throughout the patient's body, reaching even the brain, leading to certain death."* [IDI 20 traditional healer from Khulna district]

Most of the traditional healers believed that the tourniquet application was the primary first-aid measure for snakebite victims. They stressedthe importance of applying a tourniquet as soon as possible after a snakebite to prevent death. Given the time required to transport a patient to a hospital or Ozha's residence, which could be considerable, proper tourniquet application could significantly reduce the risk of death.

> *"When someone is bitten by a snake, they need to be taken to a hospital or an Ozha's residence for treatment. However, the distance to these facilities from the patient's location can be considerable, sometimes exceeding ten kilometers and taking two hours or more. During this time, if a tourniquet is not applied properly, the snake venom will spread throughout the patient's body."* [IDI 19 traditional healer from Dhaka district]

Several traditional healers described that there were specific methods for applying a tourniquet to snakebite patients. Failure to adhere to these methods could lead to critical complications, such as organ paralysis. They considered it essential to apply the tourniquet lightly to ensure normal blood circulation.

> *"If snakebite patients do not apply the tourniquet lightly, normal blood circulation will be hindered. Tight tourniquets can cause blood vessels to die, leading to dysfunction of the*

veins and potential paralysis, especially in the bitten area." [IDI 28 traditional healer from Rajshahi district]

Moreover, they described there are guidelines regarding the timing of tourniquet application. According to a traditional healer, a tourniquet should be applied within 15 minutes of the snakebite. They believed thatdelaying tourniquet application rendered it ineffective, emphasizing the importance of following and adheringthis rule during incidents.

Challenges faced while providing traditional healing

Traditional healers were reported that they had previouslybeebhighly respected by the community, but their status had diminished over time. People no longer hold them in the same regard as before, attributing this shift in attitude to the prominence of doctors and modern medical treatments. Additionally, they feld that instances of dishonesty among some traditional healers had tarnished the reputation of the profession, particularly concerning snakebite treatment. Consequently, many traditional healers had become disheartened by the gradual loss of respect and trust from the public.

"People used to hold Ozha and kobiraj (traditional healers) in high esteem in the past. We used to receive respect and admiration from the community. However, nowadays, we face criticism due to the actions of a few dishonest individuals among us." [IDI 24 traditional healer from Moulvibazar district]

Many traditional healers struggled to sustain their livelihoods solely through their profession. Many found it challenging to meet their family's financial needs and often have to seek alternative sources of income to make ends meet.

"I have been unable to support my family's expenses solely through my work as an Ozha. At times, I have to seek additional employment opportunities to provide for my family."[IDI 27 traditional healer from Rajshahi district]

A significant obstacle in treating snakebite patients is identifying the snake responsible for the bite. Without this crucial information, *Ozha* and *Kobiraj* cannot initiate treatment effectively. However, determining the type of snake without seeing it poses a considerable challenge. Moreover, Ozha, who were tasked with catching snakes, often faced dangerous situations. When summoned to capture a snake in a residential area, they must accurately identify the snake's species, distinguishing between venomous and non-venomous varieties. Unfortunately, they sometimes receive misinformation from the public regarding the type of snake, complicating their efforts.

"The primary challenge in treating snakebite patients lies in identifying the snake responsible for the bite. Without this information, initiating treatment is difficult. Additionally, Ozha who are tasked with catching snakes often encounter hazardous situations. They must be able to identify the type of snake accurately, which can be complicated by misinformation from the public."

In addition, interview o explored whether traditional healers were exposed to snakebites because of them , the nature of their occupation, the high incidence snakebite among them. Regularly catching, handling, and performing with snakes meant that frequent contact with snakes made bites a common and often accepted part of their daily lives. They also rely on traditional herbal remedies to manage such incidents.

Motives behind choosing the profession as a 'traditional healer'

All respondents were asked about the reasons for choosing the traditional healer profession. Among *Ozha*, *Kobiraj*, or *Gunin*, thi profession was often chosen to honor their ancestral lineage. Some among them specifically selected this path to assist patients suffering from snakebites. Their connection to this work usually stems from the legacy of their fathers or grandfathers, who served people afflicted by snakebites. One participant reflected,

> *"My father and grandfather treated snakebite patients. I believe this service is essential for people's safety."* [ID 33 traditional healer from Sherpur district]

The majority of respondents were older individuals, typically above 50 years of age, and had dedicated 40 to 50 years to this profession. They now take pride in their work and find contentment in providing treatment for snakebites. One respondent expressed,

> *"This profession has been passed down through generations, so I willingly continue it. When people are bitten by snakes, they come to me, and I cannot turn them away."* [ID 24 traditional healer from Moulvibazar district]

However, interviews revealed that many traditional healers viewed this occupation as supplementary to their main livelihoods because it did not provide sufficientfinancial support their families. They see it primarily as a means of serving the community. Many of them also engage in other occupations such as farming, day labor, or running businesses. They recognize that this profession alone cannot cover their family's expenses and acknowledge it as volunteer work. Furthermore, they did not impose specific charges on patients for treating snakebites; instead, people willingly offered monetary contributions. However, some snakebite patients, particularly those who are very poor, are unable to afford these payments.

One traditional healer shared that he was encouraged by his neighbor to pursue this profession after witnessing snakebite treatments in his neighbor's home. He perceived this profession as honorable and decided to learn from his elder neighbor, believing it to be a means of aiding vulnerable individuals, not solely for financial gain. Some respondents were drawn to this profession out of personal interest in serving others during times of peril. Furthermore, several respondents also stated that they chose this career path for mental fulfillment stability rather than financial gain.

An intriguing folk tale recounts the origin of one respondent's profession. One respondent spoke that he had recurring dreams from his childhood where snakes visited him every night. Through these dreams, he acquired knowledge about treating snakebites.

Attitude towards government training on snakebite treatment

Traditional healers expressed interest in administeringsnake antivenom injections,as used in hospitals,to improve treatment. They wanted standardized treatment charts from the government to share on social media. Additionally, they desire comprehensive training and government campaigns to educate communities on snakebite treatment, emphasizing the importance of hospital visits for anti-venom treatment.

Traditional healersexpressed interest in government training on snakebite treatment despite feeling competent with current traditional methods. However, some elderly traditional healers feel ineligible for training due to age and personal beliefs. Concerns arose about the risk of administering injections without proper licensing, fand the possibility of legal repercussions, unlinedoctors. They acknowledge the need for improved training to enhance snakebite treatment efficacy.

Types of traditional healers and their activities

In the community, individuals engaged in snake-related activities had different names and identities based on their roles. Some individuals specialized in catching and selling snakes, while others showcased snake games and soldherbal medicines and amulets. Others, some were dedicated to treating snakebite patients.

Those who provided care to snakebite patients were known as *'Ozha' or 'Kobiraj'*. They were accustomed to treating snakebite patients and capturing snakes from residential areas upon request, but they didnot engage in showcasing snakes. They relied on their expertise and bravery to capture snakes, emphasizing that mantras were not effective for snake-catching; rather, strategy and experience were essential. When people found a snake in their residential area, they informed the 'Ozha' or 'Kobiraj', who promptly responded to capture. A participant shared,

> *"My ancestors were skilled at catching snakes, and we are experts at it. No one in my family has ever been harmed by a snake while catching them, and I believe I will also be safe by the grace of Allah."* [ID 21 traditional healer from Khulna district]

Another group in the community, known as the *'Bede'*, specialized in showcasing snake games, selling herbal medicines and amulets, and also capturing snakes from natural habitats. They explained,

> *"We travel to villages, bringing snakes with us. Additionally, we conduct snake shows and sell herbal medicines to the locals. This is our primary business, and we do not engage in any other activities."* [ID 21 traditional healer from Khulna district]

Discussion

Thisstudy provides a nuanced understanding of how traditional healers in rural Bangladesh perceive, interpret, and manage snakebite incidents. Their perspectives reveal a complex

interplay of cultural beliefs, experiential learning, and limited access to biomedical services. The findings suggest that traditional healers continue to be the first point of contact for snakebite victims, primarily due to their proximity, affordability, and strong community trust—factors that align with earlier studies conducted in similar resource-limited settings of South Asia.In another study it was reported that nearly half of the patients chose traditional healers as their initial point of care when seeking treatment(6)(17), compared with only 3% of them went straight to a hospital or physician(12).Evidence from neighboring Asian countries and African countries similarly indicates that traditional healers commonly serve as the primary providers of first-line treatment(18)(19)(20)(21)(22).During case management, health providers observed that patients frequently followed multiple pathways before eventually reaching the health center. Visiting traditional healers consumed precious time, resulting in delayed arrival at hospitals, thereby wasting critical time and increasing the risk of adverse outcomes (23). Victims or their familiespreferred formal medical treatment due to high treatment costs, rangingfrom $1,250 to$1,600, most of amount borrowed from relatives and friends(11). During interviews, traditional healers reported thatthe long distance tohealth centers led patients to seek care from them rather than medical professionals. This accessibility preceded snakebite patients visiting traditional healers(11)(24).

Many medical professionals at sub-district hospitals tend to refer snakebite cases to higher-level facilities because of limited confidence or insufficient training to manage such cases locally (1). In this study, traditional healers in the interviews claimed that doctors at hospitalsfrequently did not provide adequate care to snakebite patients and seemed to lack sufficient expertise in managing such cases. Perveivingthis as negligent treatment, patients or their relatives sometimes soughttreatment from traditional healers again alongside the physicians' interventions.

Bangladesh is a disaster-prone country due to the geographical location and climatic conditions. During the monsoon season, riverine areas are flooded,causing snakes to seek shelter in people's homes, therebyincreasing snakebite cases. Data showed that flood prone districts in Bangladesh recorded more fatal snakebite cases during the monthsfrom May to October (5).

Some traditional healers accrued their skills in neighbouring India, which is renowned for spiritual instruction, where they trainedunder different masters.Similar findings were observed in other study,in which healers gained knowledge andobtainedmedical plants for treatment purposesby visiting certain parts of India(25).

Traditional healers, such as *Ozha*, *Kobiraj*, and *Gunin*, commonly attributed their success in treating snakebite to divine power, herbal remedies, and rituals. However, many also acknowledged their limitations in treating venomous snakebites, suggesting a pragmatic understanding of the boundaries of traditional practice.

This blend of spiritual faith and experiential observation indicates that traditional healers act not only as care providers but also as cultural mediators who manage fear and anxiety within the community following a snakebite incident.

Many healers believed that psychological panic, rather than venom, could cause death after a snakebite. This perception demonstrates the healers' experiential grasp of psychosomatic effects, though it may lead to underestimation of venom severity. Furthermore, traditional diagnostic methods,such as observing wound marks, colourchanges,applying chili and herbal pastes, suction, incision, and reciting spells, reflect an empirical but non-scientific attempt to classify snakebite types. These practices highlight both the deep-rooted indigenous knowledge systems and the urgent need for scientific validation and training.A similarfinding was reported inanother study in which that snakebite treatment varied according to the snake types and

snakebitesymptoms. These treatment consisted of herbal pastes prepared from plants and craftedtablets made from plant materials(25)(14).

The study also found that healers often resorted to harmful practices, such as tight tourniquets or incisions as the first aid for snakebite treatment, which may increase complications. This is consistent with findings from other low-resource countries where similar misconceptions persist(11)(15).

Traditional healers reported that they made every possible effort to snakebite patients tothe best of their ability. However, they acknowledgedthat the treatment outcomes varied, particularly in cases involving highly venomous snakes. In such cases. they referred patients to a nearby health center for treatment. Traditional healers in another study similarly reported that they made every possible effort to treat snakebite patients, and they referredpatients with venomous bites to health facilities(25).

Traditional healers' motivations for pursuing this profession were largely altruistic, and some inherited the profession from theirancestors. They perceived their role as a community duty rather than a commercial activity, often receiving minimal financial return. Yet their declining social recognition and economic insecurity have led to a gradual erosion of traditional practices. Therefore, traditional healers were less likely to work with established institutions. Younger generations were less likely to adopt this profession, which may further reduce the availability of such healers in rural areas.

Encouragingly, some healers emphasized early intervention andimmediate response, which could be leveraged in community awareness programmess if supported by appropriate training and integration into public health frameworks. Moreover, many respondents expressed willingness to receive government-based instituational traininginstitution-basedtrainingon snakebite

512 management and first aid. This offers a potential pathway for collaboration between traditional
513 and biomedical sectors. Structured capacity-building programs could empower healers to
514 recognize venomous bites, provide safe first aid, and refer patients promptly to health facilities.
515 Both snakebite victims and traditional healers were expressed the view that collaboration
516 between health services and traditional healers could help to improve snakebite management and
517 outcomes (26).

518 Snakebite is a neglected public health issue for rural populations. The rural community often
519 seektreatment from traditional healers. Community engagement and mass awareness are required
520 to build capacity among the villagers to take appropriate precautions and access the right
521 interventions for the safe reduction of snakebite poisoning in Bangladesh.

522 Traditional healers seem an integral part of the snakebite response system in rural Bangladesh.
523 Recognizing their influence, improving their knowledge, and integrating them into community-
524 based awareness and referral networks could play a pivotal role in reducing preventable deaths
525 from snakebite envenoming in Bangladesh.

526 **Limitations**

527 This study has several limitations. The findings were based on self-reported experiences and
528 practices that might be subject to recall bias. The qualitative design, purposive sampling and
529 conducting partial interviews utilizing phone calls may limit generalizability. Additionally, data
530 collected in 2021 may not fully reflect current snakebite management practices.

531 **Author contributions**

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MAF and FR conceived and designed the research study. MAF, FR and NCD developed data collection guidelines. NCD and RR collected the data, including conducting interviews. NCD, MAF and FR contributed materials and analysis tools. NCD drafted the initial manuscript. FF assisted with the languageof the manuscript. All authors contributed to the writing and gave final approval for publication.

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Ethics approval

The ethical clearance for this study was obtained from the National Research EthicsCommittee (NREC) (Memo: BMRC/NREC/2022-2025/67). The participants in the study were informed that the data collected would be used only for research purposes. The anonymity of each interviewee was strictly maintained.

Data sharing

After getting institutional approval, the corresponding author will share the data upon reasonable request.

Competing Interest

The authors declare that they have no competing interests.

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