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Ethnobotanical Survey of Medicinal Plants Used in Managing Hypertension in Warri South LGA, Delta State, Nigeria

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Abstract
Cardiovascular disease, cataract, chronic kidney disease, heart failure and many other complications resulted from the effect of hypertension. Several communities especially the low-income earner rely more on traditional medicine because they are affordable and easily accessible. However, interest on medicinal plants is dwindling due to lack of knowledge on their usefulness. This study therefore was carried out to document the medicinal plants used in the management of hypertension in Warri South Local Government Area of Delta State. Semi-structured questionnaires were used to collect from 150 respondents among which are Herb Sellers and Herbal Practitioners. Twenty (20) plant species belonging to 17 families were identified for the management of hypertension with Persea americana being the highest mentioned plant having a relative frequency of citation of 0.33, followed by Allium sativum (0.29) and Vernonia amygdalina (0.22). Liliaceae, Zingiberaceae and Myrtaceae were the families with the highest number of plant species. The results obtained also showed that the leaves part of plant were the most frequently used while the decoction as a method of preparation had the highest percentage application in the management of hypertension. In conclusion, the role of different plants parts in the management of hypertension is vital to healthcare delivery. Hence, scientific validations and sustainable use of these plants are recommended so as to ensure their availability in the nearest future.

Keywords: Ethnobotanical survey, Hypertension Management, Medicinal plants, Herb Sellers, Herbal Practitioners.

Introduction

Hypertension commonly referred to as high blood pressure is a health challenge affects systolic and diastolic pressures of the heart when it reads over 120/80mmHg (Atawodi et al., 2014; Eghianruwa et al., 2016). This health challenge arises when the pressure of blood in the arteries is continually increases. It leads to complication in humans' health in areas related cardiovascular system resulting to diseases such as heart failure, stroke, myocardial infarction, peripheral arterial and chronic kidney disease (Mensah et al., 2009; Lagnika et al, 2016).

Recently, hypertension, though not a communicable disease has affected over 20% of the world's adult population (Osamor & Owumi, 2010). This condition has the ability to destroy vessels that supply blood to the heart, kidneys, brain and eyes. This chronic disease cannot be cured but can be managed throughout life and requires permanent monitoring to avoid complication. The disease may sometimes not show symptoms but have different causes. Hence it is referred to as a "silent killer" mainly due to the fact that over 30% of the people that suffer from it do not realize it. In many African countries, the total number of adults with hypertension has been estimated to be over 40% (Lagnika et al., 2016). In addition, there were epidemiological projections that in 2025, 29.5% of adults worldwide will be afflicted with hypertension. Dizziness, nausea, stomach problems, impotence, fatigue, insomnia, loss of appetite and many others are some associated side effects with anti-hypertensive synthetic drugs. Most of these drugs expose affected persons to the risk of developing new diseases which worsen their health status. This has led many scientific studies to suggest different life style and use of appropriate herbal medicines in treating high blood pressure.

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The role of traditional medicines in treating different health challenges cannot be over emphasized. Application of medicinal plant is an integral part of African traditional medicine. These medicinal plants used contain thousands of chemicals which are used for therapeutic purposes and drug production. The reliance on medicinal plants is currently gaining prominence as the medical world is moving towards the application of organic compounds in disease avoidance and cure. Also, its easy availability, low cost than novel pharmaceuticals, medicinal activities and safe margins enhanced its usage.

Although various plants are been used in African traditional medicine, yet their active ingredient/constituents have limited information. Information on medicinal plants is gotten from ethnobotanical surveys. Ethnobotanical surveys are participatory approach where different ethnic groups contribute their knowledge on the uses of plants within their environment. It involves the identification, utilization, documentation and conservation of medicinal plants. Over time, "quack" medical knowledge passed down by primitive people has become sources of information useful for scientific research. It is therefore safe to say that there are strong relationships between science and tradition. Due to the high prevalence of hypertension, there is need for new effective natural remedies; this study will provide information on medicinal plant used in the management of hypertension in Warri South Local Government Area, Delta State.

Materials and Methods

Study Area

The study was carried out across some major markets within the study area including Igbudu market, Warri main market, Okere market, Ogbe-ijoh market, Ugbuwangue market and Mclver market in Warri South Local Government Area, Delta State. Warri is geographically located in longitude $5^0$3N and latitude $5^0$45'E with an area of 633km^2.

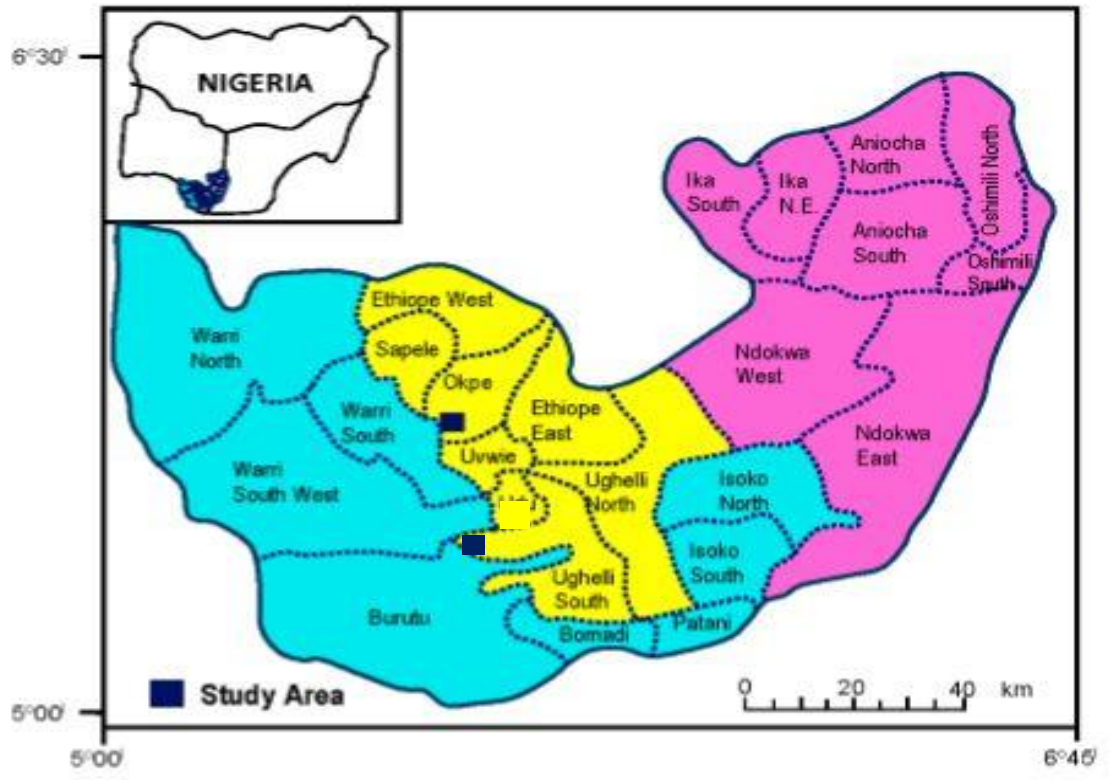

Figure 1: Map Showing Warri South Local Government Area

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Data Collection

Semi-structured questionnaires were administered to respondents. However, the consent of respondents was sought before each interview and the aims of the study made known to them. Respondents were randomly selected among knowledgeable herb sellers and herbal practitioners. The questionnaires were administered to randomly selected informants. Information gathered during the survey were related to medicinal plants used in the management of hypertension and their specific functions, the plant parts used, mode of preparation and how they are administered.

Plant Identification

Identified plants were authenticated by Dr. Nodza George, a taxonomist at the Department of Botany, University of Lagos and voucher numbers were given byb Lagos University Herbarium (LUH).

Data Analysis

Collected data were analyzed using the method of Iyamah and Idu, (2015). The method involves the Relative frequency of citation (RFC) which signifies the local importance of each species in a study area. Relative frequency of citation (RFC) is determined by dividing the number of respondents citing a useful species (FC) by total number of respondents in the survey (N). Relative frequency of citation is calculated by the formula as described,

$$RFC = \frac{FC}{N}$$

Results

Demographic Features of Respondents

The documentation carried out on the basis of information collected from knowledgeable herb sellers and herbal practitioners in the markets. One hundred and fifty (150) respondents were censured which consisted of females (70%) and males (30%). Majority of them were herbal practitioners (63.3%), followed by herb sellers (36.7%). Table 1 below presents the Demographic status of informants.

Table 1: Demographic representation of respondents

S/N	GENDER	TOTAL	PERCENTAGE%
1.	Male	45	30
2.	Female	105	70
	AGE GROUP		
3.	30-50	70	46.7
4.	50-70	80	53.3
	PRACTICE SPECIFICATION		
5.	Herb sellers	55	36.7
6.	Herbal practitioners	95	63.3

Medicinal Plants Used for the Management of Hypertension

A total of 20 plant species from different families were administered for the management of hypertension. Plants information documented were botanical name, common name, family name, mode of administration, RFC are given in Table 2. Medicinal plants belonging to Seventeen (17) plant families were recorded in this study.

Quantitative Data Analysis

The Relative frequency of citation of the different plant species ranges from 0.01 to 0.33.*Persea americana* has the highest RFC value 0.33, *Allium sativum* was followed RFC value 0.29, *Vernonia amygdalina* (0.22) and lowest value was observed for *Phoradendron leucarpum, Curcuma longa* and *Syzygium aromaticum* (0.01) (Table 1).

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Table 2: Medicinal plants reported

S/N	Common Name	Botanical Name	Local Name	Family	Parts Used	Method of Preparation	Mode/Route of Administration	Frequency of Citation	Relative Frequency of Citation (RFC)
1.	Pear	*Persea americana Mill* LUH: 9957	Ewe-pia (Y), Ube-oyibo (I)	Lauraceae	Seed, Leaf	Powder/ Decoction	Oral	50	0.33
2.	Garlic	*Allium sativum L.* LUH: 9958	Ayuu (I), Ayo (Y)	Liliaceae	Bulb	Paste/Decoction	Oral	44	0.29
3.	Bitter leaf	*Veronia amygdalina* Delile LUH: 9959.	Ewuro (Y) Onugbu (I) Kirologbo (Ij)	Asteraceae	Leaf	Juice	Oral	33	0.22
4.	Zobo	*Hibiscus sabdariffa* l. LUH: 9960	Zobo (H)	Malvaceae	Leaf	Decoction	Oral	20	0.13
5.	Paw-paw	*Carica papaya* L. LUH:9961	Edemede (Ij) Ibepe (Y)	Caricaceae	Seed, leaf	Paste/crushing	Oral	20	0.13
6.	Ginger	*Zingiber officinale* Rosc. LUH: 9962	Jinja (I)	Zingiberaceae	Rhizome	Decoction	Oral	18	0.12
7.	Neem	*Azadirachta indica* A.Juss LUH:9963	Dongoyaro (H)	Meliaceae	Leaf	Infusion	Oral	16	0.11
8.	Wonderful kola	*Buchholzia coriacea* Engl LUH:9964	Uworo (Y), Uke (I)	Capparidaceae	Fruit	Decoction	Oral	16	0.11
9.	Lemon	*Citrus limon* (L) Burn F. LUH: 9965	Osan-ijaganin (Y)	Rutaceae	Rinds/ Skin	Decoction	Oral	15	0.1
10.	Onion	*Allium cepa* L. LUH: 9966	Alubosa (Y), Otita (Ij) Utita (U)	Liliaceae	Bulb	Crushing	Oral	15	0.1
11.	Moringa	*Moringa oleifera* Lam LUH: 9967	Moringa	Moringaceae	Leaf	Infusion/Decoction	Oral	15	0.1
12.	Resurrection plant	*Bryophyllumpinnatum* (Lam.) Oken LUH: 9976	Ebiokpakpa (U) Abamoda (Y)	Crassulaceae	Leaf	Juice	Oral	10	0.07
13	Scent Leaf	*Ocimum gratissimum*L. LUH: 9968	Efinrin (Y)	Lamiaceae	Leaves	Decoction	Oral	10	0.07
14.	Guava	*Psidium guajava* L. LUH: 9969	Guava	Myrtaceae	Fruit, Leaf, root	Decoction	Oral	10	0.07
15.	Mango	*Mangifera indica* L. LUH: 9970	Mangoro (U)	Anacardiaceae	Leaf	Decoction	Oral	10	0.07
16.	Locust bean	*Parkia biglobosa*Jacq. LUH: 9971	Dawadawa (H) Iru (Y)	Fabaceae	Seed	Crushing	Oral	10	0.07
17.	Soursop	*Annona muricata* L. LUH: 9972	Ebo or Akpekan (Y), Ogbaka nti (I), Fasadaruri (H)	Annonaceae	Leaf	Decoction	Oral	5	0.03
18.	Mistletoe	*Phoradendron leucarpum*(Raf.)Revea l&M.C.Johnst. LUH: 9973		Visaceae	Fruit	Decoction	Oral	2	0.01
19.	Tumeric	*Curcuma longa* L. LUH: 9974	Mkpiri or Mbugbo (I), Atale pupa (Y)	Zingiberaceae	Root	Decoction	Oral	1	0.01
20.	Clove	*Syzgium aromaticum* L. LUH: 9975	Nchuawun (I), Kanafuru (Y), Daidoya (H)	Myrtaceae	Flower	Decoction	Oral	1	0.01

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Language Key: Ijaw (Ij), Yoruba (Y), Igbo (I) Urhobo (U), Hausa (H).

Family Frequency

Among the 17 families encountered in this study, Liliaceae, Zingiberaceae and Myrtaceae were observed to be predominant families with 2 species each while the other families had one species each (Figure 2).

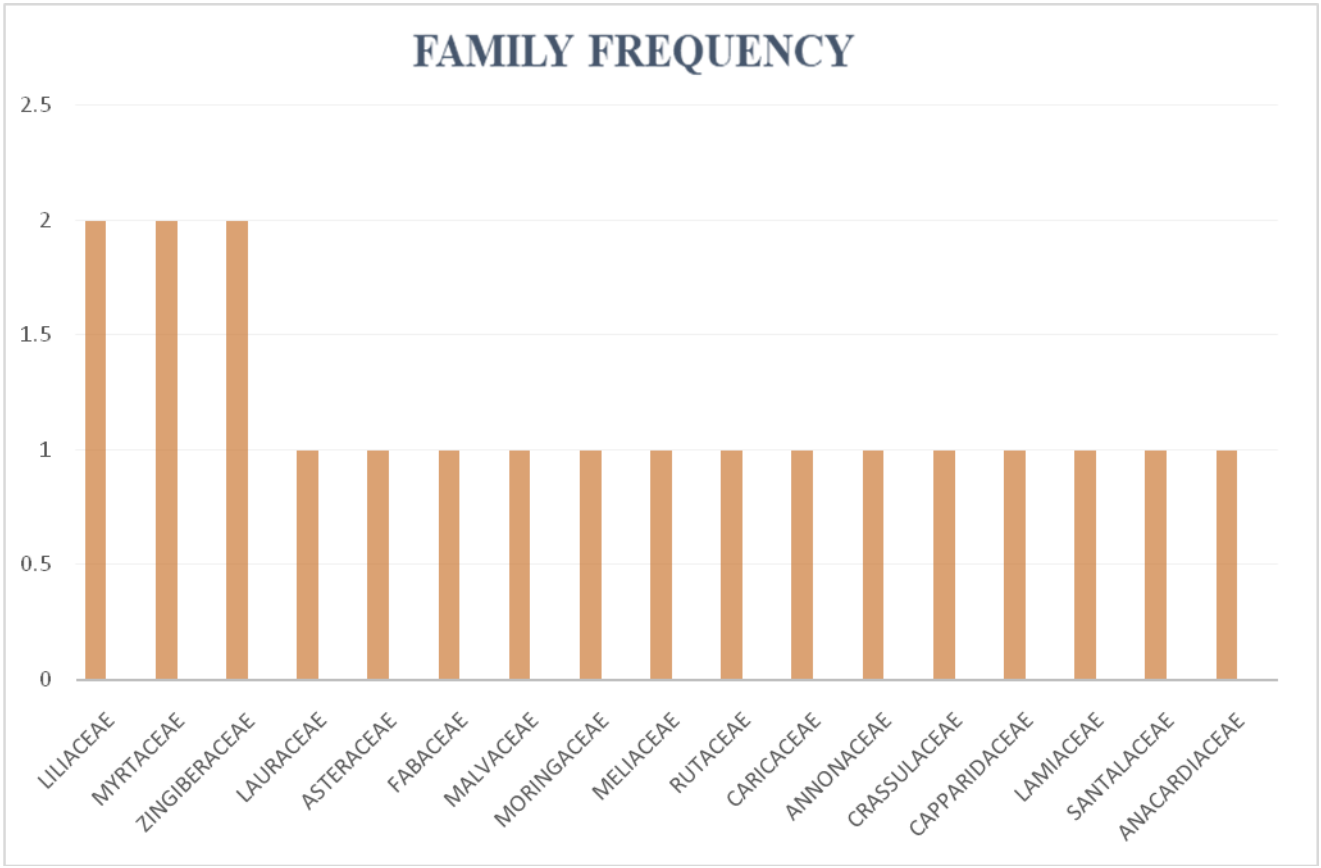

Figure 2: Family Frequency

Parts of Plant Used

Different parts of plant were used in the preparation of herbal recipes including seeds, leaves, fruits, bulbs, roots, rhizomes, rind\fruit skin and flower. The leaves was the most frequently used part (44%), followed by seeds (12%), bulb, rind\ fruit skin and root (8%), Rhizome and flower (4%) (Figure 3).

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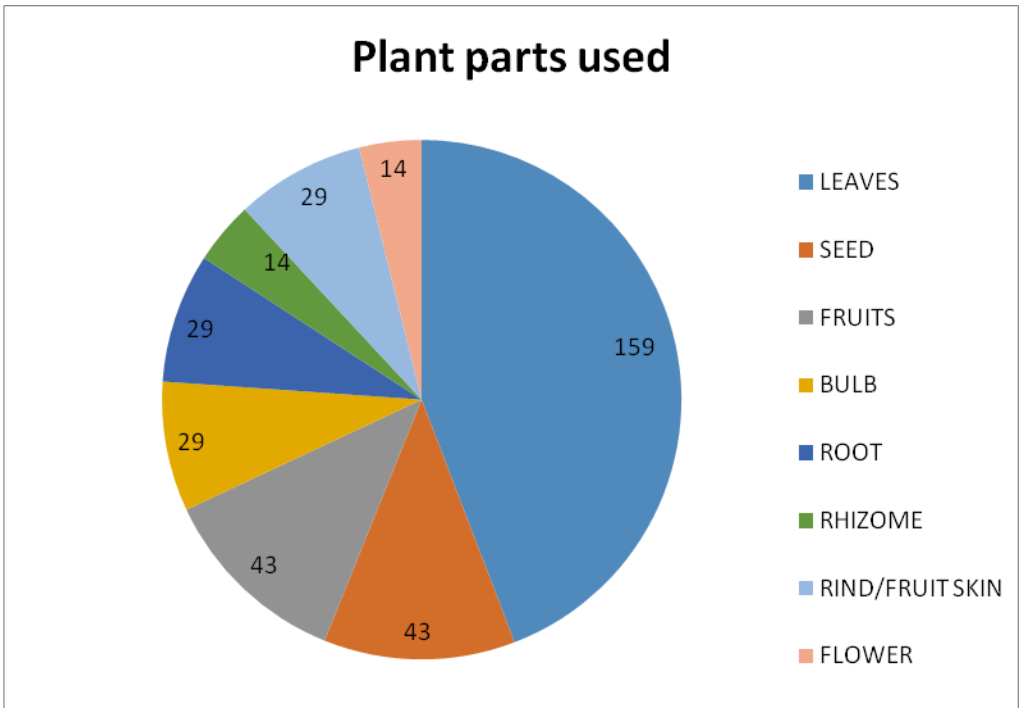

Figure 3: Parts of Plant Used

Preparation Method

Preparation methods used by respondents include decoction, infusion, juice, powder, paste and crushing (figure 4). The most frequently recorded method of preparation was decoction (12 species), followed by infusion (6 species), crushing (3 species), juice & paste (2 species) and powder (1 species) (Figure 4). Infusions method involve soaking a plant in water for more than an hour at room temperature, while decoctions involve boiling the plant part in water until the water volume is reduced to half of its original volume. Juice is simply by extracting and grinding the fresh part of plants and then mixed in any liquid. Paste involve grinding. Medicines were taken along with like milk, honey, oil etc. The plants obtained were used for the preparation of various recipes presented on Table 3.

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S/N	Common Name	Recipe
1.	Avocado Pear	The dry seed is grinded into powder and then mixed with ginger and peak milk. Grind the leaves and boil in water. Cut the seed into pieces air dry and then grind and mix with pap or honey.
2.	Wonderful kola	Cut into pieces and soak in water for a day.
3.	Garlic	Chew or pound in mortar, if pounded, boil with water and drink the extract. The bulb is eaten with food.
4.	Bitter leaf	Wash the leaf with water drink one glass daily. Leaf is also used in preparing food. Boil the leaves together with scent leaf, ginger and garlic,drink when its warm.
5.	Locust bean	Roasted seed with 1-2 spoonfuls of crushed seed to 1 tea cup of boiled water.
6.	Zobo	Leaf is used as soup. Boil the leaves and drink the extract. Leaf is boiled with ginger, dry pepper, cloves, bark of pineapple and lime.
7.	Moringa	Leaf is dried and prepared as tea or leaf is boiled with onion and oil. Boil the leaves of moringa with the flowers of mistletoe, drink the extract
8.	Ginger	The rhizome is chewed.
9.	Neem	Soak the leaf in water for a day then drink the extract.
10.	Lemon	Two handful of peels with banana leave and boiled in water.
11.	Resurrection plant	Leaf is washed and mixed with onion.
12.	Paw-paw	The seed is blended with honey and taken on empty stomach. Leaf is crushed with little water and native chalk is added to it.
13.	Onion	Bulb is crushed in water for a day, filtered with clean water, and drank before food.
14.	Guava	Use one handful of fruit, leaves and root, boil in water till it changes it colour.
15.	Mango	Boil the leaf in water and drink the extract.
16.	Scent leaf	Soak the leaf in water for a day and drink the extract
17.	Cloves	Boil the flowers of mistletoe with the leaves of moringa, drink the extract
18.	Mistletoe	Same preparation with moringa
19.	Tumeric	Boil the roots together with the fruit of clove, the bulb of garlic and the flowers of mistletoe, drink extract. Pound and soak the leaves for three days, filter and drink extract.
20.	Soursop	Boil the leaves together with the seeds of pear, drink extract with honey.

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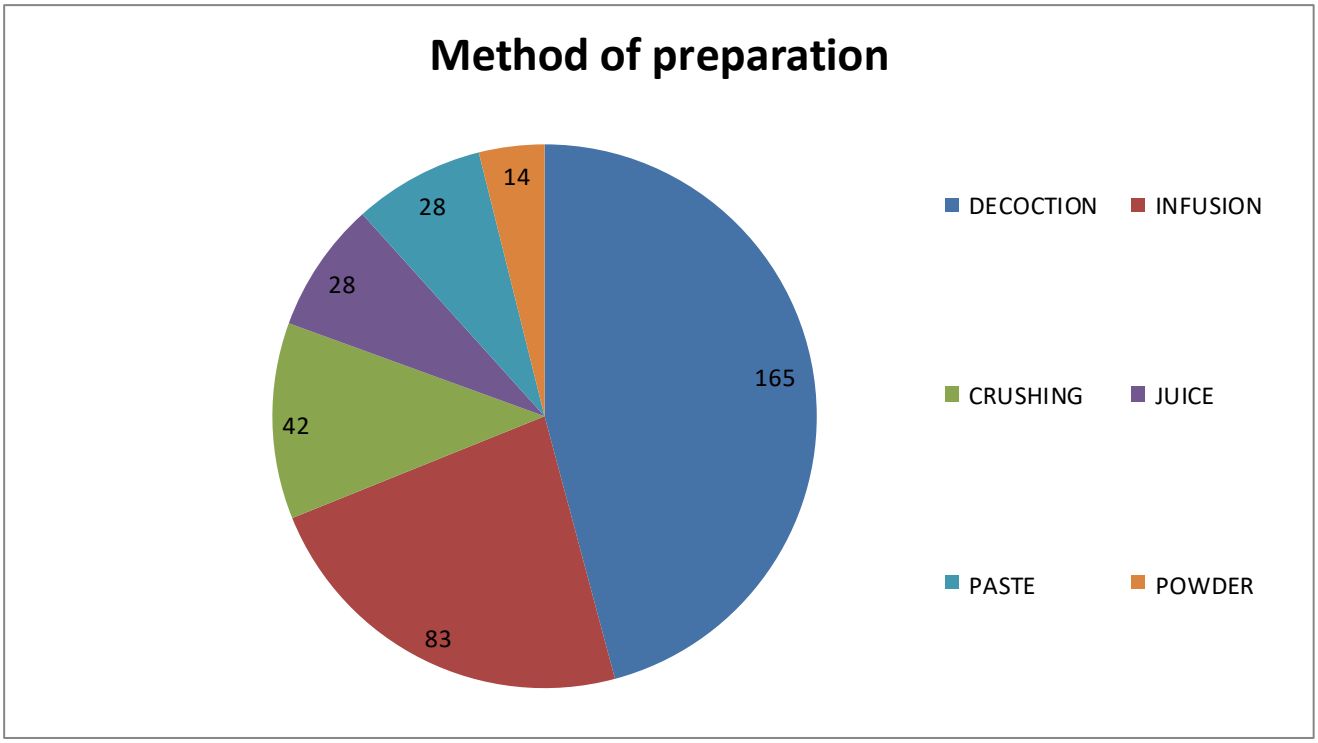

Figure 4: Method of Preparation

Common recipes for the management of hypertension

Table 3 below show some common recipes used in the management of hypertension in Warri South Local Government Area of Delta State.

Table 3: Some common recipes used in the management and treatment of hypertension in Warri South Local Government Area of Delta State.

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S/N	Common Names	Phytochemical Constituents	Pharmacological Activity	References
1.	Avocado Pear	Fructose, phenolic acid, sorbitol, ascorbic acid, glucose, sucrose, triterpenes.	Anti-malarial, anti-diabetic, anti-leishamemal, anti-fertility, hypotensive, vasodilatory, hypoglycemic	Holly and Joanne, 2015,
2.	Wonderful kola	Saponins, Flavonoids, carbohydrates, alkaloids, tannins.	Anti-microbial, anti-helminthic, anti-bacterial, hypoglycemic, anti-oxidant.	Nwankwo et al., 2018
3.	Garlic	Flavonoids, saponin, glycoside, alkaloids.	Anti-bacteria, anti-virus, anti-inflammatory.	Garba *et al.*, 2013
4.	Bitterleaf	Tannins, glycosides, alkaloids, saponins, flavonoids, anthraquinones.	Anti-oxidant, anti-diabetic, anti-inflammatory, anti-cancer, anti-malaria.	Odukoya "et al"., 2019
5.	Locust beans	Phenolics, saponins, flavonoids.	Anti-oxidant, antibacterial, anti-malaria.	Komolafe "et al".,2017
6.	Zobo	Saponins, tannins, glycosides, phenols, alkaloids, flavonoids.	Anti-bacterial,anti-oxidant,nephro and hepato-protective, renal\ diuretic effect, anti-diabetic and anti-hypertensive.	Oluwanyi and Bazambo, 2014
7.	Moringa	Glycosides, alkaloids, glucosinolates, flavonoids, phenolic acids, carotenoids, tocophenols.	Anti-malarial, anti-leishmemal, anti- fertility, hypotensive, anti- hypertensive, vasodilatory, hypoglycemic, anti- diabetic.	Saini et al., 2016
8.	Ginger	Gingerol, shogaol, paradol, zingerone	Anti-helmitic, antipyretic, anticancer, anticoagulant,anti-inflammatory, anti-conceptive, anti- oxidant, cardiovascular, gastrointestinal, antimicrobial.	Mishra et al., 2012
9.	Neem	Azadirachtin, nimbidin, nimbin, nimbinene, limonoids, nimbolide	Anti-fungal, anti-bacterial, anti-inflammatory, anti-viral, analgesic.	Alzohairy, 2016
10.	Lemon	Flavonoids, citric acid, ascorbic acid.	Anti-oxidant, anti-inflammatory, anti-allergic, anti-viral,anti-proliferative, anti-mutugenic, anticancer	Makni, 2018
11.	Resurrection plant	Alkaloids, flavonoids, glycosides, steroids.	Anti-fungal, anti- bacteria, anti-inflammatory.	Nwali et al., 2012
12.	Pawpaw	Papain	Anti-bacterial, anti-viral,anti-fungal, anti-oxidant.	Bako and Jonah, 2016
13.	Onion	Phenolic acid, thiosulfinates, flavonoids.	Antibacterial, anti-fungal, anti-viral, anti-protozoal, anthelmetics , anti- cancer.	Marrelli, 2019
14.	Guava	Phenolics, terpenes, caryophyllene oxide, quercetin, ethyl acetate.	Antioxidant, hepatoprotective, anti-allergic, anti-cancer, cardioprotective, antidote, antinociceptive.	Bako and Jonah, 2016
15.	Mango	Mangiferin, gallic acids, gallotannins, quercetin, isoquercetin, ellagic acid.	Anti- cancer, anti- inflammatory, anti-diabetic, antioxidant, antibacterial, anti-fungal, anti-helmintic, gastroprotective, hepatoprotective, immunomodulatory.	Parvez, 2016,
16.	Scent leaf	Flavonoids, glycosides, alkaloids, anthraquinones, phenols, saponnin, steroids and tannins.	Anti- bacterial, anti-convulsant, anxiolytic, anti-inflammatory, antinociceptive.	Obho, 2006
17.	Cloves	Monoterpenes, sesquiterpees, Phenolics and hydrocarbon.	Antimicrobial, anti-inflammatory anesthetic, analgesic, antioxidant and anticancer, aphrodisiac	Mittal, 2014
18.	Soursop	Alkaloids, flavonoids phenols, acetogenins.	Anxiolytic, anti-stress, anti-inflammatory, contraceptive, antitumeral, antiulceric, wound healing, hepato-protective, and hypoglycemic.	Onuah "et al"., 2019
19.	Turmeric	Curcumin, diarylheptanoids	Anti-inflammatory, antioxidant, antimutagenic, antidiabetics, antibacterial, hepatoprotective, expectorant and anticancer.	Chanda and Ramachandra, 2015
20.	Mistletoe	Allkaloids, viscotoxins, phenylpropanoids, tannins, lignins	Hypotensive, hypoglycemic, antilipidemic, anti-oxidative, anti-inflammatory, antimicrobial.	Ogunmefien, 2013,

Discussion

The result from this study revealed that the 30% of the respondents were males while 70% were females indicating that the females are more than the males in the sales of traditional medicine in this region and are more willing to share their knowledge than the males. In addition, it was shown that most of the local respondents belong to the age range of 50 – 70 years had more knowledge and interest in traditional medicine practice. This further reveals that the knowledge of traditional medicine is rapidly declining among the present generation as a result of modernization and civilization (Cox, 2005). The low number of herbs sellers (33.7) also indicates that most of the target respondents were unwilling to share their knowledge due to fear of losing their major sources of their income. The investigated area revealed 20 medicinal plant species use for the management of hypertension. This result shows that

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despite the modernization of this area, this indigenous knowledge is still prevalent. The reason behind this could be due to the side effect of synthetic drugs and its cost.

The most dominant families reported having the highest number of medicinal plants was Liliaceae, Zingiberaceae and Myrtaceae. The usage of these plants may be because of the effective bioactive chemicals contained in them such as gallicin in the Liliaceae and sesquitepenes in Myrtaceae. This result is in line with results from previous studies (Rahman & Zaman, 2015; Lim, 2016; Jin et al.,2018). The plant species with the highest RFC values were the *Persea americana* (0.33) followed by *Allium sativum* (0.29), *Vernonia amygdalina* (022). Relative Frequency of Citation (RFC) refers to the importance of each local plant species with reference to informants who cited the species (Vitalini et al., 2013). The possible reason for high RFC values may be attributed to availability of species and high medicinal properties for treating various ailments which agrees with the results of Ajibesinet al.,(2008) and Lagnikaet al.,(2016).

The leaves were the major parts used as revealed in this study. It is believed that leaves were preferably used in the treatment of ailments due to availability significant amount of bioactive compounds present. This finding agrees with report from previous literature (Mahishi et al.,2005; Abo et al., 2008; Shil et al., 2014). Decoction was the most common method of preparation in the present study which is also in accordance with the studies of Nadenbega et al.,(2011) and Reheiho et al., (2011). The high usage of decoctions may be influenced by the oral route of medicine administration. Since herbal medicines are mostly bitter in taste, they are usually prepared by mixing with sugar and honey in order to enhance their taste and make them more appealing.

Phytochemical analysis of some plants identified in his study including *Allium sativum*, *Allium cepa*, *Ocimum gratissimum*, *Persea americana*, *Carica papaya* as reported in previous studies revealed the presence of tannins, cardiac glycosides, flavonoids, terpenoids and alkaloids which have been found to be efficacious in the management of hypertension and also in providing protection for the heart Mensha et al., (2009). However, the exact mechanisms responsible for the anti-hypertensive effect of medicinal plants are yet unknown. Although, several findings suggest that increased oxidative stress potentially contributes to the elevation of blood pressure level. Hence antioxidant activity a major biological effects of medicinal plants could be responsible for its antihypertensive effects which can attributed to the presence of secondary metabolites, especially phenolic compounds such as flavonoids, tannins, quinines and curcuminoids.

Conclusion

The present study documented various medicinal plants use in the management of hypertension in the study area. The pharmacological and phytochemical reviews obtained showed that these plants have various phytochemicals and possess anti-hypertensive activities.

Recommendation

Sustainable use of these plants is recommended so as to conserve them for future use.

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