



## ETHNOBOTANICAL SURVEY OF PLANTS USED FOR THE MANAGEMENT OF HYPERTENSION IN ZANGO KATAF, KADUNA STATE, NIGERIA

ESTHER BADUGU PATRICK<sup>1,2,\*</sup>, SUNDAY ORITSETIMENYIN OTIMENYIN<sup>1</sup>, BUKATA BAYERO BUKAR<sup>1</sup>

1. Department of Pharmacology, Faculty of Pharmaceutical Sciences, University of Jos, Nigeria.
2. Department of Pharmacology and Toxicology, Kaduna State University, Kaduna State, Nigeria.

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### ABSTRACT

Zango Kataf is home to a diverse range of medicinal plant species among which are herbs used for the management of high blood pressure. This study was conducted to document the antihypertensive plants used by indigenes of Zango Kataf, Kaduna State, Nigeria. Seventeen (17) herbal healers were interviewed (using a semi structure questionnaire) in order to gather information about their knowledge of plants used for the treatment of hypertension. A total of twenty-three (23) antihypertensive plants (*Zingiber officinale*, *Carica papaya*, *Lycopersicon esculentum*, *Anacardium occidentale*, *Annona senegalensis*, *Moringa oleifera*, *Newbouldia laevis*, *Vernonia amygdalina*, *Vitex doniana*, *Cymbopogon citratus*, *Terminalia catappa*, *Sesamum indicum*, *Hibiscus sabdariffa*, *Piliostigma reticulatum*, *Nelsonia canescens*, *Hibiscus cannabinus*, *Allium sativum*, *Aloe vera*, *Pavetta crassipes*, *Ocimum basilicum*, *Ocimum gratissimum*, *Persea americana* and *Eucalyptus globulus*) used for the treatment of hypertension were identified. The identified plant species belong to 21 families. Most of the ethnomedicinal plant parts used were leaves. It was concluded that herbal healers in Zango Kataf Local Government area of Kaduna State hold medicinal knowledge of plants used for the treatment of hypertension.

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### INTRODUCTION

Hypertension is a major cause of deaths and cardiovascular diseases worldwide especially in low- and middle-income Countries [1] like Nigeria. In Nigeria, the estimated prevalence of hypertension from a meta-analysis of cross sectional population and community-based studies published between 1980 and 2013, was found to be 28.9% (30.6% in

urban and 26.4% among rural dwellers) [2]. Studied conducted by Odili and colleagues shows that as of 2017, the prevalence of hypertension in Nigeria is 38.1%, (41.8% in women and 31.8% in men) [3]. These data show that the prevalence of hypertension in Nigeria is increasing. Therefore, the need to control hypertension becomes very imperative, as its

\*Corresponding author: ebadugupatrick@gmail.com; +234-8184890534

complications are also associated with high morbidity and mortality [4].

Among the various treatment options for hypertension are plants and herbal remedies. Plants and herbal medicines reflect one of the first attempts by man to improve human health and wellbeing. Identification of medicinal plants involve different approaches and processes, one of such methods used in the selection of plants for pharmacological screening is the ethnobotanical survey approach [5,6], which is based on traditional medical uses of a plant.

Literature search shows that there are no documented ethnobotanical data of plants used in the treatment of hypertension in Zango Kataf Local Government. Consequently, little is known about the medicinal practices of the indigenous people. More so, the number of young people with knowledge of antihypertensive herbs is low, whereas there is rapid decline in the number of older person (due to death) with herbal knowledge [7-9]. Hence, there is serious need to document information on medicinal plants used for the treatment of hypertension in the region to avoid the loss of valuable medicinal plants. Therefore, the present study aimed at documenting the plants and the plant parts used in the management of hypertension in Zango Kataf Local Government, Kaduna State.

## METHODS

### Study Design

A cross-sectional study was conducted by consulting with herbal healers in Zango Kataf, Kaduna State, Nigeria, between 2019 and 2020. Semi-structured interview was used to gather information on the herbs used to manage hypertension and the criteria used in prescribing a given herb. This interview was conducted via personal communication with traditional healers or persons with practical knowledge of herbal remedy for hypertension. Only willing respondents were interviewed. Throughout the interview, local plant names, useful plant parts, method of preparation, and route of administration, were recorded.

### Sampling Method

Herbal healers were identified through personal communication and recommendations from locals. Participants (herbal healers) were selected via purposeful sampling method.

### Ethical Clearance and Consideration

Institutional consent was acquired for all experimental procedures from the Ethics

Committee of the Department of Pharmacology, Faculty of Pharmaceutical Sciences, University of Jos ( F17-00379). Oral informed consent was sought from herbal healers, who were allowed to opt out of participating in the study at any point. Individuals that participated in the study were assured that their identity would be kept confident.

### Study Area

Zango Kataf has its headquarters in Zonkwa. The Local Government Area (LGA) is one of the councils that comprise the LGAs of Kaduna State, Nigeria. Zango Kataf, Kaduna State, Nigeria, lies between latitudes 9° 25 "N and 10° 20 "N and between longitudes 7° 45 "E and 8° 40 "E, with a total land area of approximately 5,625km<sup>2</sup>. The LGA is located within the tropical continental climate with two distinct seasons, wet and dry seasons. The vegetation type found in the study area is the Southern Guinea Savana type characterized by thick woodlands, tall grasses and herbs, with forests along streams and riverbanks. The town of Zango Kataf and its environs have an average annual temperature of approximately 24.8°C (76.6 °F), average yearly highs of approximately 28.6°C (83.5 °F) and lows of 18.8°C (65.8 °F), zero rainfalls at the end and beginning of the year, a yearly average precipitation of approximately 28.1mm (1.11 in), and an average humidity of 53.7%. The indigenous people of Zango Kataf include the Bajju, Atyap proper, Bakulu, Anghan and Atyecarak people [10].

### Plant Collection and Identification

The antihypertensive plants mentioned by herbal healers were collected at respective herbal homes within Zango Kataf Local Government of Kaduna State. The plants were authenticated by a taxonomist in the Department of Forestry and Wildlife, University of Agriculture, Markudi, Nigeria. Eventually, the names and family of each plant was confirmed online [11].

## RESULTS

Seventeen (17) out of the eighteen (18) herbal healers contacted participated in the study. Most of them were above 50 years (76.5%) and are mostly primary school graduates (58.8 %) (Table 1). When asked about the criteria for choice of herbal preparation 47 % of the herbal healers said they usually recommend the most effective plant, 29 % consider the most readily available plus most effective plants as bases for prescription, while 12 % use efficacy plus easy preparation and 12 % used availability, efficacy plus easy preparation as the

bases for prescription of a given herbal preparation (Table 2).

A total of twenty three (23) antihypertensive plants used by the people of Zango Kataf for the treatment of hypertension were identified. The plants include; *Zingiber officinale*, *Carica papaya*, *Lycopersicon esculentum*, *Piliostigma reticulatum*, *Anacardium occidentale*, *Annona senegalensis*, *Moringa oleifera*, *Newbouldia laevis*, *Vernonia amygdalina*, *Vitex doniana*, *Cymbopogon citratus*, *Terminalia catappa*,

*Sesamum indicum*, *Hibiscus sabdariffa*, *Piliostigma reticulatum*, *Nelsonia canescens*, *Hibiscus cannabinus*, *Allium sativum*, *Aloe vera*, *Pavetta crassipes*, *Ocimum basilicum*, *Ocimum gratissimum*, *Persea americana* and *Eucalyptus globulus*. The identified plant species belong to 21 families and most of the ethnomedicinal plant parts used were leaves (Table 3)

**Table 1. Age and educational qualification of herbal healers**

Question/Responses	Number of herbal practitioners that responded	% Response
<b>• Age of herbal healer</b>		
50 years and above	13	76.5
Below 50 years	4	23.5
<b>• Type of herbal healer</b>		
Herbalist	2	11.8
Inheritance	7	41.2
Practical Knowledge	8	47.1
<b>• Educational qualification</b>		
No formal education	2	11.8
Primary school Certificate	10	58.8
Secondary school certificate	3	17.7
Tertiary certificate	2	11.8

**Table 2. Criteria for prescription**

Question/Responses	Number of herbal Practitioners that Responded	% Response
<b>• What inform you choice of herbal preparation?</b>		
Availability only	0	0
Efficacy only	8	47
Ease of preparation only	0	0
Availability and efficacy	5	29
Availability and easy preparation	0	0
Efficacy and easy preparation	2	12
Availability, efficacy and easy preparation	2	12

**Table 3. Medicinal Plants used for the Treatment of hypertension in Zango Kataf Local Government, Kaduna State.**

Plants Name/ Family Name	Vernacular Name (Bajju)	Plant part used	Method of preparation	Route of administrati on
<i>Zingiber officinale</i> (Zingiberaceae)	Shita K <u>a</u> byan	Root Rhizomes	Hot tea or a decoction of the ginger & Hibiscus sabdariffa	Oral
<i>Carica papaya</i> (Caricaceae)	A <u>k</u> a nbvut	Unripe fruit or Leaves	Leaves sap or decoction or cool maceration	Oral
<i>Lycopersicon esculentum</i> (Solanaceae)	Atomato	Ripe tomato	Juice extract or cool macerate of powdered ripe tomato. Also add up in food after food is cooked (large quantity)	Oral.
<i>Piliostigma reticulatum</i> (Fabaceae)	Hwom	Leaves and top portion of the plant	Cool maceration	Oral drink
<i>Anacardium occidentale</i> (Anacardiaceae)	A <u>k</u> ashuu	Leaves or stem or nuts	Paste of grounded nut + honey + garlic + Moringa or leaves decoction or decoction of leaves + stem back	Oral by licking the grounded paste. Oral drink of decoction
<i>Annona senegalensis</i> (Annonaceae)	D <u>u</u> bvut	Leaves only or leaves + mature unripe fruit	Cool maceration or hot infusion	Oral drink
<i>Moringa Oleifera</i> (Moringaceae)	Jog <u>a</u> le	leaves	Cool maceration or infusion or powdered leaves on cooked food (sometimes mixed with garlic) or fresh leaves in food	Oral drink
<i>Newbouldia laevis</i> (Bignoniaceae)	A <u>d</u> uruku	Leaves with small portion of tip	Decoction	Oral
<i>Vernonia amygdalina</i> (Asteraceae)	D <u>u</u> tun	Leaves with young stem	Leaf sap or decoction Mostly mix with other herbs	Oral
<i>Vitex doniana</i> (Lamiaceae)	K <u>a</u> bvuu	young leaves	Decoction	Oral
<i>Nelsonia canescens</i> (Acanthaceae)	Dinurk	fruits + small portion of leaves	Decoction sometimes mix with honey. Also prepare with native corn drink	Oral
<i>Cymbopogon citratus</i> (Poaceae)	Asisat b <u>a</u> pyi	Whole grass	Hot tea or decoction mix with lemon juice	Oral drink
<i>Terminalia catappa</i> (Combretaceae)	K <u>a</u> kon Wwat Mnngwuuk	Leaves or mixture of leaves and stem back	Decoction	Oral
<i>Sesamum indicum</i> (Pedaliaceae)	A <u>j</u> ajju	seed	Seed oil. Use as cooking oil or add up in cooked meals. Mostly use as an add up therapy.	Oral

Table 3 contd.

Plants Name/ Family Name	Vernacular Name (Bajju)	Plant used	part	Method of preparation	Route of administrati on
<i>Hibiscus sabdariffa</i> (Malvaceae)	A_barbata	Mature calyx and corolla		Decoction, sometimes mix with honey. Or Decoction of calyx + ginger	Oral
<i>Hibiscus cannabinus</i> (Malvaceae)	Ra ma	leaves		Decoction, sometime mixed with honey	Oral
<i>Allium sativum</i> (Amaryllidaceae)	A_muii A_gu_rma	Bulb		Chewing of bulb or powdered bulb on food or as cool macerate. Mostly use as add up therapy with other herbs	Oral
<i>Aloe vera</i> (Asphodelaceae)	Aloe vera	Whole plant; stem and leaves		Plant sap. Mostly use as an add up therapy with other herbs	Oral
<i>Pavetta crassipes</i> (Rubiaceae)	Basoza	leaves		Decoction sometimes mix with honey. Or use decoction to prepare local corn drink	Oral
<i>Ocimum basilicum</i> (Lamiaceae)	Kpa_nsrong	Leaves or a combination of leaves+ seed+ flower		Hot tea / infusion . Mostly combine with other herbs	Oral
<i>Ocimum gratissimum</i> (Lamiaceae)	Ma_ngyang	leaves		Leaves sap or cool maceration. Mostly combine with other herbs	Oral
<i>Persea americana</i> (Lauraceae)	Pear	leaves		Decoction	Oral
<i>Eucalyptus globulus</i> (Myrtaceae)	A_jinging Ka kon	leaves		Decoction	Oral

## DISCUSSION

Nineteen (82.6 %) antihypertensive plant species reported in this survey have similar antihypertensive traditional use in the literature consulted. Ethnomedicinal uses of *Allium sativum*, *Moringa oleifera*, *Persea americana*, *Vernonia amygdalina* [12], *Anacardium occidentale*, *Zingiber officinale*, *Cymbopogon citratus*, , *Ocimum basilicum* [13], *Zingiber officinale*, *Hibiscus sabdariffa* [14], *Newbouldia laevis* [15], *Vitex doniana*, *Pavetta crassipes* [16], *Eucalyptus globulus* [17], *Annona senegalensis*, *Ocimum gratissimum*, *Carica papaya* [18], *Sesamum indicum*, *Lycopersicon esculentum*, *Aloe vera* [19] have been reported. However, there were no data on the folk use of *Piliostigma reticulatum*, *Nelsonia canescens*, *Terminalia catappa* and *Hibiscus cannabinus* in hypertension in the literature consulted. Mechanism of antihypertensive effect reported for the plants ranges from calcium channel blocking effect, angiotensin converting enzyme inhibition (ACEI), diuretic, antioxidant, antiproliferation of vascular

smooth muscle cells, increased nitric oxide bioavailability, and cardioprotective effects. Evidence has shown that *Zingiber officinale* lower blood pressure via blockade of voltage-dependent calcium channels [20] and by inhibition of ACE [21]. Methanolic extract of *Carica papaya* possessed angiotensin converting enzyme inhibitory effects and normalizes baroreflex sensitivity in spontaneously hypertensive rats [22]. Ethanolic root bark extract of *Carica papaya* decrease blood pressure in renal artery occluded hypertensive rats [23]. *Carica papaya* leaves decreases both systolic/ diastolic blood pressure and also decreased arterial stiffness in fructose induce hypertensive rats [24]. *Lycopersicon esculentum* fruit extract reduce blood pressure in sodium chloride induce hypertensive rats [25]. Hexane extract from the leaves of *Anacardium occidentale* decreased mean arterial pressure in spontaneously hypertensive rats, induced hypotension and bradycardia in normotensive rats [26]. *Anacardium occidentale* possesses antioxidant, cardioprotective effects and ACE inhibition activity

[27, 28]. Several researches shows that extracts from the calyx of *Hibiscus sabdariffa* reduces both systolic and diastolic pressure via vasodilatation and diuretic activity [29-32]. *Hibiscus sabdariffa* also inhibits ACE, increases nitric oxide production and blocks calcium channels [33-35].

Sesame oil and sesamin capsules were found to reduce both systolic and diastolic blood pressure in mild to moderate hypertensive patient [36-39]. *Terminalia catappa* leaf and stem bark inhibits ACE activity [40]. *Cymbopogon citratus* has been shown to be effective in the treatment of hypertension [41]. Methanolic extracts of leaves, stems, and roots of *Cymbopogon citratus* relaxes vascular smooth muscle on rat aortic ring precontracted with phenylephrine [42]. Additionally, a weak/moderate diuretic activity of *Cymbopogon citratus* has also been reported in animals and humans [43]. Oral and intravenous administration of the seed extract of *Vitex doniana* produced a dose-dependent hypotensive effect in both normotensive and hypertensive rats [44]. Administration of the stem bark extract of *Vitex doniana* produced a dose-dependent hypotensive effect in both normotensive and hypertensive rats [45]. Aqueous leaves extracts of *Vernonia amygdalina* produced a significant reduction in mean arterial pressure in normotensive rats [46]. Ethanol leaf extract of *Vernonia amygdalina* produced a vasorelaxant effect in rats aortic ring preparation [47]. The vasorelaxation produce by the ethanol leaf extract of *Vernonia amygdalina* involves upregulation of NO/cGMP and PGI<sub>2</sub> signaling pathways, and modulation of calcium/potassium channels, and muscarinic and  $\beta_2$ -adrenergic receptor [48].

Methanol leaf extract of *Newbouldia laevis* reduces blood pressure in cats [49]. Crude ethanolic leaf extracts of *Moringa oleifera* reduce the blood pressure in epinephrine treated Sprague-Dawley rats [50]. The leaf, seed, and root extracts of *M.oleifera* produces hypotensive activity in spontaneous hypertensive rat [51,52]. Administration of *Aloe vera* gel in cadmium-induced hypertension rats significantly lowered blood pressure [53]. *Aloe vera* also shows cardioprotective effect and ACE inhibition activity [54-56]. The ethanolic extract of *Pavetta crassipes* produces a dose dependent hypotensive effect in cats and rats [57]. Dried bulb powder tablet of *Allium sativum* reduces blood pressure in stage 1 hypertensive patients [58]. *Allium sativum* possess angiotensin II inhibiting and vasodilating effect [58-61]. *Allium sativum* also decreased proliferation of vascular smooth muscle cells, increased nitric oxide bioavailability, increased production of hydrogen

sulfide and have vasorelaxant activity [62,63]. *Ocimum basilicum* reduces blood pressure and cardiac hypertrophy in two-kidney one-clip (2K1C) Goldblatt rats' model of renovascular hypertension [64]. *Ocimum gratissimum* possesses antihypertensive and cardioprotective effect [65]. *Ocimum gratissimum* extract inhibits ACE both in vitro and in spontaneous hypertensive rats [66]. Aqueous seed extract (AE) of *Persea americana* significantly reduces blood pressure and heart rate in normotensive rats [67]. Aqueous leaf extract of *Persea americana* relaxes rat aorta [68]. The leaf extract of *Persea americana* produce hypotension in normotensive rats [69]. Aqueous leaf extract of *Persea americana* produces ACE inhibition effect [70]. The leaves extract of *Eucalyptus globulus* reduced blood pressure in L-NAME-induced hypertensive rats [71].

More studies on efficacy and safety of the plants identified are needed in order to provide more proof of efficacy, safety and to achieve dose standardization. Information gathered in this study will help document plants used in the management of hypertension in the area. Also, the plants identified can be a source of new lead compound for a new antihypertensive agent.

## CONCLUSION

Herbal healers in Zango Kataf local Government area of Kaduna state hold medicinal knowledge of plants used for the treatment of hypertension.

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