

Ethnobotanical Survey of Medicinal Plants Used in the Treatment of Transmissible Diseases

Bawale Sani Halliru¹, Nuraddeen Wada², Abdulrahman Mahmoud Dogara^{3*}, Aisha Abdullahi Mahmud⁴, Musa Daniel Danladi⁴, Isah Labaran⁵, Hussaini Danlami⁶

1 Department of Biological Sciences,

Al-Qalam University, Katsina State, NIGERIA.

2 Department of Science Laboratory Technology,

Al-Qalam University, Katsina State, NIGERIA

3 Biology Education Department, Faculty of Education,

Tishk International University, Erbil, IRAQ.

4 Department of Plant Science and Biotechnology, Faculty of Life Science,

Federal University Dutsin-Ma, Katsina State, NIGERIA

5 Department of Sciences Laboratory Technology,

School of Science, Federal polytechnic Mubi, Adamawa state, NIGERIA

6 Department of Biological Sciences, Faculty of Life Sciences,

Kaduna State University, Kaduna State, NIGERIA

*Corresponding Author: abdulrahman.mahmud@tiu.edu.iq

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Abstract

Herbal medicine, as an ancient traditional medical method, predates the establishment of contemporary healthcare systems within human culture. Globally, several groups develop their own indigenous forms of medicine and corresponding methodologies for treating and enhancing overall well-being. The research presents a comprehensive ethnobotanical survey of medicinal plants used in the treatment of transmissible diseases in Katsina State. A random selection technique was employed in conjunction with an open-ended interview guide over the period spanning from October 2022 to June 2023. The demographic information of the respondents was ascertained using Excel 2016. Quantitatively, the documented plants were subjected to analysis based on their Relative Frequency of Citation (RFC). This study identified 26 medicinal plants used in the administration and treatment of various transmissible diseases in the northern Nigerian state of Katsina. *Moringa oleifera* (28%) is the most frequently reported plant, followed by *Olea Europaea* (24%) and *Azadirachta indica* (20%). Leaves were the most frequently used part of the plants (69%), common method of preparation is decoction (65%). As their popularity and recognition expanded throughout the world, plants with medical potential remain the sole hope for the future. According to the current study, people of Katsina citizens had a solid awareness of the medicinal plant. Even with the progress of contemporary medicine, the people in the area still depend on using traditional plants for medical purposes.

1. Introduction

The utilization of plants and their resources for the purpose of addressing many ailments predates the advent of written records and continues to be practiced globally [1]. The first documented instance of utilizing medicinal plants to produce pharmaceutical substances has been discovered on a Sumerian clay tablet originating from Nagpur, estimated to be over 5000 years in age [2].

A medicinal plant refers to a botanical species that possesses components inside one or more of its organs that can be utilized for therapeutic intentions or serve as precursors to produce beneficial pharmaceutical compounds [3, 4]. The provided description enables the differentiation between medicinal plants that have undergone scientific development to establish their therapeutic properties and constituents, and those plants that are considered medicinal but have not yet undergone comprehensive scientific research [1, 5]. Various flora has been utilized in traditional medicine for several decades [1]. Certain botanical specimens have potential therapeutic properties, while lacking comprehensive scientific substantiation, such as the absence of rigorous double-blind experiments, which would otherwise validate their effectiveness [6]. These plants should be considered as therapeutic herbs. Pharmacists and pharmacologists employ the term "crude drugs of natural or biological origin" to denote plants or their constituent parts that possess therapeutic attributes [4]. Medicinal plants serve a diverse array of purposes, encompassing both curative and preventative measures for a wide range of ailments, including communicable infections [7].

A disease can be characterized as an atypical state that detrimentally impacts the structure or functionality of a whole organism or a specific portion thereof and is not attributable to any immediate external trauma. Diseases are commonly recognized as medical disorders characterized by distinct signs and symptoms. In the context of human health, the term "disease" is frequently employed in a broader sense to encompass any state or condition that induces discomfort, impaired functioning, anguish, social complications, or mortality in the affected individual or comparable challenges for individuals near the affected person [8]. In a larger sense, it also encompasses impairments such as injuries, disabilities, disorders, syndromes, infections, single symptoms, aberrant behaviors, and structural and functional differences that are not typical [9]. In addition to the obvious physical toll, coping with a chronic illness can have profound psychological repercussions [10]. On the other hand, transmissible diseases can be acquired through vectors such as contaminated surfaces, foods, animals, air, or vomit, or by direct contact such as blood exchange with an infected host. Contagious diseases include, but are not limited to, cough, asthma, fever, and cold ailments [8]. It is impossible to exaggerate the significance of plants in conventional medicine and as raw materials for the pharmaceutical industry. Most non-industrialized societies employ herbal remedies or mixtures to treat illnesses [11].

This survey is extremely beneficial to doctors and pharmacists because they are legitimate manufacturers of novel medications. The great growth of traditional medicine and the increasing interest in herbal remedies have led to a global increase in the use of medicinal plants [7]. Numerous studies have been carried out to investigate the application of medicinal plants in the treatment of a range of illnesses. However, there is a lack of extensive study to ascertain the efficacy of utilizing medicinal herbs for the treatment of major communicable diseases. This study is justified due to the need to address the existing gap in the literature concerning the utilization of medicinal plants for treating transmissible diseases in northern Nigeria. We anticipate that the research will serve as a reference for people who utilize therapeutic plants. The current study identified a few specific medicinal plants in Nigeria's Katsina State that are highly effective in treating several prevalent transmissible illnesses.

2. Materials and Methods

2.1 Study Area

The survey was carried out in the Nigerian state of Katsina. with a total land area of 24,192 km², it is situated at Latitude 12.985531N and Longitude 7.617144E (Figure 1). Katsina's population was predicted to be 429,000 based on 2016 Nigerian National Population Commission's Census. The city, known as the "Home of Hospitality," is situated in the center of the state [3]. The rainy season, which lasts for 5.1 months, is stifling and mostly cloudy, while the dry season is windy and partly cloudy. Additionally, the city has year-round heat. Temperature ranges for the year average are 25 to 45 °C. Based largely on agriculture, Katsina is situated in the Sahelian Savannah and is home to the largest ethnic group in the state, the Hausa-Fulani. The predominant religion in the area is Islam [3].

2.6 Data Analysis

A simple descriptive analysis was used to analyse the data. According to previous study [14], we were able to determine the frequencies and percentages by using the following socio-demographic data from the respondents:

- I. Gender
- II. Educational level
- III. Occupational status
- IV. The following frequencies and percentages were calculated using taxonomic data related to plants:
 - a. Genus occurrence
 - b. Family occurrence
 - c. Plant portion utilized.
 - d. Administration method
 - e. Preparation method and Experience

- V. The subsequent quantitative ethnobotany indices were employed:

- a. The Relative Frequency of Citation (RFC) is calculated using the formula F_c/N , where F_c represents the count of individuals who referenced a certain plant species, and N represents the total number of respondents that were interviewed [2].

3. Results and Discussions

3.1 Questionnaire Response from the Respondents

Out of three hundred (300) copies of the questionnaires that were given to the respondents, 200 copies were properly completed and retrieved. The questionnaires were completed two times. The respondents were visited twice to authenticate their claim. 100% of the responses were adequately retrieved from the respondents (Table 1).

Table 1 *Questionnaire response of the respondents*

S/N	Administered Questionnaire	Frequency	Percentage
1.	Returned	200	75%
2.	Unreturned	100	25%
	Total	300	100%

3.2 Demographic Profile of the Respondents

There were 200 interviewees in total, with 110 males (55%) and 90 females (45%) included (Table 2). Traditional African medicine is primarily practiced by men [15]. The phenomenon's pervasiveness can be attributed to the population's shared cultural and religious values. Most of the housework is projected to be done by women [16]. The ages of the respondents ranged from 20 to 55, with the largest percentage (72.5% of the total) in that group. Most users are between the ages of 41 to 50 (32.5%) since those individuals are in the prime of their lives and are more open to the use of medicinal herbs. Traditional wisdom is often thought to be preserved by older individuals, but this study shows that this is not always the case. The group's middle-aged informants were knowledgeable, kind, and assured in their ability to serve customers. Most respondents (85%) hold university degrees. It was reported that only 15% had never attended college. This contradicts the findings of an ethnobotanical investigation of plants used to treat inflammatory disorders in Ringim, Jigawa State [1]. While the majority of respondents did not receive a western education, the clear majority started studying religion when they were just 8 years old [1]. It has been documented that, in some part of the world, women demonstrate a more thorough knowledge and expertise in the use of plants, and this is because of their role in the family for home keeping [5].

Moreover, the socio-demographic data of the respondents showed that the older populations from 40 years were the most represented. It is also common that older people have gained more expertise on the use of medicinal plants or have mastered the knowledge from other people [17]. As in many traditional societies, this aligns with a common belief that older people possess an extensive knowledge of medicinal plant usage. This finding agrees with the survey conducted in Kano, Nigeria where most of the respondents are mostly males, and they are above 40 years of age. Only five of the respondents were reported as females [16].

Table 2 Summary of socio-demographic characteristics of the respondents

Demography	Frequency (n=200)	Percentage (%)
Traditional healers	49	24.5
Herbalists	101	50.5
Locals with knowledge of Medicinal Plant	50	25
Gender		
Male	110	55
Female	90	45
Age range		
20 – 30	30	15
31- 40	50	25
41 – 50	65	32.5
51 – 55	55	27.5
Ethnicity		
Hausa	80	40
Fulani	70	35
Mixed (Hausa-Fulani)	50	25
Religion		
Islam	200	100
Education		
No formal	30	15
Primary	25	12.5
Secondary	40	20
Diploma	45	22.5
Degree and above	60	30

3.3 Biodiversity of the Documented Plants

Transmissible disease is any infectious disease that can be caused by viruses. It can also be transferred to other uninfected individuals. The local name of the plant, the components employed, and the preparation techniques are among the details. The listed plants' local names were verified using published works, and the correct taxonomic nomenclature was verified in the plant list database at www.worldfloraonline.org and www.plantlist.org. The present study explored 26 medicinal plants that are used in the management and treatment of various transmissible diseases, in Katsina State, Northern part of Nigeria, and highlight the specific diseases they managed (Table 3). The plants were properly identified by communities of; Kofar Soro, Rafindadi, Masanawa, KofarMarusa, and Goruba GRA in Katsina State. The plants were properly identified by the locals as plants used to treat various transmissible diseases. The data documented from the survey include Local name of the plant, disease the plant treated, and total number of the species of that plant in the region. The prevalence of Typhoid fever in all the communities indicates a spread of contaminated water and food. The study agrees with [18] on their study of transmissible diseases and its impact on human survival. The variety of plants listed in the study demonstrates the diversity of the community's traditional healers [2].

Table 3 List of medicinal plants and some infectious disease they treated

Scientific names	Family	Name of Plant	Frequency of occurrence	Part used	Diseases	Administration route	Voucher number
<i>Azadirachta indica</i>	Meliaceae	Neem Plant	20	Leaves	Intestinal worms and leprosy.	Oral (Concoction)	SHB001-2022
<i>Moringa oleifera</i>	Moringaceae	Drumstick tree	28	Leaves	Anaemia, Asthma & Bronchitis	Many routes (Decoction, Infusion, Maceration or Powder)	SHB002-2022
<i>Toddalia asiatica (L) Lam</i>	Rutaceae	Orange climber	9	Root	cough, and influenza	Oral (Decoction)	SHB013-2022
<i>Olea Europaea</i>	Oleaceae	Olive Tree	24	Seed oil	Respiratory and Urinary tract infections	Oral (Decoction, Infusion, Maceration)	SHB012-2023
<i>Sambucus nigra L.</i>	Adoxaceae	Elder Flower	8	Leaves	Cold and Flu	Oral (Concoction)	SHB013-2023
<i>Aleo Vera</i>	Liliaceae	Aleo Vera	14	Leaves	Skin Diseases	Oral (Concoction)	SHB011-2023
<i>Allium sativum</i>	Alliaceae	Garlic	10	Bulb	Fever, and Cold illnesses	Oral (Raw bulbs)	SHB003-2022
<i>Ficus sycomorus</i>	Moraceae	Sycamore fig	7	Bark	Whooping Cough	Oral (Decoction)	SHB002-2023
<i>Cymbopogon citratus</i>	Poaceae	Lemon Grass	16	Leaves	Catarrh, Cold and Flu	Oral (Bioling raw and drink as Tea)	SHB004-2022
<i>Eucalyptus globulus</i>	Myrtaceae	Blue Gum	12	Eucalyptus oil	Bronchitis and Asthma	Topical (Eucalyptus oil)	SHB005-2022
<i>Prunus spinosa</i>	Rosaceae	Blackthorn	10	Leaves	common cold, cough	Oral (Infusion & Tea)	SHB014-2023
<i>Guiera Senegalensis</i>	Combretaceae	Moshi medicine	14	Leaves	Eczema/Ringworm	Oral (Decoctions or Mixed with Honey)	SHB009-2023
<i>Ocimum basilicum</i>	Lamiaceae	Basil Leaf	11	Leaves	Cold and Flu	Oral (Infusion & Tea)	SHB010-2023
<i>Carica papaya</i>	Caricaceae	Papaya Leaf	10	Leaves	Intestinal parasite	Oral (Leaf Extract or raw fruits)	SHB006-2022
<i>Murraya koenigii</i>	Rutaceae	Curry Leaf	7	Leaves	Dysentery	Oral (Infusion & Tea)	SHB008-2023
<i>Ricinus Communis</i>	Euphorbiaceae	Castor	16	Seed Oil	Skin Infections	Topical (Oil Massage)	SHB007-2022
<i>Nepeta cataria</i>	Lamiaceae	Catnip	4	Leaves	Cold and Flu	Oral (Infusion & Tea)	SHB008-2022
<i>Rumex crispus</i>	Polygonaceae	Yellow Dock	5	Leaves	Skin Infections	Oral (Decoction or Tincture)	SHB006-2023
<i>Vernonia amygdalina</i>	Asteraceae	Bitter Leaf	10	Leaves	Malaria & Diabetes	Oral (Decoction or Tincture)	SHB009-2022



<i>Anogeissus Leiocarpus</i>	Combretaceae	African birch	13	Bark	Cough/Tuberculosis	Oral (Decoction of bark)	SHB011-2022
<i>Artemisia Annu</i>	Asteraceae	Wormwood	11	Leaves	Jaundice and Hepatitis	Oral (Decoction)	SHB007-2023
<i>Ficus Glumosa</i>	<u>Moraceae</u>	Mountain Fig	6	Bark	Diarrhea & Hemorrhoids	Oral (Decoctions)	SHB012-2022
<i>Nigella sativa</i>	Ranunculaceae	Black Seed	12	Seed	Asthma	Oral (Tincture Preparation)	SHB005-2023
<i>Coleus scutellarioides</i>	Lamiaceae	Coleus	4	Leaves	Urinary tract infection	Oral (Chewing)	SHB002-2023
<i>Ocimum gratissimum</i>	<u>Lamiaceae</u>	Clove basil	16	Leaves	Ophthalmic diseases	Topical (Essential oil)	SHB002-2023
<i>Senna occidentalis (L)</i>	Fabaceae	Senna Leaf	13	Leaves	Typhoid	Oral (Infusion)	SHB003-2023
<i>Link</i>							

3.4 Parts of the Plant utilised, Method of Preparations and Administration

Furthermore, several parts of the plants were used to prepare the traditional medicine. However, the survey revealed the leaves were the most frequently used part of the plants (69%), bark and seed oil of the plants' parts each has (11.5%), followed by root and bulb with (4%) frequency each as shown in Fig 2. This implies that, the people in Katsina State depend heavily on plants' leaves to prepare traditional medicine. The finding is in line with what was obtained in research carried out by [2] where they reported leaves as the most used part of the plant to use in traditional medicine. This dependency on plants' leaves might be attributed to the fact that leaves are easier to collect and poses less threat to the local flora.

Moreover, the plant leaves are easier to use and extracted. Medicinal plants contain numerous biologically active compounds which have medicinal activities. The study observed the most common method of preparation of the plant parts is decoction and infusion (65%), followed by topical (11%) and concoction with (4%) (Fig 3). Decoction is the simplest way to prepare medicinal plant parts as previously reported [8]. According to Fig. 4, the most common methods of administering traditional medicine were oral administration (88.5%) and tropical administration (11.5%). The finding is in conformity with what was revealed by [7] where he has reported oral administration of medicinal plants part as the most administration route to take traditional medicine.

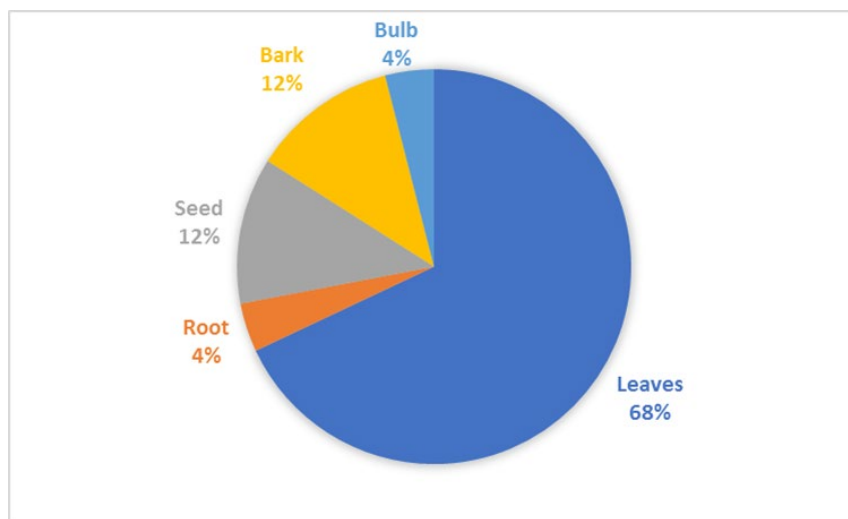


Fig. 2 Percentage of used parts of plants effective in infectious diseases of various body systems

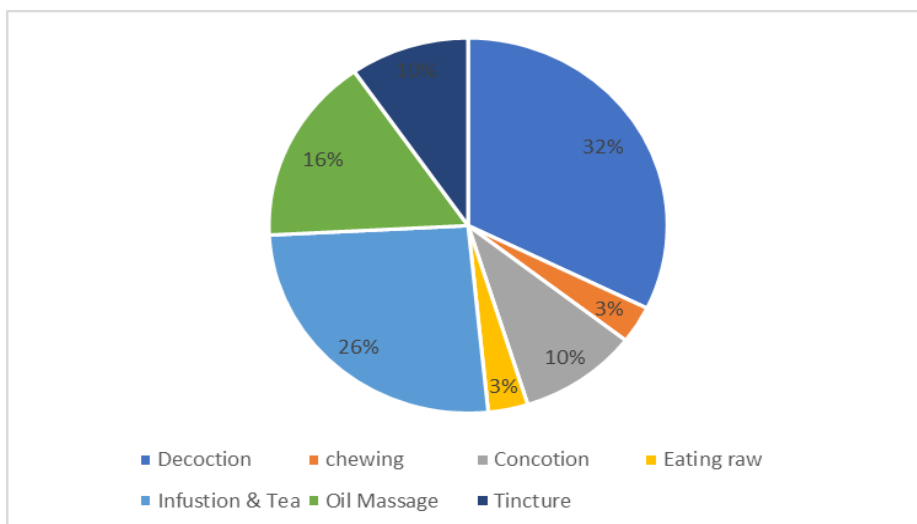


Fig. 3 Frequency of methods of preparation of medicinal plants effective in infectious diseases of various body systems

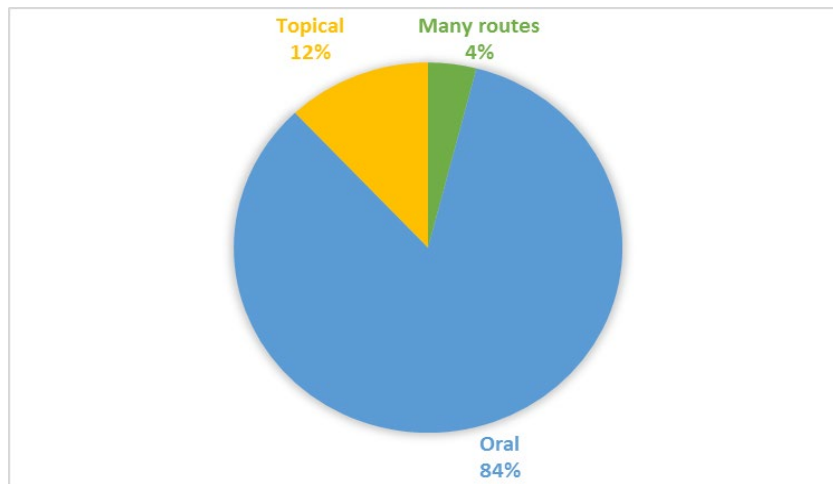


Fig. 4 Percentage of administration routes

There is a renewed interest in the choice of traditional medicinal plants as potential remedies for the treatment of transmissible disease. In the past several medicinal plant products have been investigated leading to the isolation of several compounds that have proven to be very effective in the treatment of disease. Based on the reported response from the respondents', the most frequently used parts are the leaves, followed by the bark. This can be attributed to the fact that leaves are easier to collect, extract and used. These findings are in line with what was obtained in research carried out, where the most used plants' part is the leaves [1]. Also reported leaves as the most frequently used plant part, in ethnobotanical research of medicinal plants used in the treatment of malaria in Ogbomosho, Southwest Nigeria in ethnobotanical research on medicinal plants used by Guinean traditional healers for the treatment of children diseases, showed also that the leaves were the most frequently used plant part [7]. Also published their findings after conducting an ethnobotanical survey about folk use of herbal plants for the treatment of diseases in Abeokuta North local government area of Ogun state, Nigeria [19-21]. Their findings reveal the leaves as the most used plant part.

Table 4 Aqueous extracts

S/N	Neem Extract	Moringa Extract	Olive Extract
1	Alkaloid ++	Alkaloid ++	Alkaloid ++
2	Tannins ++	Tannins ++	Tannins ++
3	Saponins -	Saponins -	Saponins ++
4	Flavonoid ++	Flavonoid ++	Flavonoid ++
5	Glycoside ++	Glycoside +	Glycoside +

Keys:

+++Symbol indicates higher Concentration

++ Symbol indicates moderate Concentration

+Symbol indicates low Concentration.

- Symbol indicates negative

Table 5 Methanol extracts

S/N	Neem Extract	Moringa Extract	Olive Extract
1	Alkaloid +++	Alkaloid +	Alkaloid +
2	Tannins +++	Tannins +++	Tannins +++
3	Saponins +	Saponins +++	Saponins +++

4	Flavonoid +	Flavonoid +++	Flavonoid +++
5	Glycoside +	Glycoside +++	Glycoside +

Table 6 Chloroform extracts

S/N	Neem Extract	Moringa Extract	Olive Extract
1	Alkaloid +++	Alkaloid ++	Alkaloid +++
2	Tannins ++	Tannins ++	Tannins +++
3	Saponins +++	Saponins +	Saponins +++
4	Flavonoid +	Flavonoid +	Flavonoid +++
5	Glycoside ++	Glycoside +	Glycoside -

4. Conclusion

To conclude, the survey of the medicinal plants used in the treatment of transmissible diseases has revealed several useful plants that will serve as lead for the plant-based drug for management and treatment of transmissible diseases that will stand the test of time. This research was the beginning of extensive transmissible research in a bid to produce a compound with diseases that will equal or supersede those that are already in the market. This research work is proof that traditional medicine information is very useful tools in the development of new drugs in Nigeria and the continent. *Moringa oleifera* (28%) is the most frequently reported plant, followed by *Olea europaea* (24%) and *Azadirachta indica* (20%). The leaves of the mentioned plant have been used to treat infectious illnesses and other disorders by traditional herbalists. This prompted us to investigate the plant extract's phytochemical composition. Primary and secondary metabolites responsible for the various biological activities of *Moringa oleifera*, *Olea europaea*, and *Azadirachta indica* were found in 100% aqueous, ethanol, and chloroform extracts of their leaves. Medicinal and physiologically useful substances were found in the extract, as determined by phytochemical testing. Northern part of Nigeria still uses traditional herbal medicine for a variety of ailments and health enhancements, as evidenced by this study; however, there is an urgent need to preserve both the culture and the traditional medicinal plants, as well as conduct further biological evaluation of the documented medicinal plants. There is a pressing need to bring attention to and give scientific evidence in support of the claims made by traditional medical practitioners on the use of raw medicinal plants, the production of herbal supplements, and the potential discovery of new pharmaceuticals of plant origin.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design: Bawale Sani Halliru and Nuraddeen Wada, Aisha Abdullahi Mahmud Musa Daniel Danladi; data collection: Isah Labaran and Hussaini Danlami; analysis and interpretation of results: Abdulrahman Mahmoud Dogara; draft manuscript preparation.** All authors reviewed the results and approved the final version of the manuscript.

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