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Ethno-Medicinal Plants' Survey for The Management of Heart Disease in Ago-Iwoye, Ogun State, Nigeria

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Abstract

This study was designed to investigate medicinal plants (MPs) traditionally used for managing heart disease (HD) in Ago-Iwoye, Ogun State, Nigeria. A semi-structured questionnaire was designed to collect demographic data, local names of plants, morphological parts of plants, modes of preparation, administration routes, and recommended dosages. Seventy (70) respondents (23 males and 47 females) comprised of herbalists, herb retailers and herb hawkers were enrolled for the study. Collected plant samples (20) were taxonomically identified. The results showed relative frequency citation (RFC) values of *Zingiber officinal*e (1.00), *Viscum album* (1.00), *Coffea arabica* (0.93), *Citrus aurantifolia*, *Bryophyllum pinnatum* and *Carica papaiya* (0.86) as the most frequently used, whereas *Hannoa undulata* (0.21), *Gossypium arboreum* (0.43), *Citrullus colocynthis* and *Vitis vinifera* (0.50) were the least reported. Boiling was the most employed mode of preparation, and plants/herbs were mostly administered orally daily. Also, about 61% of female respondents patronized them more for herbs than males (39%). There is a need to further investigate the efficacy, safety, and pharmacology of bioactive components of these indigenous medicinal plants in managing heart disease in order to provide scientific basis for their consumption for the protection of public health.

KEYWORDS: Ethnobotanicals, Heart Disease, Medicinal Plants, *Zingiber officinal*e, *Viscum album,*

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INTRODUCTION

Heart disease is a cardiovascular disease (CVD) that affects all genders, all races and all ethnic groups in high-income and low-to middle-income countries without leaving Nigeria out (Al-Snafi, 2017). Studies have shown that there is a persistence increase in the prevalence of CVD risk factors and deaths in South-West Nigeria (Dele-Ojo *et al*., 2021; Odunaiya *et al*., 2021), possibly due to unhealthy behavioural risk factors such as lack of good diets and physical exercises (Nwafor *et al.*, 2024). Although, Ike and Onyema (2020) had previously associated the increase of CVD with the high cost of treatment, poor funding, and poor support of cardiovascular healthcare delivery services. Despite the scientific advances in the management of CVD and the availability of medications in healthcare systems, some Nigerians still strongly depend on the use of herbs for the management of CVD. The use of herbs in traditional medicine has contributed significantly to the prevention, treatment, and management of many diseases, including CVDs, and it has formed an integral part of drug discovery and development in modern ethnomedicine (Newman and Cragg, 2020). Plants, as a source of complementary and alternative medicine, are gaining both international and local attention because of their accessibility, affordability, availability in local communities, ease of administration and shorter duration of treatment (Yahaya *et al*., 2019).

The potential of African flora as a heritage source of phytomedicines and other therapeutics for various diseases and infections has been documented several times (Salisu *et al*., 2019; Troost *et al*., 2020). However, there is a dearth of information on Nigerian medicinal plants used to manage heart disease in the literature. The present survey was carried out to search and document plant used to manage CVDs by traditional medicinal practitioners in Ago-Iwoye, Ogun State, Nigeria.

MATERIALS AND METHODS

Study location

The survey was carried out in Ago-Iwoye city, Ijebu-North Local Government Area, Ogun State, Southwest, Nigeria. The Yoruba ethnic group are the main tribe settling in the area. customarily populated by the Ijebu indigenes. It lies within Latitude 6.942359° North and Longitude 3.921554° East in the Greenwich meridian (Figure 1) with temperature around 35°C during the dry season (October/ November till March/April of every year). The rainy season is usually from March/April to October/November. The inhabitants of Ago-Iwoye are mostly farmers, traditional medicinal practitioners, herb sellers and local traders.

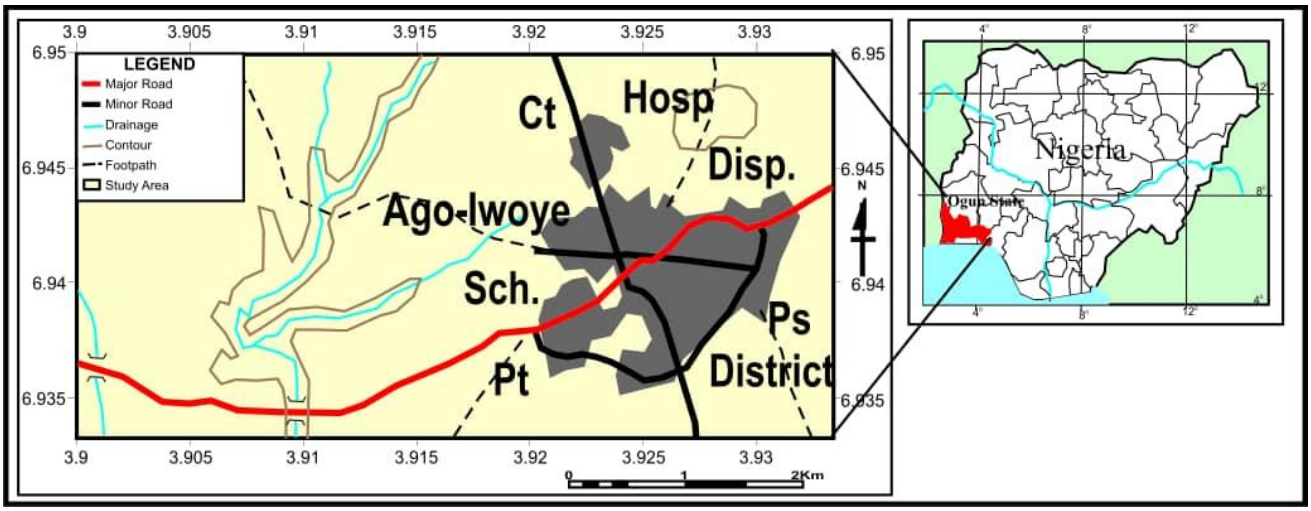

Figure 1. Map of Ago-Iwoye with Locations of Plants' Collection and Survey.

Informed consent

Verbal informed consent was obtained from all the willing respondents comprised traditional medicine practitioners (TMPs), herb hawkers and retailers prior administering of the questionnaires.

Questionnaire administration

Designed semi-structured questionnaires were administered to the respondents who are traditional medicine practitioners (TMPs), medicinal plant hawkers (MPH), medicinal plant retailers (MPR), and elderly people (herbalists) in their workplaces and homes. The local names of MPs, plants' parts, availability, source of knowledge, years of experience, level of education, preparation, recommended doses, administration, most treated gender, side effects, frequency of treatment, and duration were all collected.

Plants' collection and systematic identification

Samples of plants used for managing heart disease were collected from respondents and identified by a taxonomist, at the Department of Botany, University of Lagos, Akoka-Yaba, Nigeria. The voucher specimens' numbers (VSN) for the identified plant species were also deposited for the public to access in the herbarium of the same University.

Relative frequency citation (RFC) index

The local significance of each medicinal plant species in Ago-Iwoye was determined by the relative frequency citation (RFC) index (Iyamah and Idu 2015) using the formula RFC = FC / N. FC indicates frequency of respondents citing a useful species while N is the total number of respondents in the survey.

Data Analysis

Extracted data from the filled questionnaires were analyzed descriptively in frequencies and percentages using Statistical Package for Social Science (SPSS) version 25 and the RFC index.

RESULTS

Demographic characteristics of the respondents

The demographic information revealed that females accounted for 67.1% of respondents and 42.8% fall within the age group of 31-40, other demographic information are documented in table 1.

Table 1: Demographic components of respondents on medicinal plants used in management of heart disease in Ago-Iwoye

Demographic Components	Frequency	Percentage (%)
Gender		
Male	23	32.86.
Female	47	67.14
Total Respondents	**70**	**100**
Age Group		
21-30 years	11	15.71
31-40 years	30	42.86
41- 50 years	15	21.43
51- 60 years	09	12.86
61- 70 years	03	04.29
71- 80 years	02	02.86
Total Respondents	**70**	**100**
Practice Specification		
Herbalist	04	05.71
Herb Retailers	27	38.57
Herb Hawkers	18	25.71
Traditional Medicinal Practitioners	21	30.00
Total Respondents	**70**	**100**
Marital Status		
Single	28	40.00
Married	39	55.71
Divorced	03	04.29
Total	**70**	**100**
Religion		
Islam	30	42.86
Christianity	25	35.71
Others	15	21.43
Total Respondents	**70**	**100**
Education		
Primary	17	24.29
Secondary	29	41.43
Tertiary	06	08.57
No Education	18	25.71
Total Respondents	**70**	**100**
Years of Experience		
1- 5 years	10	14.29
6- 10 years	16	22.86
11- 15 years	32	45.71
16- 20 years	08	11.43
21- 25 years	04	05.71
Total Respondents	**70**	**100**
Source of Knowledge		
Ancestral	18	25.71
Training	27	38.57
Parental	10	14.29
Parental and Training	15	21.43
Total Respondents	**70**	**100**

Plants' survey components of respondents in the management of heart disease

Availability of plants, duration of treatment, and gender of users of plants employed in the management of heart disease in Ago-Iwoye are presented in table 2 below. Most MPs reported by the respondents were available in the forest and market (29, 41.43%). Most heart disease treatments usually last for about 2–3 weeks (41, 58.57%). Women (43, 61.43%) formed over half of the consumers of MPs for heart disease.

Table 2: Plants' availability, treatment duration and patronizing gender of medicinal plants for heart disease in Ago-Iwoye

Other Components	Frequency	Percentage (%)
Availability of Plants		
Forest only	19	27.14
Market only	22	31.43
Forest/Market	29	41.43
Total	**70**	**100**
Duration of Treatment		
2-3 weeks	41	58.57
3-5 weeks	24	34.29
5-12 weeks	05	07.14
Total	**70**	**100**
Patronizing Gender		
Women	43	61.43
Men	27	38.57
Total	**70**	**100**

Medicinal plants used in the management of heart disease with their preparations

Table 3 shows the identified plant species used for treating or managing heart disease in Ago-Iwoye, Ogun State, Nigeria with their vouchers' numbers. A total of 19 families with 20 plants were reported by respondents as MPs used in managing heart disease. Table 3 also shows common or local names of plants with their parts, preparations, administrations, and dosages. Furthermore, the study identified various methods of preparation, which depend on the nature and physical properties of the plants and include boiling, cooking, grinding, extraction, and eating raw. The mode of administration of the MPs reported includes drinking, rubbing, mixing with pap, and licking. Doses could be once, twice, or thrice daily or recommended as required.

Table 3: Plants used in the management of heart disease in Ago Iwoye, Ogun State, Nigeria

S/N	Common /Local Names	Scientific Names	Family Names/VSN	Part Used	Mode of Preparation/ Administration	Dosages
1	Ginger/ Ata Ile	*Zingiber officinal*e Rosc.	Zingiberaceae/ LUH 9116	Rhizome	Grinding/boiling and Drinking/eaten raw	Once daily
2	Garlic/ Ayuu	*Allium sativum* L.	Amaryllidaceae/ LUH9117	Bulb	Grinding/boiling and Drinking/eaten raw	Twice daily
3	Onion/ Alubosa	*Allium cepa* L.	Amaryllidaceae/ LUH9118	Bulb	Grinding to paste/Drinking	Two times daily
4	Lime/Osan wewe	*Citrus aurantifolia* Christm and Panzer	Rutaceae/ LUH 9119	Fruits and leaves	Boiling/infusion /raw squeezing and Drinking	Three times daily
5	Shea butter/ Ori	*Vitellaria paradox* C.F.Gaertn.	Sapotaceae/ LUH 9120	Oil and cream	Melting/ Rubbing on chest	Three times daily
6	Climbing black pepper/ Iyere	*Piper nigrum* L.	Piperaceae/ LUH 9121	Seeds	Cooking/grinding and Drinking/mixing with pap	Daily
7	Africa never die/ Abamoda	*Bryophyllum pinnatum* (Lam.)	Crassulaceae/ LUH 9122	Leaves	Decoctions/ Drinking/ bathing	Daily
8	Tamarind/ Awin	*Tamarindus indica* L.	Fabaceae/ LUH 9123	Leaves	Cracking/ boiling and Drinking/ licking	As require
9	Sorrel/ Isapa pupa	*Rumex acetosa* L.	Polygonaceae/ LUH 9124	Seeds	Cooking/infusion and Eating/drinking	Daily
10	Plantain/Oge de dodo	*Musa paradisiaca* L.	Musaceae/ LUH 9125	Unripe fruits and leaves	Burning into ashes/ cooking and Licking/eating	As require
11	Mango/ Mangoro	*Mangifera indica* L.	Anacardiaceae/ LUH 9126	Leaves and bark	Boiling/cooking and drinking	Twice daily
12	Pawpaw/ Ibepe	*Carica papaiya* L.	Caricaceae/ LUH9127	Unripe leaves	Grinding/cooking and Drinking	Twice daily
13	Mistletoe/ Afomo	*Viscum album* L.	Loranthaceae/ LUH 9128	Leaves	Cooking/infusion and Drinking	Once daily
14	Cow melon/ Egusi bara	Citrullus colocynthis (L.) Schrad.	Cucurbitaceae/ LUH 9129	Fruits and seeds	Boiling and Drinking	Twice daily
15	West India cotton/ Owu akese	*Gossypium arboreum* L.	Malvaceae/ LUH 9130	Leaves	Boiling and Drinking	Twice daily/ Once daily
16	Sweet and hairy basil/ Efinrin wewe	*Ocimum basilicum* L.	Lamiaceae/ LUH 9131	Leaves	Soaking/squeezing and Drinking	Thrice a day
17	African coffee/ Rare	*Coffea arabica* L.	Rubiaceae/ LUH 9132	Leaves and seeds	Cooking/infusion and Drinking	Once (at night) in three days
18	Hannoa/ Igiun	*Hannoa undulata* (Guill. & Perr.) Planch.	Simaroubaceae/ LUH 9133	Leaves	Decoctions/cooking and Drinking	Once (at night) in three days
19	Grape/ Gireepu	*Vitis vinifera* L.	Vitaceae/ LUH 9134	Fruits and juice	Boiling and Drinking	Once (at night) in three days
20	Green Tea/ Imo alawo ewe	*Camellia sinensis* (L.) Kuntze.	Theaceae/ LUH 9135	Leaves	Cooking/decoction/infusion and Drinking	Once (at night) in three days

Frequency citation and RFC values of reported plants' species

Table 4 shows the FC and RFC values of the most useful plants in managing heart disease as reported by the informants. The highest value of RFC (1.00) was recorded in *Zingiber officinal*e (Ginger tubers) and *Viscum album* (Mistletoe), followed by *Coffea arabica* (African coffee) with 0.93, *Citrus aurantifolia* (Lime), *Bryophyllum pinnatum* (Africa Never Die) and *Carica papaiya* (Pawpaw) showed 0.86, and *Musa paradisiaca* (plantain) with 0.79 respectively. The lowest value of RFC (0.21) was documented in *Hannoa undulata* (Hannoa leaves) with only fifteen (15) FC by the respondents.

Table 4: Respondents' frequency of citation of plant species used in management of heart disease in Ago-Iwoye

S/N	Plant Species	Frequency Citation (FC)	Total Respondents (N)	Relative Frequency of Citation (RFC)
1	*Zingiber officinal*e Rosc.	70	70	1.00
2	*Allium sativum* L.	45	70	0.64
3	*Allium cepa* L.	37	70	0.53
4	*Citrus aurantifolia* Christm and Panzer	60	70	0.86
5	*Vitellaria paradox* C.F.Gaertn.	50	70	0.71
6	*Piper nigrum* L.	55	70	0.79
7	*Bryophyllum pinnatum* (Lam.)	60	70	0.86
8	*Tamarindus indica* L.	40	70	0.57
9	*Rumex acetosa* L.	40	70	0.57
10	*Musa paradisiaca* L.	55	70	0.79
11	*Mangifera indica* L.	45	70	0.64
12	*Carica papaiya* L.	60	70	0.86
13	*Viscum album* L.	70	70	1.00
14	*Citrullus colocynthis* (L.) Schrad.	35	70	0.50
15	*Gossypium arboreum* L.	30	70	0.43
16	*Ocimum basilicum* L.	45	70	0.64
17	*Coffea arabica* L.	65	70	0.93
18	*Hannoa undulata* (Guill. & Perr.) Planch.	15	70	0.21
19	*Vitis vinifera* L.	35	70	0.50
20	*Camellia sinensis* (L.) Kuntze.	45	70	0.64

DISCUSSION

This study identified 20 medicinal plant species belonging to 19 families from 70 indigenous people (47 females and 23 males) of the Ago-Iwoye community in Ogun State, Nigeria. Women were more ready than men to provide information on plants used to treat heart disease. Possibly, this may be due to the report that women are more affected

than males (Roger *et al*., 2011). It could also mean they believe in the potency of MPs more than men. The involvement of more females than males in sales of MPs, as reported in this study, is consistent with the findings of the Erhuwaren community in South East Nigeria (Chijindu *et al.*, 2020). Herb sellers with at least secondary school education have also been reported as the main respondents in an ethnobotanical survey of plants used in the treatment of hypertension that is closely related to heart disease in Ibadan North Local Government Area of Oyo State (Ajayi *et al*., 2019). Islam (86%) was the highest religion of respondents, followed by Christianity (35.71%) and other religions (21.43%). This order of religion agrees with the results from a similar survey of MPs in Oyo State (Ajayi *et al*., 2019). Most respondents received their knowledge of MPs from training and from their ancestors. Thus, there is need for more comprehensive documentation of this knowledge because a combination of training and well-documented ancestral knowledge may provide a sustainable transfer and conservation of the historical heritage of MPs among the populace.

The preferred route of administration is oral, and this could be done once or twice daily or as required. The plant parts, their mode of preparation, and administration reported in this survey conform to several studies reported in the literature for the treatment and management of diseases (Arowosegbe *et al*., 2015). The other plants' parts used for preparation are bark, bulbs, and rhizomes. Ago-Iwoye informants gave the local names of these MPs used in the management of heart disease, which is consistent with the way plants are generally known in different parts of the world (Singh, 2020). Although local names are not scientifically acceptable due to the unstandardized and inconsistent system of naming, they are useful references for indigenous people to search, identify, and document plant species in a particular area. The use of RFC as an index of the importance of plant species in the management of heart disease in Ogun state was employed. *Zingiber officinal*e (1.00), *Viscum album* (1.00), *Coffea arabica* (0.93), *Citrus aurantifolia* (0.86), *Bryophyllum pinnatum* (0.86), *Carica papaya* (0.86), and *Musa paradisiaca* (0.79) were at the top of the list in the management of heart disease, respectively. The individual RFC of these plant species indicates their importance in the management of heart disease (Table 4). Ginger and mistletoe were the topmost MPs mentioned by the respondents for disease management. This is contrary to the report by Ajayi *et al*. (2008), listing ginger as the second medicinal plant used in the management of hypertension. Ginger (*Zingiber officinal*e) has been widely used for health benefits, including CVD. In fact, it has been shown to protect rats from heart attacks (Hassanien, 2020). Mistletoe (*Viscum album*) has been a source of complementary phytotherapy in the treatment of many diseases. Our findings are consistent with its well-documented cardio-protective properties in experimental rats with myocardial ischemia and reperfusion injury (Karagöz *et al*., 2016; Suveren *et al*., 2017). Also, our result on coffee as the second plant on the list corroborates with the findings of Di Maso *et al.* (2021) that regular and moderate

consumption of coffee is beneficial for fatal and non-fatal CVD. Lime (*Citrus aurantifolia*) has been documented as one of the most consumed fruits in the world (Kelebek and Selli, 2011). They are high in flavonoids, which protect against atherogenesis, and their high RFC value in our study adds to the importance of lime in the treatment of CVD (Delgado, 2019). African Never Die leaves (*Bryophyllum pinnatum*), lime, and pawpaw had the same RFC values, indicating their importance in disease management. In a clinical study, *Bryophyllum pinnatum* was used in combination with other MPs to curb CVD risk factors (Sparman, 2017). Wilson *et al*. (2002) reported that pawpaw, a very popular fruit, possesses beneficial activities on CVD, and this was also supported by our study. As reported by Suleiman *et al*. (2021), bananas are also among the top listed fruits with cardio-protective potential. The least RFC was recorded in *Hannoa undulata* (0.21). Nonetheless, our report disagrees with the study of Ajao *et al*. (2019), which reflects the use of Hannoa only in skin diseases. Other medicinal plant species implicated in the management of heart disease from our survey include garlic, onion, shea butter, black pepper, sorrel, mango, cow melon, west Indian cotton, sweet and hairy basil, grapes, and green tea.

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Competing interests

The authors declare that they have no competing interests

Bioethics Consideration

This research was conducted in accordance with the ethical standards of European and German animal welfare legislation, the Declaration of Helsinki and the local ethics committee of the linkages, research and advancement in Olabisi Onabanjo University, Ago-Iwoye, Ogun-State (regulation CEE 86/609). Throughout the survey process, it was made clear that anyone who did not wish to engage in the study had the option to do so. Throughout the survey process, all dataset was de-identified to ensure no participant's identity was revealed and all participants' responses were kept completely confidential.

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