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ETHNOBOTANICAL SURVEY OF POTENTIAL HERBAL REMEDIES FOR THE TREATMENT OF SARS-COV-2 AND ITS SYMPTOMATIC COMPLICATIONS IN ZARIA, NORTHWEST NIGERIA

Ibrahim, H., *Danmalam, U. H, Ibrahim, G., Shehu, U.F., Shehu, S. and Katsayal, U. A

Department of Pharmacognosy and Drug Development, Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Zaria-Nigeria

***Author for correspondence**: habibdanmalam@gmail.com

ABSTRACT

The novel coronavirus has caused many cases of viral pneumonia since December, 2019.The novel coronavirus was named "SARS-CoV-2" by the International Virus Classification Commission. Traditional herbal medicines are getting significant attention in global health. In China, traditional herbal medicine played a prominent role in the strategy to contain and treat severe acute respiratory syndrome (SARS). Eighty per cent of African populations use some form of traditional herbal medicine. This project was aimed at surveying some selected traditional medical practitioners (TMPs) within Zaria and its environs, Kaduna State-Nigeria with a view to identifying medicinal plants with potentials for the treatment of viral and respiratory tract infections. A cross-sectional survey was conducted within Zaria and its environs from October to November, 2022, where TMPs were interviewed using a structured questionnaire in order to address the questions of community knowledge and practices in treating respiratory tract infections. A total of 60 respondents were interviewed which comprise of 45 (75%) males while 15 (25 %) females. 20 of the respondents interviewed (36 %) fall within the age range of 20 – 40, 23 (41 %) fall within the range 41 – 55 years, 5 (9 %) are within 56 – 65 years and respondents with age above 65 are eight (14 %). Sixteen respondents (32 %) had attained Islamic education, 13 (26 %) had attained primary education, 18 (36 %) had secondary education and only 3 (6 %) had attained tertiary education. 52 plants were obtained from the survey. The plants were herbs, shrubs and trees. Those with higher frequency of use were the most preferred. The frequency of use gave relative frequency citation (RFC)of, 0.3, 0.12,0.05,0.03 and 0.02. The only and most frequently used plant being *Anogeissus leiocarpus* (0.3), Followed by *Allium sativum* (0.12). The phytochemical screening gave various phytochemical constituents including carbohydrates, flavonoids, tannins, glycosides, terpenes, steroids and alkaloids. These plants and their various constituents have potential for use in the management of SARS CoV-2 symptoms and complication.

Keywords: Ethnobotanical Survey, Herbal Remedies, SARS-CoV-2, Phytochemical Screening

INTRODUCTION

Over the past two decades, the World Health Organization (WHO) has been working with countries to ensure safe and effective traditional medicine development in Africa by providing financial resources and technical support. The organization has supported clinical trials, leading 14 countries to issue marketing authorization for 89 traditional medicine products which have met international and national requirements for registration (WHO, 2000). Herbal traditional medicine has the potential to improve the health of developing countries and contribute to strategic reduction of early mortality, disability, and other risk factors of human health. Nigeria is blessed with different tribes and cultures possessing various traditional remedies using medicinal plants offering huge potentials to manage different diseases, including respiratory tract infections.Ethno-medicinal plants often contain intricate blends of chemical

compounds, making it imperative to employ sophisticated extraction and characterization techniques for the precise identification and quantification of their bioactive constituents (Farnsworth et al., 1985). These botanical resources play a vital role in providing healthcare to rural communities in Africa, and their significance is steadily growing due to social and economic factors (Cragg et al., 1996; Shiyou et al., 2010).

The novel coronavirus has caused many cases of viral pneumonia since December, 2019. The WHO announced the official name of the novel coronavirus-infected disease as "COVID-19" on 11 February, 2020 while, the novel coronavirus was named "SARS-CoV-2" by the International Virus Classification Commission (WHO, 2020; Kang and Xu, 2020).

Traditional herbal medicines are naturally occurring; plant-derived substances with minimal or no industrial processing that have been used to treat illness within local or regional healing practices. Traditional herbal medicines are getting significant attention in global health debates. In China, traditional herbal medicine played a prominent role in the strategy to contain and treat severe acute respiratory syndrome (SARS). Eighty per cent of African populations use some form of traditional herbal medicine, and the worldwide annual market for these products approaches US$ 60 billion (Tilburt and Kaptchuk, 2008).

The project is aimed at surveying some selected traditional medical practitioners (TMPs) within Zaria and its environs, Kaduna State Northwest Nigeria with a view to identifying medicinal plants with potentials for management of viral and respiratory tract infections and also to carry out phytochemical screening on the collected plants to provide preliminary data on the possible active constituents of the plants.

MATERIALS AND METHODS

Research Design

A cross-sectional survey was conducted within Zaria and its environs from October to November, 2022, where some selected traditional medical practitioners (TMPs) were interviewed using a structured questionnaire in order to address the questions of community knowledge and practices in treating respiratory tract infections by traditional medical practitioners, what medicinal plants are used to treat respiratory tract infections from the perspective of traditional medical practitioners and how the plants were prepared and administered to patients (Sofowora, 1993).

Study Area

The survey was conducted within Zaria (11^0 06' N; 7^0 43'E). Zaria is the second most populated town after Kaduna in Kaduna State. It is accessible by road from various parts of Nigeria.

Sampling Techniques and Procedure

The contacts for TMPs were obtained from leaders of traditional medical practitioners in Zaria. TMPs in the community were invited, consented and interview was scheduled and conducted at the Secretariat of the association at Sabon Gari Zaria. In order to maximize cooperation, the study team was introduced to the chairperson of traditional medical practitioners. A researcher administered questionnaire was administered to the respondents by the principal investigator and three trained research assistants who were conversant with the language and cultures of the local people in the study area, with the intent of getting the correct information. The leaders of traditional medical practitioners in Zaria and respondents assisted the researchers to identify study respondents in the study area. The plants mentioned in the study were identified in the field using their local

names, based on their taxonomic characters and the voucher specimens collected for confirmation at the herbarium unit, Department of Botany, Ahmadu Bello University. All the 60 traditional medical practitioners in attendance were administered the questionnaire.

Data Collection Instruments

A semi-structured questionnaire was designed by the principal investigator with the help of co-investigators and this was used to obtain the primary data (Sofowora, 1993).

Data Organization and Analysis

To ensure completeness of information collected from each respondent, the filled questionnaires were cross checked by the data collectors after taking the last response. Data was organized using Microsoft excel 2009 and analyzed using SPSS version 20.0

Quantitative Ethnobotanical Data Analysis

The collected information was quantitatively analyzed using an index of relative frequency citation (RFC) as, $RFC = \frac{FC}{N}$

This index shows the local importance of each product and it is given by the frequency of citation (FC), the number of informants mentioning the use of the product (species) divided by the total number of informants participating in the study (N)

Phytochemical Screening

This was carried out according to standard methods (Evans 2009, Sofowora, 1993).

RESULTS

Demographic, Social and Economic Characteristics of the Respondents

A total of 60 respondents were interviewed which comprises of 45 (75%) males while 15 (25 %) females. 20 of the respondents interviewed (36 %) fall within the age range of 20 – 40, 23 (41 %) fall within the range 41 – 55 years, 5 (9 %) are within 56 – 65 years and respondents with age above 65 are eight (14 %). Sixteen respondents (32 %) had attained Islamic education, 13 (26 %) had attained primary education, 18 (36 %) had secondary education and only 3 (6 %) had attained tertiary education.

Traditional Knowledge about SARS-COV-2

Traditional healers' understanding of SARS-CoV-2 is limited, often relying on existing knowledge of treating respiratory ailments. Many did not have the opportunity to treat COVID-19 patients, but those who did, reported no significant difficulties in managing their cases

Medicinal Plants used for Management of SARS-COV-2 related Signs andSsymptoms by TMPs

Various medicinal plants, herbs, shrubs and trees were used by the traditional healers belonging to various families of the plant kingdom. (Table 1). The frequency of use gave RFC of, 0.3, 0.12,0.05,0.03 and 0.02. The only and most frequently used plant being *Anogeissus leiocarpus*(0.3), Followed by *Allium sativum*(0.12). (Table 1).

Phytochemical Consitutents

The results of phytochemical screening indicated the presence of carbohydrates, flavonoids, anthraquinones, saponins, cardiac glycosides, terpenes steroids and alkaloids (Table 2).

Table 1: List of Plants, Family, Parts Used, Local, and Common Names from the Ethnosurvey of Potential Plants used in the Treatment of SARS-Cov-2 and its Symptomatic Complications in Zaria

S/N	Botanical name (Family)	Local name (Hausa)	Common name	Part used	RFC
1	*Anogeissusleiocarpus*Guill& Perr.(Combretaceae)	*Márkéé*	Chew stick tree	Roots and stem bark	0.30
2	*Allium sativum*L. (Amaryllidaceae)	*Tàfánnúúwáá*	Garlic	Bulb	0.12
3	*Zingiberofficinale*Roscoe (Zingiberaceae)	*Cìttáá*	Ginger	Rhizome	0.05
4	*Pavetta crassipes*K.Shum (Rubiaceae)	*Gadau gadau*			0.05
5	*Ficussycomorus*l. (Moraceae)	*Baure*	Fig tree	Roots and stem bark	0.05
6	*Azadirachtaindica*L.(Meliaceae)	*Dar bejiya*	neem	Leaves and stem bark	0.03
7	*Securidaca longepedunculata*Fresen (Polygalaceae)	*Úúwármáágúngúnà*	violet tree	Stem bark	0.05
8	*Carissa edulis*Vahl.(Apocynaceae)	*Cìizáákí*	Climbing num-num	Root	0.03
9	*Lanneamicrocarpa*Engl.&K.Krause(Anacardiaceae)	*Fàárúú*	African grapes		0.03
10	*Sclerocaryabirrea* (Anacardiaceae)	*Dányáá*		Stem bark	0.03
11	*Erythrina senegalensis* (Fabaceae)	*Mijiriya*			0.03
12	*Guiera senegalensis* (Combretaceae)	*Sàábáràà*			0.03
13	**	*Tsale*			0.02
14	*Artemesia maciverae* (Asteraceae)	*Tazargade*		Whole plant	0.02
15	*Ficus iteophylla*(Moraceae)	*Wurshi*			0.02
16	*Parkiabiglobosa* (Fabaceae)	*Dóòráwà*	locust tree	Stem bark	0.02
17	*Sterculiasetigera* (Malvaceae)	*Kûkkúúkì*	karaya gum tree		0.02
18	*Khaya senegalensis* (Meliaceae)	*Mádàácíí*	Mahogany		0.02
19	*Ficusplatyphylla* (Moraceae)	*Gámjì*	gutta percha tree	Stem bark	0.02
20	*Moringa oleifera* (Moringaceae)	*Zóógálé*	horseradish tree	Root	0.02

21	*Vitellaria paradoxa* (Sapotaceae)	*Káḓányà*	Shea	Stem bark	0.02
22	*Faidherbiaalbida* (Fabaceae)	*Gawo*			0.02
23	*Syzygiumguineense* (Myrtaceae)	*Málmóó*			0.02
24	*Crinum jagus*(Amaryllidaceae)	*Gadali*	Harmattan lily		0.02
25	*Acacia nilotica* (Fabaceae)	*Bàgàárúúwáá*	Egyptian mimosa	Fruit	0.02
26	*Acacia senegalensis* (Fabaceae)	*Ɗákwàráá*			0.02
27	*Combretum glutinosum* (Combretaceae)	*Tàráuníyáá*			0.02
28	*Ziziphus spina-christi*(L.) C Desf (Rhamnaceae)	*Kúrnà*	Christ's thorn jujube		0.02
29	*Acacia polyacantha ssp.* Campylacantha Wild (Fabaceae)	*Karki*			0.02
30	*Garcinia kola*Hackel (Clusiaceae)	*NamijinGóóròò*	Bitter kola		0.02
31	*Eugenia caryophyllus* (Myrtaceae)	*Kànámfàríí*	Clove	Seed	0.02
32	*Mitragynainermis* (Rubiaceae)	*Gííyyàyáá*			0.02
33	**	*Kafau*		Bulb	0.02
34	*Echinochloastagnina*(Ritz) p. Beauv. (Poaceae)	*Bùùrú(ú)gù*	Burgu millet	Root	0.02
35	**	*Rushii*			0.02
36	*Diospyros mespiliformis* Hochsr. Ex. A.DC (Ebenaceae)	*Kányà*	West African ebony		0.02
37	*Piliostigmareticulatum*(DC) Hochst(Fabaceae)	*Kárgóó*	Camel's shoe	Fruits	0.02
38	*Senna italica*Mill. (Fabaceae)	*Fíláskóó*	Italian Senna	Leaves	0.02
39	*Ziziphusmauritiana*Lam. (Rhamnaceae)	*Mágáryáá*	Jujube	Leaves	0.02
40	*Balanitesaegyptiaca*Delile (Zygophyllaceae)	*Ádúúwàà*	Desert date	Leaves	0.02
41	*Calotropis procera*Aiton. (Apocynaceae)	*Tùmfááfìyáá*	Sodom apple	Seed	0.02
42	*Stereospermumkunthianum*Cham (Bignoniaceae)	*Jìrìí*	Tulip tree	Bark	0.02
43	*Momordica balsamina*L.(Cucurbitaceae)	*Gàràáfúníí*	Balsam apple	Whole plant	0.02
44	*Boswellia dalzielii*Hutch. (Burseraceae)	*Árárráɓíí*		Root	0.02
45	*Terminalia macroptera*Guill &Perr. (Combretaceae)	*Kwandari*		Root	0.02
46	*Bauhinia rufescens*Lam. (Fabaceae)	*Tsáttsàágíí*		Root	0.02

47	*Hibiscus sabdariffa*L. (Malvaceae)	*Zóóbàróódòò*	Red tea	Flowers	0.02
48	*Cassia arereh*Delile (Fabaceae)	*Màrgáá*		Root	0.02
49	*Typha dominguensis*Pers. (Typhaceae)	*Kàcálá*		Whole plant	0.02
50	*Sterculia setigera*Delile(Malvaceae)	*Kukuki*	Bulrush	Leaves	
51	*Aneilemalanceolatum*Benth(Commelinaceae)	*Karyàgarma*		Leaves	0.02
52	*Mangiferaindica* L. (Anacardiaceae)	*Màngwàrò*	Mango tree	Stem bark	0.02

**Unidentified plants

Table 2: Phytochemical Screening of the Plants from Ethnosurvey of Potential Herbal Remedies for the Treatment of SARS-Cov-2 and its Symptomatic Complications in Zaria

S/N	Plant	CHO	FLA	ANTH	CARD	CYA	SAP	TAN	TER	STE	ALK
1	*Anogeissus Leiocarpus*	+	+	+	+	-	+	+	+	+	+
2	*Allium sativum*	+	+	+	-	-	+	+	+	+	+
3	*Zingiber officinale*	+	+	+	-	-	+	+	+	+	+
4	*Pavetta crassipes*	+	+	+	+	-	-	+	+	+	+
5	*Ficus sycomorus*	+	+	-	-	-	+	+	+	-	+
6	*Azadirachta indica*	+	+	-	-	-	+	+	+	+	+
7	*Securidaca longepedunculata*	+	+	-	+	-	+	+	+	+	+
8	*Carissa edulis*	+	+	+	+	-	+	+	+	+	+
9	*Lannea microcarpa*	+	+	-	+	-	+	+	+	+	+
10	*Sclerocarya birrea*	+	+	-	-	-	+	+	+	+	+
11	*Erythrina senegalensis*	+	+	-	-	-	-	+	-	-	+

12	*Guiera senegalensis*	+	-	-	-	-	+	+	+	-	+
13		+	+	-	-	-	+	+	+	+	+
14	*Artemesia maciverae*	+	+			-					
15	*Ficus iteophylla*	+	+			-		+		+	+
16	*Parkiabiglobosa*	+				-		+			
17	*Sterculia setigera*	+				-					
18	*Khaya senegalensis*	+	+	+	+	-	+	+	+	+	+
19	*Ficus platyphylla*	+	+	+	+	-	+	+	+	+	-
20	*Moringa oleifera*	+	+		+	-	+	+	+	+	+
21	*Vitellaria paradoxa*	+	+	+	+	-	+	+	+	+	+
22	*Faidherbia albida*	+	+		+	-	+	+	+	+	+
23	*Syzygium guineense*	+				-					
24	*Crinum jagus*	+	+	-	+	-	+	+	+	+	+
25	*Acacia nilotica*	+	+			-		+	+	+	+
26	*Acacia senegalensis*	+	+	-	+	-	+	+	-	-	+
27	*Combretum glutinosum*	+	+	+	+	-	+	+	+		+
28	*Ziziphus spina-christi*	+	+			-	+		+	+	+
29	*Acacia polyacantha ssp.*	+	+			-	+			+	+
30	*Garcinia kola*	+	+			-	+	+			+
31	*Eugenia caryophyllus*	+				-		+			+

KEY: CHO-carbohydrates, FLA- flavonoids, CARD- cardiac glycosides, CYA-cyanogenic glycosides, SAP-saponins, TAN-tannins, TER-terpenes, STE-steroids, ALK-alkaloid

32	*Mitragynainermis*	+									
33											
34	*Echinochloa stagnina*	+	+	-	-	-	-	+	-	-	+
35											
36	*Diospyros mespiliformis*	+	+	+	+	-	+	+	+	+	+
37	*Piliostigma reticulatum*	+	-	+	+	-	+	+	+	-	+
38	*Senna italica*	+	+	+	-	-	-	+		+	+
39	*Ziziphus mauritiana*	+	+								
40	*Balanites aegyptiaca*	+	+	-	+	-	+	+	+	+	+
41	*Calotropis procera*	+	+	-	+	-	+	+	+	+	+
42	*Stereospermum kunthianum*	+	+	-	-	-	+	+	+	+	+
43	*Momordica balsamina*	+	+	-	+	-	+	+	+	+	+
44	*Boswellia dalzielii*	+	+	-	+	-	+	+	+	-	+
45	*Terminalia macroptera*	+	+	-	+	-	+	+	+	-	+
46	*Bauhinia rufescens*	+	+	-	+	-	+	+	+	+	-
47	*Hibiscus sabdariffa*	+	+	-	-	-	+	+	+	+	+
48	*Cassia arereh*	+	+	+	-	-	+	+	+	+	-
49	*Typha dominguensis*	+	+	-	-	-	+	+	-	-	+
50	*Sterculia setigera*	+	+	-	-	-	-	+	-	-	
51	*Aneilema lanceolatum*	+	+	-	-	-	+	-	+	-	+
52	*Mangifera indica*	+	+	-	-	-	+	+	+	+	+

KEY: CHO-carbohydrates, FLA- flavonoids, CARD- cardiac glycosides, CYA-cyanogenic glycosides, SAP-saponins, TAN-tannins, TER-terpenes, STE-steroids, ALK-alkaloid

DISCUSSION

Medicinal plants have been used throughout human history as sources of drugs and drug development. While laboratory tests are the most reliable method for confirming SARS-CoV-2, traditional healers relied on symptoms for diagnosis and treatment. During the COVID-19 lockdown, persistent cough and loss of taste helped differentiate the disease from others. However, there was initially a general belief that COVID-19 was not a serious illness, which was clarified through the severity of the pandemic. The traditional healers and their chairman were pleased to be involved in discussions on the topic.

The various medicinal plants are mostly not domesticated plants. The plants were herbs, shrubs and trees. Different parts of the plants were used especially the roots and stem. Most medicines from roots and stem bark may be more potent. Those with higher frequency of use may be preferred for used. The frequency of use gave RFC of 0.3, 0.12,0.05,0.03 and 0.02. The only and most frequently used plant being *Anogeissus leiocarpus* (0.3), Followed by *Allium sativum* (0.12) (Table 1). It is a commonly used plant for most respiratory problems in this region. Literature review of this plant have shown the have various activities, antimicrobial, antiviral, anti-inflammatory and various traditional uses including respiratory infections (Ahmad,2024). Recommended plants from the study are those with high RFC values 0.3,0.12 and 0.5. More than 70% of plants collected had RFC values of 0.3 or 0.2. As a result, they can be included in preliminary screening for anti-viral studies.

The phytochemical screening gave various phytochemical constituents including carbohydrates, flavonoids, tannins, glycosides, terpenes, steroids and alkaloids. Cardiac glycosides present in few plants, while cyanogenic glycosides were absent. These constituents have been reported to have antiviral activity or for treatment of respiratory problems, symptoms and implications (Mansi and Latha, 2020).

CONCLUSSION

The ethnobotanical survey conducted among traditional medical practitioners in Zaria, Nigeria, revealed a rich tradition of plant-based remedies for various ailments, including potential applications for SARS-CoV-2. A total of 52 plant species were identified, with *Anogeissus leiocarpus* being the most frequently reported. The phytochemical screening of these plants revealed a diverse range of bioactive compounds, including carbohydrates, flavonoids, tannins, glycosides, terpenes, steroids, and alkaloids.

These findings suggest that traditional healers in the region possess valuable knowledge of medicinal plants that could potentially contribute to the development of novel therapeutic approaches for SARS-CoV-2. Further research is warranted to investigate the specific pharmacological properties of these plants and their constituents, and to evaluate their efficacy and safety in the management of COVID-19 symptoms and complications.

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