Ethnobotanical survey of medicinal plants commonly used in snakebites in North Western Nigeria

Ibrahim-Maigandi Hassan1,2*, Aishatu Shehu1, Abdulkadir Umar Zezi1, Mohammed Garba Magaji1 and Jamilu Ya’u1

1Department of Pharmacology and Therapeutics, Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Nigeria.
2Ministry of Health Kebbi State, Nigeria.

Reviewed 9 April, 2020; Accepted 6 July, 2020

The incidence of snake bite in rural West Africa is reportedly high with an 11–17% mortality rate. Nigeria has one third of the cases for snake bite cases in this region. Thus, most tribes in North-western part of Nigeria depend on medicinal plants for snakebites. However, it appears that a gap exists on documentation of these plants especially tropical flora used in the management of snake bite. This led to increase depletion of medicinal plant resources and knowledge of their traditional use. Consequently, this survey provided knowledge and data on medicinal plants use in management of snake bite which will help retard the current rate of extinction and decimation of the medicinal plants in these areas and then provide need to conserve what is left as medicinal plants for posterity sake. The study was carried in three northwestern states of Nigeria namely Sokoto, Kebbi and Zamfara for three months. A semi-structured questionnaire was administered and fourteen respondents made up of herb sellers (7%), traditional medical practitioners (93%). The majority of the respondents were male (100%) and 34% were above 50 years of age. From the study, the data collected shows 25 medicinal plants were in use by different categories of practitioners. Botanical names, local names, family names, plant part(s) use and number of citations were also obtained and documented.

Key words: North-western Nigeria, snakebites, medicinal plants.

INTRODUCTION

Snakebites are common global health problem with complex consequence that is somewhat neglected (Isa et al., 2015). Snakebite is common in many other parts of Africa and the tropics (Gutierrez et al., 2010; Warrell 2010). The incidence of snakebite in rural West Africa is reportedly high with an 11-17% mortality rate (Habib et al., 2001; Habib 2013). Nigeria is one of the countries in West Africa that has one fourth of the cases for snakebites (Nasidi, 2007). Thus, most tribes in North-western part of Nigeria depend on medicinal plants for snakebites. For thousands of years, medicinal plants have played an important role throughout the world in the treatment and prevention of a variety of diseases. Most people in the world still rely on medicinal plants and most of them have a general knowledge of medicinal plants which are used as first aid remedies, to treat cough, cold, fever, headache, poisonous bites and some simple ailments (Muniappan and Savarimuthu, 2011).

*Corresponding author. E-mail: hassmaigandi@gmail.com; hassibm2000@yahoo.com. Tel: +234-803-2903601.

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Ethnobotanical information about plants are usually collected from traditional healers, community leaders, and native people of rural and urban areas. Nigeria is one of the countries in the world with wide range of snake species found in terrestrial, arboreal and aquatic habitats. This is so because of the presence of sparsely populated areas like food storage facilities, unkempt bushes, holes, crevices, and areas where prey is readily or likely to be available for them (Altimari, 1998; McDiarmid et al., 1999; Schmidt et al., 1957). This makes snake envenomation a health problem worldwide, especially in many tropical countries like Nigeria and was consequently declared as a neglected tropical disease by the World Health Organization in the year 2009. It has been estimated that global mortality from snake envenomation is up to 100,000 people per year (Venkata et al., 2015). Snake such as *Naja nigricollis*, *Echis carinatus* and *Bitis arietans* are common in Nigeria and responsible for about 95% snake bite cases (Adzu et al., 2005; Abubakar et al., 2010; Adeiza and Minka, 2013). Poor accessibility and exhortant cost of antivenoms have disrupted steady supply to snakebite locations where therapy are seriously needed (Bhavya et al., 2014). Another major challenge is the unavailability of a general antidote for either cure and or prevention of snakebites (Yogendra and Sharada, 2014). Medicinal plants, therefore, still remain the mainstay of treatment for snake bites in most developing countries (David, 2010). Medicinal plants have been used as folk medicine for treatment of snakebites for centuries, and the reliance on medicinal plants is primarily due to their effectiveness, cultural preferences, inexpensive nature, non-toxic nature and dependence on neighboring forests (Andrews et al., 2004; Du and Clemetson, 2002; Gupta and Peshin, 2012). Globally, traditional healers are using herbal medicine to cure and prevent snake envenomation (Gupta and Peshin, 2012; Yogendra and Sharada, 2014). Nigeria has many medicinal plants that are yet to be exploited and some are known traditionally to be used in the prevention and treatment of snake bite (Sule, 1999). However, there is paucity of data and no documentation on these plants. Thus, the need to establish an informational database of these medicinal plants used against snake venoms is long overdue. This will serve as a readily available source of information for pharmacological investigation of potential antivenoms and development of phytotherapies or lead compounds in drug development process. This study therefore attempted to provide information on medicinal plants used in the management of snakebite by traditional practitioners in three northwestern Nigerian States.

**MATERIALS AND METHODS**

**Ethnobotanical survey**

An ethnobotanical survey was conducted from January to April, 2017 where relevant information about medicinal plants used in the management of snakebites in Zamfara, Sokoto and Kebbi States, Nigeria were obtained. Data were collected based on an oral interview with the traditional practitioners using semi structured questionnaire. Only willing respondents were interviewed and documented. Plant specimens were collected along the line, subsequently dried and mounted on card board paper (Burkill, 1985; Sofowora, 1996). It was then taken for identification and authentication in the Herbarium Section of Department of Botany, Ahmadu Bello University, Zaria where specimen voucher numbers were obtained when compared with existing specimen.

**Study areas**

The survey was carried out in Kebbi, Sokoto and Zamfara State, Nigeria. The occupation and ethnicity of inhabit of these areas formed bases for selection. Kebbi is a state in north-western Nigeria with its capital at Birnin Kebbi. The state was created out of a part of Sokoto State in 1991. Kebbi State is bordered by Sokoto State, Niger State, Zamfara State, Dosso Region in the Republic of Niger and the nation of Benin. It has a total area of 36,800 km². Sokoto State is located in the extreme northwest of Nigeria, near to the confluence of the Sokoto River and the Rima River. It has an estimated population of more than 4.2 million and covers an area of 90,000 square kilometres (35,000 sq mi). Sokoto State is mainly populated by Hausa people with over 80% of people living in the state practicing agriculture. Zamfara is located in northwest Nigeria with an area of 38,418 square kilometres. It is bordered in the North by Niger republic, to the South by Kaduna State, in the east bordered by Katsina State and to the West by Sokoto and Niger States. Sokoto state has a population of 4.1 million with the earliest inhabitants of Zamfara being hunters and giants.

**Ethical approval**

The objectives of the study were explained to the respondents (traditional medical practitioners and herbalists) and informed consent was obtained from each of them.

**Inclusion criteria**

Recognized traditional medical practitioners and herbalists who were mentally stable and practice their jobs as at the time of the study were recruited.

**Exclusion criteria**

Unrecognized traditional medical practitioners and herbalists with no patronage for management of snakebite, mentally ill and not currently practicing their jobs at the time of the study were not enrolled.

**Administration of questionnaire**

The survey covered a period of one month. Ethno-medicinal information was obtained by consulting traditional medical practitioners and herbalists using semi-structured questionnaire and an oral interview as described by Shehu et al. (2017). The questionnaire was divided into three sections:

- **Section 1**: Demographics such as age, sex, religion, nationality, practice specification, duration of practice and educational background.
- **Section 2**: Professional experience on the management of snakebite was discussed. Questions Such as type of snakebite or wound, frequency of treatment, use of herbal therapy alone or
Table 1. Demographics of respondents.

| Parameter          | Specification             | N(%) |
|--------------------|---------------------------|------|
| Practice specification | Herbalist                | 1(7) |
|                     | Traditional medical practitioners | 13(93) |
| Sex                 | Male                      | 14(100) |
|                     | Female                    | 0(0)  |
| Age (years)         | 20-30                     | 2(14) |
|                     | 31-40                     | 3(21) |
|                     | 41-50                     | 3(21) |
|                     | 51 above                  | 5(34) |
| Religion            | Christianity              | 0(0)  |
|                     | Islam                     | 12(86) |
|                     | Traditional               | 2(14) |
| Nationality         | Nigerian                  | 14(100) |
|                     | Non Nigerian              | 0(0)  |

N= number, %= percentage.

otherwise, duration of treatment, accompanied side effects, accompanied verbal instructions, plant part(s) use, availability of plant or plant part(s) and knowledge of treatment were asked. Section 3: Plants and recipes used in the management of snakebites were inquired with questions like types of herbal preparation, arrangement of plant part(s) ingredient, traditional solvent of choice, traditional extraction methods or method of preparation and method of administration were all considered.

RESULTS

Demography/personal information on respondents

A total of fourteen respondents made up of one herb seller (7%) and traditional medical practitioners 13 (93%) were obtained. Majority of the respondents were male, as observed from demographic information of respondents (Table 1).

Professional experience of the respondents

The survey showed that only herbs are used for the cure of disease by the respondents and also inherited the knowledge of herbs from their ancestors (Table 2).

Medicinal plants commonly used in management of snake bite in North Western Nigeria

The survey also showed that a total of 25 medicinal plants species were in use by different categories of practitioners. Botanical names, local names, family, plant part(s) and number of citations obtained were presented in Table 3.

Plant forms and parts used in the treatment of snake bite in the survey

Majority of the plant life forms and parts used are trees and root/bark respectively. Other plant forms and their frequencies were reported (Table 4).

DISCUSSION

Snakebite poisoning is one of the unheeded disease in most of the developing countries. African countries are global diversity center for snakes that could be deadly from different families like Vipers, Krait and Cobras (Swaroop and Grab, 1954). Additionally, people living in tropical countries are at high risk of snakebite because of their engagement in agricultural, pastoral and hunting as means of survival. Most medical treatment for the snakebite is the use of antisera, which is costly and inaccessible by the rural patients (Cannon et al., 2008). Thus, medicinal plants are used as essential sources of medicines for humans especially in developing countries (Pankhurst, 1995; Dery and Otsyina, 2000). In this study, an ethnomedical survey to provide information on the medicinal plants used in the management of snake bite was conducted. Most of the herbal medicines came from trees, many of which also have other uses such as
Table 2. Professional experience of respondents.

| Parameter                      | Specification          | N(%)    |
|--------------------------------|------------------------|---------|
| Years of experience           | 10-20                  | 3(21)   |
|                               | 21-40                  | 6(43)   |
|                               | 41-60                  | 5(36)   |
| Frequency of treatment        | Regular                | 14(100) |
|                               | Irregular              | 0(0)    |
| Duration of treatment (days)  | 2-3                    | 6(43)   |
|                               | 7-10                   | 4(28.5) |
|                               | 14                     | 4(28.5) |
| Other treatment apart from herb| Divination/oracle/incantation | 0(0)  |
|                               | None                   | 14(100) |
| Source of knowledge           | Ancestral              | 14(100) |
|                               | Training               | 0(0)    |
|                               | Divination             | 0(0)    |
| Availability of plant/plant parts| Available           | 5(36)   |
|                               | Scarce                 | 5(36)   |
|                               | Available on season    | 4(28)   |
| Accompanied side effects      | Nausea/vomiting        | 16(62)  |
|                               | Skin removal           | 2(8)    |
|                               | Others                 | 4(15)   |
|                               | None                   | 4(15)   |
| Accompanied verbal instructions| Yes                   | 12(86)  |
|                               | No                     | 2(14)   |
| Instructions                  | Stop walking           | 8(57)   |
|                               | Don’t use other medications | 6(43) |

N= number of respondents; % percentage of respondent.

providing timber and protection of the environment. They have taxonomic classes which enable their classification with respect to their role in economic development (Ekanem and Udoh, 2009). In the study areas, the use of traditional medicine is widely acceptable and on the increase daily especially for snakebite. This was evidenced from the number of plant reported to be used in management of snakebite. So also, some of the plant species reported used were identified as medicinal plants in some other states across Nigeria (Aiyeloja and Bello, 2006; Kayode, 2008). The species variations recorded in this study were comparable to some of those recorded in a study of medicinal plants used in Katsina State in Northwestern Nigeria (Danjuma and Darda’u, 2013) and those of Biu Local Government area of Borno State, Nigeria (Ampitan, 2013). The local people reported these medicinal plants to be very useful in their communities and preferred them over orthodox medicines in management of snakebite. Trees were the plants life forms commonly used in the form of leaves, root and bark. This is similar to other studies which reported the use of trees more in traditional medicines, with leaves widely used in most African countries like Nigeria, Uganda, Ethiopia and Mali (Ugbogu and Akinyemi, 2004; Tagola, 2005; Muniappan and Savarimuthu, 2011; Shehu et al., 2017). Some of the medicinal plants were reported to be cited in treating different ailments such as asthma, stomach-ache, headache, diarrhea, whitlow, dysentery, gonorrhea and cough, among others. Ethnobotanical surveys of medicinal plants used in certain localities support tropical conservations of bioresources (Shehu et al., 2017). It has been known to help in passing down information on traditional medicine from generation to generation through documentation of facts that is
Table 3. Medicinal plants commonly used in the management of snake bite.

| S/N | Botanical name                | Local/vernacular name | Voucher number | Family name | Part(s) used | Number of citations |
|-----|-------------------------------|-----------------------|----------------|-------------|--------------|--------------------|
| 1   | Xeromphis nilolitica          | Chura                 | 2867           | Rubiaceae   | Bark         | 2                  |
| 2   | Senna singuena                | Loda                  | 6663           | Fabaceae    | Bark         | 3                  |
| 3   | Albizia chevalieri            | Katsari               | 900247         | Fabaceae    | Root         | 1                  |
| 4   | Pilostigma thonningii         | Kalgo                 | 831            | Fabaceae    | Whole        | 2                  |
| 5   | Secunnea virosa               | Tsa                   | 2520           | Euphorbiaceae| Root/bark/fruit| 5                  |
| 6   | Acacia ataxacantha           | Bakin-gumbi, Sarkakiya, duhuwa, hoorahi | 698 | Fabaceae    | Root         | 1                  |
| 7   | Annona senegalensis          | Gwandar-daji          | 3129           | Combretaceae| Leaves/ bark  | 2                  |
| 8   | Dichrostachys glomerata       | Dundu                 | 900236         | Fabaceae    | Leaves       | 1                  |
| 9   | Combretum glutinosum          | Taramniya/ marke      | 900191         | Combretaceae| Whole        | 1                  |
| 10  | Combretum lamprocarpon        | Tsini                 | 900745         | Combretaceae| Bark         | 1                  |
| 11  | Sclerocanya birea             | Danya                 | 6871           | Anacardaceae| Leaves       | 1                  |
| 12  | Secunadaca longipedunculata   | Uwar magunguna, farin yaro (H), Ezeogwu (I), Violet tree (E) | 1880 | Polygalaceae| Bark, leaves  | 2                  |
| 13  | Senna sieberiana              | Malga                 | 1387           | Fabaceae    | Leaves       | 2                  |
| 14  | Ziziphus spinachristi         | Kuma                  | 2691           | Rhamnaceae  | Leaves/roots | 1                  |
| 15  | Indigofera astragalina        | Masahi                | 454            | Rhamnaceae  | Leaves/bark  | 1                  |
| 16  | Ziziphus mucronata            | Kuma                  | 1084           | Fabaceae    | Leaves       | 1                  |
| 17  | Senna obtusifolia             | Tafasa                | 7072           | Rhamnaceae  | Leaves       | 2                  |
| 18  | Ziziphus mauritiana           | Magarya               | 1729           | Fabaceae    | Leaves       | 1                  |
| 19  | Indigofera capitata           | Baba (H), Kinoafimice (Y) | 7084 | Moraceae    | Leaves       | 1                  |
| 20  | Ficus thonningi               | Siriya                | 518            | Lamraceae   | Leaves       | 1                  |
| 21  | Hyptis suaveotans             | Bunsurun daji         | 922            | Fabaceae    | Leaves       | 2                  |
| 22  | Crotalaria falcate            | Birana                | 900085         | Bignoniacae| Leaves       | 2                  |
| 23  | Stereospermum kunthianum      | Sansame               | 1627           | Rubiaceae   | Leaves/bark  | 3                  |
| 24  | Mitrogyyas inermis            | Gayayya/ Kurukuru    | 900219         | Asclepidaceae| Leaves       | 2                  |

Table 4. Plant life forms, plant parts used and their frequencies.

| Plant life forms | Plant parts used | Frequency |
|------------------|------------------|-----------|
| Tree             | Root and bark    | 7         |
| Shrub            | Whole            | 2         |
| Climber          | Whole            | 0         |
| Creeper          | Bulbs            | 0         |

made available to researchers worldwide (Peter et al., 2018). Documentation also helps reports on herbal information from being lost gradually with every person that dies (Ogbole et al., 2010), which led to slow pace of development of traditional medicine in Nigeria and Africa in general. The rate of depletion of medicinal plant resources is generally high, yet little is known about most of Nigeria’s plant species especially tropical floras (Igoli et al., 2005). Survey of this nature assists in providing an informational source for the therapeutic potential of medicinal plants, stimulating the urgent need to retard the current trend of decimation of useful medicinal plants and promote bioconservation.

The traditional practitioners in this study stated that in most cases, snakebites were first treated locally with traditional medicine at home and transferred to the hospital only when there is no improvement or critical condition. It was reported earlier that initial local treatment of diseases is quite common among the African people (Brown, 1973; Isa et al., 2015). This could be part of the reason why there is diverse modes of preparations and routes of administration of these medicinal plants in the area and in most parts of Africa where traditional medicine is fast gaining grounds. An evidence for use of medicinal plants was reported in this study in which 25 plants were reported useful in snakebites in North-western Nigeria.

The study identified Securinega virosa as the most...
popular anti-snake bite followed closely by *Senna singueana*. *S. virosa* has been reported to possess several medicinal advantages that were reported pharmacologically. Psychopharmacological potential (Magaji et al., 2014), anti-diabetic properties (Yusuf et al., 2010) and *in vitro* inhibition of glioblastoma multiforme cell survival (Magaji et al., 2015) of *S. virosa* were scientifically validated. The use of *S. singueana* was reported as an alternative or adjuvant therapy for malaria (Hiben et al., 2015). Out of the 25 medicinal plants documented in this survey, only one, *Xeromphis nilotica* has been scientifically validated to possess anti-snake bite (Ushandanini et al., 2009). Some of the common recipes, methods of preparation and administration procedure were also documented.

**Conclusion**

This study has provided information on the usefulness of medicinal plants in management of snake bite in Zamfara, Kebbi and Sokoto State, Nigeria. An informational data for accessing and documenting traditional knowledge of medicinal plants used in management of snake bite was established. Further work is currently ongoing in the laboratory to validate the folkloric claims of these plants.

**CONFLICT OF INTERESTS**

The authors have not declared any conflict of interests.

**ACKNOWLEDGEMENT**

The support of Mr Kabiru Abdullahi of the Department of Pharmacognosy and Drug Development is highly appreciated.

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