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Received: February 11, 2023 Accepted: April 15, 2023

Abstract

Ethno-botanical survey is a process of obtaining information on the use of medicinal plants from grassroots. The aim of this research was to document medicinal plants used traditionally in the management of neuropsychiatric disorders across Northwestern Nigeria. A semi-structured questionnaire was administered to the population of traditional medicine practitioners (TMPs), herbalists and herb sellers. The questionnaire comprised up of demographic information (Section A), description of the medicinal plants (Section B), and professional experience of the respondents (Section C). The data obtained was analyzed using the Statistical Package for Social Sciences (SPSS) version 24. A total of 127 TMPs, herbalists and herb sellers were interviewed from Kano state, 59 from Katsina state and 40 from Kaduna state. Majority of the respondents were Hausa, males and aged between 41-50 years. The practice was inherited by 83% of the respondents from Kano, 58% from Katsina and 70% from Kaduna. While only few of them received formal education. A total of 50 different medicinal plants use in treatment of neuropsychiatric disorders were documented in Kano state, 23 from Katsina state, and 17 from Kaduna state. Overall, the most mentioned medicinal plants include *Securidaca longepedunculata*, *Jatropha curcas*, *Solanum aethiopicum*, *Artemisia annua*, *Terminalia macroptera*, *Aristolochia albida*, *Allium sativum*, and *Nigella Sativa*. The most reported families were *Combretaceae*, *Moraceae*, *Fabaceae*, *Aristolochiaceae*, *Solanaceae* and *Euphorbiaceae*. Prominent mental disorders documented include insomnia, epilepsy, mental illness and evil spirit. Anxiety and depression were least reported. In conclusion, there is abundance of medicinal plants for treatment of neuropsychiatric disorders in the Northwestern Nigeria. This suggested the need to scientifically experiment them and if found to be effective they can be used as lead material for the development of herbal medicine for the management of mental illness.

Keywords: Ethno-botanical, Mental Disorder, Medicinal Plants, Northwest Nigeria, Traditional Medicine.

Introduction

Ethno-botanical survey is a process through which information on the use of medicinal plants is documented. It involves digging the information from the grassroots by interviewing traditional medicine practitioners (TMP), herbalist and herb sellers (Abubakar *et al.*, 2022; WHO, 2019; Shehu *et al.*, 2017). Traditional medicine is widely consumed and practiced alongside modern medicine among developing and developed nations. The practice of traditional medicine (TM) is mainly based on regular use of the medicinal plants and individual experiences which is transmitted from generation to generation (Karunamoorthi *et al.*, 2013; Tyreman, 2011; Payyappallimana, 2010). The term TMP is a traditional health practices that involve the use of knowledge and beliefs to treat human ailments using medicine obtained from plants, animals or minerals. It also involve spiritual therapies, manual techniques and use of exercises to treat, diagnose and prevent diseases or promote good health (Nsagha *et al.*, 2020; Egharevba *et al.*, 2015; Isola, 2010). Alternatively, TMP is called, complementary medicine, alternative medicine, natural medicine, herbal medicine, phyto-medicine, indigenous medicine, folk medicine, or ethno-medicine. Typical examples of TMP include home remedies, traditional birth attendants, traditional bone setting, general healers, rituals, poison healers, specialized healing, and veterinary healers (Nsagha *et al.*, 2020; Egharevba *et al.*, 2015; Isola, 2010).

Drug discovery for treatment of mental disorders using medicinal plants can be achieved through ethno-botanical survey. This is because medicinal plants are widely

consumed for the phytotherapy of various mental and neurological disorders (Abubakar and Haque, 2019; Rungtung *et al.* 2015; Edewor-Kuponiya, 2013). Globally, the use of medicinal plants to treat diseases is getting wider acceptance due to accessibility, low cost, and ease of administration (Ameh *et al.*, 2012; Ameh *et al.*, 2010). In addition, a number of medicinal plants used for short duration of treatment are considered natural and safe. Furthermore, several medicinal plants scientifically experimented were reported to be safe even at very high doses (Abubakar *et al.*, 2020; Al-Affifi *et al.*, 2018; Porwal *et al.*, 2017). An ethno-botanical survey carried out recently on medicinal plants used for the management of mental disorders reported *Fabaceae*, *Moraceae*, *Combretaceae*, and *Euphorbiaceae* as the most commonly used plant families (Abubakar *et al.*, 2022; Mabaleha *et al.*, 2019; Amoateng *et al.*, 2018; Wubetu *et al.*, 2018; Ior *et al.*, 2017). We further expand the survey in order to report the most recent data on the use of medicinal plants in the management of mental disorders.

Materials and Methods

Study Population

The survey was carried out among the population of traditional medicine practitioners (TMPs), herbalists and herb sellers across selected states in the Northwestern Nigeria. These include Kano, Kaduna and Katsina state.

Study Area

i. Kano State: Kano State is located in the north-western region of Nigeria. Kano State shares border with Katsina

state to the north, Bauchi state to the south, Jigawa state to the east and Kaduna state to the west (Figure 1) (Abubakar *et al.*, 2017). Kano State is located between latitude 13° N and 11° S and longitude 8° W and 10° E. It also has a mean height of about 472 m above sea level and covers a total area of 20,131 km² (Abubakar *et al.*, 2017). Kano state has 44 local government areas with a total population of 18.08 million (Abubakar *et al.*, 2022).



Figure 1: Map of Kano State, Nigeria (Source: Abubakar *et al.*, 2017).

ii. Katsina State: Katsina state is located in the north-western region of Nigeria. Katsina state shares border with Niger Republic to the north, Kaduna state to the south, Kano and Jigawa states to the east and Zamfara state to the west (Figure 2) (Kankara *et al.*, 2015). Katsina state is located between latitude 11°08'N and 13°22'N and longitude 6°52'E and 9°20'E. It also has a mean height of about 503m above sea level and covers 23,938 km² (Kankara *et al.*, 2015). It has a total of 34 local government areas with a total population of 7,831, 319 million (Ladan and Iguda, 2018).

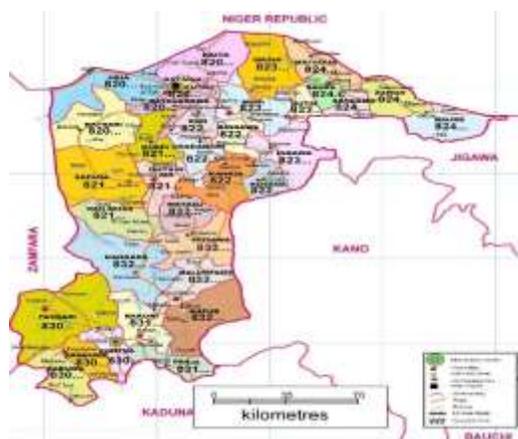


Figure 2: Map of Katsina state, Nigeria (Kankara *et al.*, 2015).

iii. Kaduna State: Kaduna state is located in the north-western region of Nigeria. Kaduna state shares border with Kano and Katsina state to the north, Federal Capital Abuja and Nasarawa state to the south, Plateau state to the east, Niger and Zamfara states to the west (Figure 3) (Premium

Times, 2020). Kaduna state is located between latitude of 10° 38'N and 10° 25' N, longitude of 7° 22'E and 7° 32 E. It also has a mean height of about 645 m above sea level and covers 45,061 km² (Bununu *et al.*, 2015). In addition, the state has a total of 23 local government areas with total population of 10,578,000 million (Bununu *et al.*, 2015).



Figure 3: Map of Kaduna State, Nigeria (Source: Premium Times, 2020).

Study design

This study was an extensive survey carried out by the team comprising of researchers, travel guides and informants. The targeted participants were the population of TMP, herbalists, and herb sellers across three states including Kano, Katsina and Kaduna. The survey was carried out using a semi-structured questionnaire. The questionnaire was adopted, modified, and validated from an earlier study (Shehu *et al.*, 2014).

Development of the questionnaire

The questionnaire is made up of four different sections. Section A comprised of the participants' demographic information such as age, gender, tribe, religion, nationality and the name of the practice involved. Section B gave the description of the plant such as local name, part of the plant used, and plant's form of life. Section C described the participants' type of practice and their experiences. During the survey, the questionnaire was administered directly to those who can read and write. But, it was read out verbally to the respondents who could not read.

Ethical approval

Ethical clearance was obtained from the ethical committee of the College of Health Sciences, Bayero University, Kano. Ref No: BUK/CHS/REC/117.

Data collection

The data was collected using a self-administered questionnaire across the population of TMPs, herbalists and herb sellers. The study was carried out between March 2021 and September, 2022. The TMP, herbalist and the herbs sellers provided a literature on the use of medicinal plants traditionally in the treatment of mental disorders. These include detailed description of the plants, the locations where the plants can be found and proper time of collection. Also, they provided the sample of the plant where available.

Data analysis

The results were tabulated and descriptive statistics carried out. The data was presented as frequencies (percentages) and mean, plus or minus standard deviation (SD) where appropriate. The whole analysis was carried out using the

Statistical Package for Social Sciences (SPSS®), version 24.0.

Results and Discussion

Demographic Information

During the course of this ethno-botanical survey, three states were visited including Kano, Katsina and Kaduna. The survey team interviewed TMPs, herbalists and herb sellers. A total of 127 participants were interviewed from Kano, 59 from Katsina state, and 40 from Kaduna state. In Kano, 64 (50%) were TMP, 46 (36%) herbalist and 17 (14%) herb sellers. In Katsina 36 (61%) were TMP, 17 (29%) herbalist and 6 (10%) herb sellers. In Kaduna 22 (55%) were TMP, 13 (32%) herbalist and 5 (13%) herb sellers.

In Kano, majority of the participants 101 (79%) were males and the rest 26 (21%) were females. In Katsina state, 48 (81%) were males and 11 (19%) were females. In Kaduna state 27 (68%) were males and 13 (32%) were females.

The respondents from Kano state include 22 (17%) of age group less than 31 years, 29 (23%) age 31-40, 45 (36%) age 41-50, and 31 (24%) age above 50 years. The Katsina state respondents include 9 (15%) of age group less than 31 years, 14 (24%) age 31-40, 20 (34%) age 41-50 and 16 (27%) age above 50 years. Kaduna state respondents include 6 (15%) age group less than 31 years, 9 (22%) age 31-40, 13 (33%) age 41-50 and 12 (30%) age above 50 years.

In Kano state, Hausa tribe has the highest number of participants 86 (68%), followed by Yoruba 29 (23%), and Igbo 5 (4%). Also, in Katsina Hausa tribe were 41 (69%), then Yoruba 12 (20%), and Igbo 1 (2%). In Kaduna state, Hausa were 27 (68%), Yoruba 8 (20%), and Igbo 2 (5%). Lastly, among Kano state respondents 116 (91%) were Muslims and 11 (9%) Christians. In Katsina, 56 (95%) were Muslims and 3 (5%) Christians. In Kaduna 33 (83%) were Muslims and 7 (17%) Christians, (Table 1).

Table 1: Demography of respondents

State		Kano (n=127)	Katsina (n=59)	Kaduna (n=40)
Variable	Category	N (%)	N (%)	N (%)
Type of Practice	TMPs	64 (50)	36 (61)	22 (55)
	Herbalists	46 (36)	17 (29)	13 (32)
	Herb sellers	17 (14)	6 (10)	5 (13)
Gender	Male	101 (79)	48 (81)	27 (68)
	Female	26 (21)	11 (19)	13 (32)
Age (years)	Less than 31	22 (17)	9 (15)	6 (15)
	31-40	29 (23)	14 (24)	9 (22)
	41-50	45 (36)	20 (34)	13 (33)
	> 50 years	31 (24)	16 (27)	12 (30)
Tribe	Hausa	86 (68)	41 (69)	27 (68)
	Yoruba	29 (23)	12 (20)	8 (20)
	Igbo	5 (4)	1 (2)	2 (5)
	Others	7 (5)	5 (9)	3 (7)
Religion	Islam	116 (91)	56 (95)	33 (83)
	Christianity	11 (9)	3 (5)	7 (17)
Nationality	Nigerian	124 (98)	55 (93)	38 (95)
	Non-Nigerian	3 (2)	4 (7)	2 (5)

N: Number of respondents; %: percentage of respondents.

In Kano state, the survey team visited Kurmi market, Sabon Gari market, Abubakar Rimi market, Hajj Camp Trade Fair, and others dispersed within the metropolis. In Katsina state, the locations surveyed include Katsina Central market, Chake market, Central Mosque, Makera Jabiri market. In Kaduna state locations include Kasuwar Barci market, Kawo market, Kabala Costain, Badarawa, Kakuri Market and Zaria City Market. The number of respondents obtained from each market is described below, (Table 2).

Table 2: Respondent based on locations visited in each state

State	Kano (n=127)	N (%)	Katsina (n=59)	N (%)	Kaduna (n=40)	N (%)
Locations	Kurmi Market	66 (52)	Katsina Central Market	19 (32)	Kasuwar Barci Market	9 (23)
	Sabon Gari Market	31 (24)	Chake Market	11 (19)	Kawo Market	11 (27)
	Abubakar Rimi Market	14 (11)	Central Mosque Market	13 (22)	Kabala Costain Market	8 (20)
	Hajj Camp Trade Fair	11 (9)	Makera Jabiri Market	9 (15)	Kakuri Market	5 (12)
	Others	5 (4)	Others	7 (12)	Zaria City Market	7 (18)

N: Number of respondents; %: percentage of respondents.

Professional Experience of the Respondents

The respondents from Kano state obtained their knowledge of TMP through inheritance 105 (83%), inheritance plus formal training 11 (9%), training alone 8 (6%) and divination 3 (2%). In Katsina state 34 (58%) inherited the practice, 8 (14%) inheritance plus formal training, 12 (20%) training and 5 (8%) divination. In Kaduna state, 28 (70%) inherited the practice, 4 (10%) inheritance plus formal training, 5 (13%) training and 3 (7%) divination. In Kano, The major sources of these plants include 84 (66%) forest, 11 (9%) home gardens, and 32 (25%) markets. In Katsina state, the sources of plants were 43 (73%) forest, 10 (17%) home gardens, and 6 (10%) markets. In Kaduna state, 26 (65%) of the plants were from forest, 5 (12%) home gardens, and 9 (23%) markets. The traditional practitioners from Kano state 89 (70%) suggested that their medicine has no side effects. In Katsina state, 47 (79%) claimed no side effects. Also, in Kaduna state, 29 (73%) revealed no side effects. However, few incidences of nausea and vomiting were reported in all the three states respectively. In Kano, the most commonly used method of preparation of medicinal plants was maceration 79 (62%), followed by infusion 31 (25%), and decoction 17 (13%). Also, in Katsina state maceration was 49 (83%), decoction 7 (12%), and infusion 3 (5%). In Kaduna state, maceration was 24 (60%), decoction 10 (25%), and infusion 6 (15%), (Table 3).

Table 3: Professional experience of respondents

State		Kano (n=127)	Katsina (n = 59)	Kaduna (n= 40)
Variables	Specification	N (%)	N (%)	N (%)
Frequency of treatment	Regular	115 (91)	53 (90)	35 (88)
	Irregular	12 (9)	6 (10)	5 (12)
Duration of treatment (days)	2-3	9 (7)	39 (66)	20 (50)
	4-5	26 (20)	16 (27)	12 (30)
	6-14	92 (73)	4 (7)	8 (20)
Other treatment apart from herbs	Divination/incantation	6 (5)	5 (9)	3 (7)
	None	121 (95)	54 (91)	37 (93)
Source of knowledge	Ancestral	105 (83)	34 (58)	28 (70)
	Training	8 (6)	12 (20)	5 (13)
	Ancestral/Training	11 (9)	8 (14)	4 (10)
	Divination	3 (2)	5 (8)	3 (7)
Availability of plant/ plant parts	Forest	84 (66)	43 (73)	26 (65)
	Home garden	11 (9)	10 (17)	5 (12)
	Market	32 (25)	6 (10)	9 (23)
Accompanied side effects	Nausea/vomiting	20 (16)	8 (14)	8 (20)
	Others	18 (14)	4 (7)	3 (7)
	None	89 (70)	47 (79)	29 (73)
Accompanied verbal instructions	Yes	127 (100)	59 (100)	40 (100)
Method of Preparations	Maceration	79 (62)	49 (83)	24 (60)
	Decoction	17 (13)	7 (12)	10 (25)
	Infusion	31 (25)	3 (5)	6 (15)

N: Number of respondents; %: percentage of respondents.

Medicinal Plants Reported from each State

In Kano state, the survey team documented 50 different medicinal plants with various claims for traditional management of mental disorders in (Table 4). In Katsina, 23 medicinal plants were reported (Table 5). In Kaduna, 17 plants were recorded, (Table 6). In addition, in Kano state the highest mentioned medicinal plants include *Securidaca longepedunculata* 22 (8.6%), *Jatropha curcas* 19 (7.5%), *Solanum aethiopicum* 18 (7.1%), *Artemesia annua* 17(6.7%), *Terminalia macroptera* 16 (6.3%), *Aristolochia albida* 15 (5.9%), *Andira inermis* 14 (5.5%), *Ipomoea asarifolia* 14 (5.5%), *Nigella Sativa* 14 (5.5%), and *Burkea Africana* 12 (4.7%), (Table 4). In Katsina state, the most frequently reported medicinal plants were *Allium sativum* 6 (26.1%), *Artemesia annua* 4 (17.4%), *Nigella Sativa* 4 (17.4%), *Securidaca longepedunculata* 4 (17.4%), and *Englerina gabonensis* 3 (13%), (Table 5). In Kaduna state the medicinal plants frequently used in the management of mental disorders include *Securidaca longepedunculata* 3 (18.8%), *Jatropha curcas* 3 (18.8%), *Nigella Sativa* 3 (18.8%), and *Bryophyllum pinnatum* 3 (18.8%), (Table 6).

Table 4: Medicinal plants commonly used in treatment of mental disorders in Kano state.

S/N	Botanical Names	Local Names	Family	Part	Traditional Claim	N (%)
1	<i>Aframonium melengueta</i> K. Schum.	<i>Citta maikwaya</i> (Hausa), <i>Atare</i> (Yoruba), <i>Ose-oji</i> (Igbo)	<i>Zingiberaceae</i>	Pod/Seed	Insomnia	1(0.4)
2	<i>Andira inermis</i> (Wright) DC.	<i>Gwaska</i> (Hausa), <i>Geloki</i> (Fulfulde)	<i>Fabaceae</i>	Stem Bark	Insomnia	14(5.5)
3	<i>Annona senegalensis</i> Pers.	<i>Gwandardaji</i> (Hausa), <i>Abo</i> (Yoruba), <i>Uburuocha</i> (Igbo)	<i>Annonaceae</i>	Leaf	i. Insomnia ii. Epilepsy	1(0.4)
4	<i>Anogeissus leiocarpus</i> (DC) Guill and Perr.	<i>Marke</i> (Hausa), <i>Atara</i> (Igbo), <i>Ayin</i> (Yoruba)	<i>Combretaceae</i>	Stem Bark	i. Insomnia ii. Epilepsy	1(0.4)
5	<i>Aristolochia albida</i> Duch.	<i>Madacin qasa</i> , (Hausa), <i>Gad'ahuka</i> (Fulfulde)	<i>Aristolochiaceae</i>	Root	Evil Spirit	15(5.9)
6	<i>Aristolochia bracteolata</i> L.	<i>Duman Dutse</i> (Hausa)	<i>Aristolochiaceae</i>	Leaf	Mental illness	1(0.4)
7	<i>Artemisia annua</i> L.	<i>Tazargade</i> (Hausa)	<i>Asteraceae</i>	Leaf	Evil Spirit	17(6.7)
8	<i>Balanite aegyptiaca</i> Del.	<i>Aduwa</i> (Hausa), <i>Dubakara</i> (Fulani), <i>Dawagara</i> (Kanuri)	<i>Balanitaceae</i>	Stem Bark	i. Insomnia ii. Anxiety	2(0.8)
9	<i>Bridelia ferruginea</i> Benth.	<i>Kirni</i> (Hausa), <i>Iralodan</i> (Yoruba), <i>Ola</i> (Igbo)	<i>Euphorbiaceae</i>	Root/ Leaf	Epilepsy	1(0.4)
10	<i>Burkea Africana</i> Hook.	<i>Maqarho</i> (Hausa)	<i>Fabaceae</i>	Stem Bark	Anxiety Insomnia	12(4.7)
11	<i>Calotropis procera</i> L.	<i>Tumfaafiyaa</i> (Hausa), <i>Bomubomu</i> (Yoruba), <i>Babambi</i> (Fulani)	<i>Asclepiadaceae</i>	Flower	Evil spirit	13(5.1)
12	<i>Carica papaya</i> L.	<i>Gwanda</i> (Hausa) <i>Egemmu</i> (Igbo), <i>Ibepe ibepe</i> (Yoruba)	<i>Caricaceae</i>	Leaf	Evil spirit	4(1.6)
13	<i>Celtis integrifolia</i> Lam.	<i>Zuwoo</i> (Hausa), <i>Ganki</i> (Fulani), <i>Akpe</i> (Yoruba)	<i>Ulmaceae</i>	Leaf	i. Epilepsy ii. Mental illness	11(4.3)
14	<i>Cinnamomum verum</i> J.Presl.	<i>Girfa</i> (Hausa)	<i>Lauraceae</i>	Stem Bark	Stimulant	1(0.4)
15	<i>Combretum molle</i> R.Br. ex G.Don	<i>Wuyandamo</i> (Hausa), <i>Boodi</i> (Fulani) <i>Anragba</i> (Yoruba)	<i>Combretaceae</i>	Root/ Leaf	Insomnia	1(0.4)
16	<i>Enantia chlorantha</i> Oliv	<i>Awopa/Osu pupa</i> (Yoruba), <i>Erenba-vbogo</i> (Igbo)	<i>Annonaceae</i>	Stem Bark	Epilepsy	3(1.2)
17	<i>Entada africana</i> Guill. and Perr.	<i>Tawatsa</i> (Hausa), <i>Ogurobe</i> (Yoruba)	<i>Fabaceae</i>	Leaf	Mental illness Epilepsy	1(0.4)
18	<i>Ficus congensis</i> Engl.	<i>Baure</i> (Hausa)	<i>Moraceae</i>	Stem Bark	Insomnia	1(0.4)
19	<i>Ficus ingens</i> (Miq.) Miq.	<i>Qaawurii</i> (Hausa), <i>Basaga</i> (Kanuri), <i>Fut</i> (Biom)	<i>Moraceae</i>	Stem Bark	Insomnia	1(0.4)
20	<i>Ficus platyphylla</i> Del.Holl.	<i>Gamji</i> (Hausa), <i>Dundehi</i> (Fulani), <i>Ogbagba</i> (Yoruba)	<i>Moraceae</i>	Stem Bark	i. Epilepsy ii. Insomnia	3(1.2)
21	<i>Ficus thonningii</i> (Blume.)	<i>Chediya</i> (Hausa)	<i>Moraceae</i>	Leaf/Stem Bark	Mental illness	3(1.2)
22	<i>Garcinia kola</i> (Heckel).	<i>Namijingoro</i> (Hausa), <i>Orogbo</i> (Yoruba)	<i>Clusiaceae</i>	Fruit	Stimulant	1(0.4)
23	<i>Guiera senegalensis</i> J.F. Gmel	<i>Saabara</i> (Hausa) <i>Kaashi</i> (Kanuri), <i>Gelooki</i> (Fulani)	<i>Combretaceae</i>	Leaf	i. Anxiety ii. Insomnia	5(2)
24	<i>Indigofera pulchra</i> Willd.	<i>Namijin Baabaa</i> (Hausa), <i>Ejaomode</i> (Yoruba)	<i>Papilionoideae</i>	Leaf	Mental Illness	4(1.6)
25	<i>Ipomoea asarifolia</i> (Desr.) Roem. & Schult.	<i>Dumanrafi</i> (Hausa), <i>Layre ngabbu</i> (Fulani), <i>Gbooro ayaba</i> (Yoruba)	<i>Convulvulaceae</i>	Leaf	Mental illness	14(5.5)
26	<i>Jatropha curcas</i> L.	<i>Biniidazuguu</i> (Hausa), <i>Bulu olu</i> (Igbo), <i>Botuje</i> (Yoruba)	<i>Euphorbiaceae</i>	Stem Bark	i. Insomnia ii. Epilepsy	19(7.5)
27	<i>Laptadenia hastate</i> (Pers.) Decne	<i>Yaadiya</i> (Hausa), <i>Isanaje</i> (Igbo), <i>Iran-aji</i>	<i>Asclepiadaceae</i>	Leaf	i. Evil spirit	10(3.9)

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28	<i>Lophira alata</i> Banks ex Geartn.	(Yoruba) <i>Kujeme</i> (Hausa)	<i>Ochnaceae</i>	Stem Bark	ii. Mental illness Epilepsy Mental illness	2(0.8)
29	<i>Mentha piperita</i> L.	<i>Na, a na, a</i> (Hausa)	<i>Lamiaceae</i>	Leaf	i. Mental illness ii. Stimulant	2(0.8)
30	<i>Mormordica balsamina</i> L.	<i>Garaafunii</i> (Hausa), <i>Akban ndene</i> (Igbo), <i>Ejirin</i> (Yoruba)	<i>Curcubitaceae</i>	Leaf	Mental illness	2(0.8)
31	<i>Moringa oleifera</i> Lam.	<i>Zogale</i> (Hausa), <i>Ewe</i> (Yoruba), <i>Okweolu</i> (Igbo)	<i>Moringaceae</i>	Leaf	i. Mental illness ii. Epilepsy	2(0.8)
32	<i>Nauclea latifolia</i> (Smith) Bruce	<i>Tuwonbiri</i> (Hausa), <i>Egbesi</i> (Yoruba), <i>Uburu-ilu</i> (Igbo).	<i>Rubiaceae</i>	Leaf	Evil spirit	2(0.8)
33	<i>Nigella Sativa</i> L.	<i>Habatus sauda</i> (Hausa), <i>Asofeyeje</i> (Yoruba)		Seed	Mental illness	14(5.5)
34	<i>Ocimum grattissimum</i> L.	<i>Daddoya</i> (Hausa), <i>Ahuji</i> (Igbo), <i>Efinrin</i> (Yoruba)	<i>Lamiaceae</i>	Whole	i. Mental illness ii. Epilepsy iii. Insomnia	3(1.2)
35	<i>Olox subscopioidea</i> Oliv.	<i>Gwaanon kurmi</i> (Hausa)	<i>Olacaceae</i>	Leaf	Epilepsy Mental illness	3(1.2)
36	<i>Piliostigma thonningii</i> (Schumach.) Milne-Rech.	<i>Kalgo</i> (Hausa), <i>Abefe</i> (Yoruba), <i>Okpoatu</i> (Igbo)	<i>Leguminosae</i>	Leaf	Epilepsy Mental illness	1(0.4)
37	<i>Proposis Africana</i> (Guill and Perr.) Taub.	<i>Kiryra</i> (Hausa) <i>Ayan</i> (Yoruba), <i>Ubwa</i> (Igbo)	<i>Mimosoideae</i>	Root	i. Anxiety ii. Epilepsy	2(0.8)
38	<i>Ricinus communis</i> Linn.	<i>Zurman</i> (Hausa), <i>Laraa</i> (Yoruba), <i>Ogilisi</i> (Igbo)	<i>Euphorbiceae</i>	Leaf/Seed	i. Insomnia ii. Epilepsy	1(0.4)
39	<i>Scelerocarya birrea</i> (A Rich) Hochst.	<i>Danya</i> (Hausa), <i>Eedere</i> (Fulani), <i>Kamaa</i> (Kanuri)	<i>Anacardiaceae</i>	Stem Bark	Epilepsy	1(0.4)
40	<i>Securidaca longepedunculata</i> Fres.	<i>Sanyaa/ Uwar maguna</i> (Hausa), <i>Alali</i> (Fulani)	<i>Polygalaceae</i>	Stem Bark	i. Depression ii. Epilepsy	22(8.6)
41	<i>Strychnos spinosa</i> (Lam.)	<i>Kokiya</i> (Hausa), <i>Atako</i> (Yoruba),	<i>Loganiaceae</i>	Fruit	i. Mental illness ii. Epilepsy	1(0.4)
42	<i>Solanum aethiopicum</i> L.	<i>Gauta</i> (Hausa), <i>Anara</i> (Igbo), <i>Igbagba</i> (Yoruba)	<i>Solanaceae</i>	Fruit	i. Anxiety ii. Insomnia	18(7.1)
43	<i>Spathodea campanulata</i> P. Beauv	<i>Oruru/mojutoro</i> (Yoruba), <i>Imi ewu</i> (Igbo)	<i>Bignoniaceae</i>	Stem bark	i. Mental illness ii. Epilepsy	2(0.8)
44	<i>Terminalia macroptera</i> Guill and Perr.	<i>Baushe</i> (Hausa), <i>idi</i> (Yoruba), and <i>Booji</i> (Fulfulde)	<i>Combretaceae</i>	Stem Bark	i. Depression ii. Insomnia	16(6.3)
45	<i>Vernonia amygdalina</i> Del.	<i>Shuwaka/ Chusar-doki</i> (Hausa), <i>ewuro</i> (Yoruba), <i>onugbu</i> (Igbo)	<i>Asteraceae</i>	Leaf	i. Mental illness ii. Insomnia	2(0.8)
46	<i>Vitellaria paradoxa</i> (C. F. Gaertn)	<i>Kadanya</i> (Hausa), <i>Balire</i> (Fulfulde), <i>Kendager</i> (Kanuri)	<i>Sapotaceae</i>	Stem Bark	i. Evil Spirit ii. Epilepsy	3(1.2)
47	<i>Vitex doniana</i> L.	<i>Dinyaa</i> (Hausa), <i>Ngalbihi</i> (Fulfulde), <i>Elili</i> (Igbo) <i>Ori</i> (Yoruba)	<i>Verbenaceae</i>	Root Bark	i. Evil spirit ii. Insomnia	2(0.8)
48	<i>Waltheria indica</i> L.	<i>Hankufa</i> (Hausa), <i>Korikodi</i> (Yoruba), <i>Kafaffi</i> (Fulfulde)	<i>Sterculiaceae</i>	Whole	i. Epilepsy ii. Insomnia	2(0.8)
49	<i>Ximenia americana</i> L.	<i>Tsaada</i> (Hausa), <i>Kabbule</i> (Fulfulde), <i>Igo</i> (Yoruba)	<i>Olacaceae</i>	Stem Bark	i. Insomnia ii. Insomnia	3(1.2)

50	<i>Ziziphus mauritiana</i> Lam.	<i>Magarya</i> (Hausa), <i>Jaabe</i> (Fulfulde), <i>Kusulu</i> (Kanuri), <i>Eekannase adie</i> (Yoruba)	<i>Rhamnaceae</i>	Leaf	i. Insomnia ii. Epilepsy	2(0.8)
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Table 5: Medicinal plants commonly used in treatment of mental disorders in Katsina state.

S/N	Botanical Names	Local Names	Family	Part	Claim	N (%)
1	<i>Aframonium melengueta</i> K. Schum.	<i>Citta maikwaya</i> (Hausa), <i>Atare</i> (Yoruba), <i>Ose-oji</i> (Igbo)	<i>Zingiberaceae</i>	Pod/Seed	Insomnia	1(4.3)
2	<i>Allium sativum</i> L.	<i>Tafarnuwa</i>	<i>Liliaceae</i>	Bulb	i. Insomnia ii. Epilepsy	6 (26.1)
3	<i>Annona senegalensis</i> Pers.	<i>Gwandardaji</i> (Hausa), <i>Abo</i> (Yoruba), <i>Uburuocho</i> (Igbo)	<i>Annonaceae</i>	Leaf	i. Insomnia ii. Epilepsy	1(4.3)
4	<i>Aristolochia albida</i> Duch.	<i>Madacin qasa</i> , (Hausa), <i>Gaɗ'ahuka</i> (Fulfulde)	<i>Aristolochiaceae</i>	Root	Evil Spirit	2(8.7)
5	<i>Aristolochia bracteolata</i> L.	<i>Duman Dutse</i> (Hausa)	<i>Aristolochiaceae</i>	Leaf	Mental illness	1(4.3)
6	<i>Artemisia annua</i> L.	<i>Tazargade</i> (Hausa)	<i>Asteraceae</i>	Leaf	Evil Spirit	4(17.4)
7	<i>Balanite aegyptiaca</i> Del.	<i>Aduwa</i> (Hausa), <i>Dubakara</i> (Fulani), <i>Dawagara</i> (Kanuri)	<i>Zygophyllaceae</i>	Stem Bark	i. Insomnia ii. Anxiety	1(4.3)
8	<i>Boswellia dalzielii</i> Hutch	<i>Ararrabi</i> (Hausa), <i>Mangalede</i> (Fulani)	<i>Burseraceae</i>	Stem Bark	i. Depression ii. Epilepsy	1(4.3)
9	<i>Bryophyllum pinnata</i> (Lam.)	<i>Karan Masallaci</i> (Hausa), <i>Abamoda</i> (Yoruba), <i>Odaa opue</i> (Igbo)	<i>Crassulaceae</i>	Whole	i.Epilepsy ii.Mental illness	3 (13)
10	<i>Burkea Africana</i> Hook.	<i>Maqarho</i> (Hausa)	<i>Fabaceae</i>	Stem Bark	i.Anxiety ii.Insomnia	2(8.7)
11	<i>Cassia singueana</i> (Del) Lock	<i>Runhu</i> (Hausa)	<i>Fabaceae</i>	Leaf	i. Insomnia ii. Anxiety	1(4.3)
12	<i>Cyperus articulatus</i> Linn.	<i>Kaajiji</i> (Hausa)	<i>Cyperaceae</i>	Fruit	Evil spirit	1(4.3)
13	<i>Dialium guineense</i> (Wild.)	<i>Tsamiyar biri</i> (Hausa)	<i>Fabaceae</i>	Fruit	i. Depression ii. Epilepsy	1(4.3)
14	<i>Englerina gabonensis</i> (Engl.)	<i>Kaucin Tsamiya</i> (Hausa)	<i>Loranthaceae</i>	Whole	Evil spirit	3(13)
15	<i>Ipomoea asarifolia</i> (Desr.) Roem. & Schult.	<i>Dumanrafi</i> (Hausa), <i>Layre ngabbu</i> (Fulani), <i>Gbooro ayaba</i> (Yoruba)	<i>Convulvulaceae</i>	Leaf	Mental illness	1 (4.3)
16	<i>Jatropha curcas</i> L.	<i>Biniidazuguu</i> (Hausa), <i>Bulu olu</i> (Igbo), <i>Botuje</i> (Yoruba)	<i>Euphorbiaceae</i>	Stem Bark	i. Insomnia ii. Epilepsy	2(8.7)
17	<i>Nigella Sativa</i> L.	<i>Habatus sauda</i> (Hausa), <i>Asofeyeje</i> (Youruba)	<i>Ranunculaceae</i>	Seed	Mental illness	4 (17.4)
18	<i>Securidaca longepedunculata</i> Fres.	<i>Sanyaa/ Uwar maguna</i> (Hausa), <i>Alali</i> (Fulani)	<i>Polygalaceae</i>	Stem Bark	i. Depression ii. Epilepsy	4(17.4)
19	<i>Senna occidentalis</i> (L.)	<i>Rai doore</i> (Hausa)	<i>Leguminosae</i>	Whole	i. Insomnia ii. Anxiety	1(4.3)
20	<i>Solanum aethiopicum</i> L.	<i>Gauta</i> (Hausa), <i>Anara</i> (Igbo), <i>Igbagba</i> (Yoruba)	<i>Solanaceae</i>	Fruit	i. Anxiety ii. Insomnia	2 (8.7)
21	<i>Solanum incanum</i> L.	<i>Gautan daaji</i>	<i>Solanaceae</i>	Fruit	Mental illness	1(4.3)
22	<i>Vitex doniana</i> L.	<i>Dinyaa</i> (Hausa), <i>Ngalbihi</i> (Fulfulde), <i>Elili</i> (Igbo), <i>Ori</i> (Yoruba)	<i>Verbenaceae</i>	Root Bark	i. Evil spirit ii. Insomnia	1(4.3)
23	<i>Ximenia americana</i> L.	<i>Tsaada</i> (Hausa), <i>Kabbule</i> (Fulfulde), <i>Igo</i> (Yoruba)	<i>Olacaceae</i>	Leaf	i. Insomnia ii. Insomnia	1(4.3)

Table 6: Medicinal plants commonly used in treatment of mental disorders in Kaduna state.

S/N	Botanical Names	Local Names	Family	Part	Claim	N (%)
1	<i>Anogeissus leiocarpus</i> (DC) Guill and Perr.	Marke (Hausa), Atara (Igbo), Ayin (Yoruba)	Combretaceae	Stem Bark	i. Insomnia ii. Epilepsy	1(6.3)
2	<i>Bryophyllum pinnatum</i> (Lam.)	Karan Masallaci (Hausa), Abamoda (Yoruba), Odaa opue (Igbo)	Crassulaceae	Whole	i. Epilepsy ii. Mental illness	3(18.8)
3	<i>Calotropis procera</i> L.	Tumfaafiyaa (Hausa), Bomubomu (Yoruba), Babambi (Fulani)	Asclepiadaceae	Flower	Evil spirit	1(6.3)
4	<i>Enantia chlorantha</i> Oliv	Awopa/Osu pupa (Yoruba), Erenba-vbogo (Igbo)	Annonaceae	Stem Bark	Epilepsy	1(6.3)
5	<i>Ficus capensis</i> Thunb.	Farin Baure, Uwar yara (Hausa), Opotu (Yoruba), Akakoro (Igbo),	Moraceae	Fruit, Leaf	Mental illness	1(6.3)
6	<i>Ficus platyphylla</i> Del.Holl.	Gamji (Hausa), Dundehi (Fulani), Ogbagba (Yoruba)	Moraceae	Stem Bark	i. Epilepsy ii. Insomnia	1(6.3)
7	<i>Ipomoea asarifolia</i> (Desr.) Roem. & Schult.	Dumanrafi (Hausa), Layre ngabbu (Fulani), Gbooro ayaba (Yoruba)	Convolvulaceae	Leaf	Mental illness	2(12.5)
8	<i>Jatropha curcas</i> L.	Biniidazuguu (Hausa), Bulu olu (Igbo), Botuje (Yoruba)	Euphorbiaceae	Stem Bark	i. Insomnia ii. Epilepsy	3(18.8)
9	<i>Nauclea latifolia</i> (Smith) Bruce	Tuwonbiri (Hausa), Egbesi (Yoruba), Uburu-ilu (Igbo).	Rubiaceae	Leaf	Evil spirit	1(6.3)
10	<i>Nigella Sativa</i> L.	Habatus sauda (Hausa), Asofeyeje (Yoruba)	Ranunculaceae	Seed	Mental illness	3(18.8)
11	<i>Ocimum grattissimum</i> L.	Daddoya (Hausa), Efinrin (Yoruba), Ahuji (Igbo).	Lamiaceae	Whole	i. Mental illness ii. Epilepsy	2(12.5)
12	<i>Piliostigma thonningii</i> (Schumach.) Milne-Rech.	Kalgo (Hausa), Abefe (Yoruba), Okpoatu (Igbo)	Leguminosae	Leaf	i. Mental illness ii. Epilepsy	1(6.3)
13	<i>Ricinus communis</i> Linn.	Zurman (Hausa), Laraa (Yoruba), Ogilisi (Igbo)	Euphorbiaceae	Leaf/Seed	i. Insomnia ii. Epilepsy	1(6.3)
14	<i>Securidaca longepedunculata</i> Fres.	Sanyaa/ Uwar maguna (Hausa), Alali (Fulani)	Polygalaceae	Stem Bark	i. Depression ii. Epilepsy	3(18.8)
15	<i>Solanum aethiopicum</i> L.	Gauta (Hausa), Anara (Igbo), Igbagba (Yoruba)	Solanaceae	Fruit	i. Anxiety ii. Insomnia	1(6.3)
16	<i>Spathodea campanulata</i> P. Beauv	Oruru/mojutoro (Yoruba), Imi ewu (Igbo)	Bignoniaceae	Stem bark	i. Mental illness ii. Epilepsy	2(0.8)
17	<i>Vernonia amygdalina</i> Del.	Shuwaka/ Chusar-doki (Hausa), Ewuro (Yoruba), Onugbu (Igbo)	Asteraceae	Leaf	i. Mental illness ii. Insomnia	2(0.8)

Families of Plants Reported from Each State

In Kano state, the most mentioned plants' families were *Combretaceae* 4 (12%), *Moraceae* 4 (12%), *Euphorbiaceae* 3 (9%), and *Fabaceae* 3 (9%). In Katsina state *Aristolochiaceae* 2 (11%), *Fabaceae* 3 (16%), and *Solanaceae* 2 (11%) were reported. In Kaduna state the most mentioned plants' families were *Euphorbiaceae* 2 (13%), and *Moraceae* 2 (13%), (Table 7).

Table 7: Families of plants reported from each state and their frequency

State Family	Kano N (%)	Katsina N (%)	Kaduna N (%)
<i>Anacardiaceae</i>	1 (3)	-	-
<i>Annonaceae</i>	2 (6)	1(5)	1(7)
<i>Aristolochiaceae</i>	2 (6)	2(11)	-
<i>Asclepiadaceae</i>	2 (6)	-	1(7)
<i>Asteraceae</i>	2 (6)	1(5)	1(7)
<i>Balanitaceae</i>	1 (3)	-	-
<i>Bignoniaceae</i>	1 (3)	-	1(7)
<i>Burseraceae</i>	-	1 (5)	-
<i>Caricaceae</i>	1 (3)	-	-
<i>Clusiaceae</i>	1 (3)	-	-
<i>Combretaceae</i>	4(12)	-	1(7)
<i>Convulvulaceae</i>	1 (3)	1(5)	1(7)
<i>Crassulaceae</i>	-	1(5)	1(7)
<i>Curcubitaceae</i>	1 (3)	-	-
<i>Cyperaceae</i>	-	1(5)	-
<i>Euphorbiaceae</i>	3 (9)	1(5)	2(13)
<i>Fabaceae</i>	3 (9)	3 (16)	-
<i>Lamiaceae</i>	2 (6)	-	1(7)
<i>Lauraceae</i>	1 (3)	-	-
<i>Leguminosae</i>	2 (6)	1(5)	1(7)
<i>Liliaceae</i>	-	1(5)	-
<i>Loranthaceae</i>	-	1(5)	-
<i>Lythraceae</i>	1 (3)	-	-
<i>Mimosoideae</i>	1 (3)	-	-
<i>Moraceae</i>	4 (12)	-	2(13)
<i>Moringaceae</i>	1 (3)	-	-
<i>Orchnaceae</i>	1 (3)	-	-
<i>Olacaceae</i>	2 (6)	1(5)	-
<i>Papilionoideae</i>	1 (3)	-	-
<i>Polygalaceae</i>	1 (3)	1(5)	1(7)
<i>Ranunculaceae</i>	-	-	1(7)
<i>Rhamnaceae</i>	1 (3)	1(5)	-
<i>Rubiaceae</i>	1 (3)	-	1(7)
<i>Sapotaceae</i>	1 (3)	-	-
<i>Solanaceae</i>	1 (3)	2(11)	1(7)
<i>Sterculiaceae</i>	1(3)	-	-
<i>Ulmaceae</i>	1 (3)	-	-
<i>Verbenaceae</i>	1 (3)	1(5)	-
<i>Zingeberaceae</i>	1 (3)	1(5)	-
<i>Zygophyllaceae</i>	-	1(5)	-

#: percentage of plant families mentioned.

Forms of Plants and Part Used from each State

The medicinal plants used in the traditional management of mental disorders come in different forms. In Kano state, 32 (64%) of the plants were trees, 14 (28%) shrubs, 3(6%) creepers, and 1(2%) climber. In Katsina state, 10 (44%) of the plants were trees, 7(30%) shrubs, 4 (17%) creepers, and 2 (9%) climbers. Also, in Kaduna state 11(65%) of the plants were trees, 5 (29%) shrubs, and 1(6%) creepers, (Table 8).

Table 8: Forms of Plants and Part Used from each State

Plant forms of life	Plant parts used	Frequency (%)		
		Kano N (%)	Katsina N (%)	Kaduna N (%)
Tree	Root and Bark	32 (64%)	10(44%)	11(65%)
Shrub	Whole	14(28%)	7(30%)	5(29%)
Climber	Whole	1(2%)	2(9%)	--
Creepers	Bulbs	3(6%)	4(17%)	1(6%)

#: percentage

Frequently Mentioned Mental Disorders from each State

In Kano state, insomnia and epilepsy (28%) each were the most mentioned mental disorders. This was followed by mental illness (23%), and evil spirit (6%). Anxiety and depression (3%) each were the least reported. In Katsina, insomnia (32%) was the highest, then epilepsy (18%). This was followed by mental illness, evil spirit, and anxiety (14%) each. Depression (3%) was the least reported mental disorder. In Kaduna, epilepsy (36%) was the highest mentioned mental disorder, then insomnia (21%). This was followed by mental illness (28%), and evil spirit (7%). Anxiety and depression (4%) each were the least reported mental disorders (Table 9).

Table 9: Frequently Mentioned Mental Disorders from each State

Mental Disorders	Kano N (%)	Katsina N (%)	Kaduna N (%)
Insomnia	22 (28)	12 (32)	6 (21)
Epilepsy	22 (28)	7(18)	10 (36)
Mental Illness	18 (23)	5(14)	8(28)
Evil Spirit	7(9)	5(14)	2(7)
Anxiety	5 (6)	5(14)	1(4)
Depression	2(3)	3(8)	1(4)
Stimulant	2(3)	--	--

#: percentage of mental disorders reported.

Ethno-botanical survey was conducted across 3 states in the Northwestern Nigeria. These include Kano, Katsina and Kaduna states. A total of 127 respondents participated from Kano state, 59 from Katsina state and 40 from Kaduna state. The majority of the participants were males but rest were females. This indicated that males participated more in the TMP than women due to the difficulty involved in collection and processing of the herbal medicine. Also, traditionally in Nigeria males inherits the occupation of their father. A number of other ethno-botanical surveys also reported similar findings (Mounkoro et al., 2020; Ayeni and Aliyu, 2018; Dambatta and Aliyu, 2011). Most of the respondents aged between 41 and 50 years. This suggested that the practice of herbal medicine requires a lot of experience and skills that can be acquired over time. This is in lines with reports published by other researchers (Mounkoro et al., 2020; Amaghnoije et al., 2020; Ibrahim et al. 2007).

During this survey majority of the participants inherited the practice with few others that had formal training. This is same for in Kano, Katsina and Kaduna state. The result of this survey was comparable to the outcome of other studies (Ayeni and Aliyu, 2018; Dambatta and Aliyu, 2011). In addition, their primary source of this herbal medicine is forest, followed by open markets, and in few cases home gardens. Recent surveys carried out supported this finding (Abubakar et al., 2022; Shehu et al., 2017). Majority of them believed their medicine has no side effects. However, few reported nausea and vomiting. This is similar to the reports by two other scientists (Shehu et al., 2017; Dambatta and Aliyu, 2011). Maceration was the most commonly used method of preparation of the medicinal plants, followed by decoction then infusion. Several other

practitioners used similar methods preparations (Abubakar et al 2022; Shehu et al 2017; Mounkoro et al., 2020; Ibrahim et al. 2007).

During this survey, medicinal plants with various claims for use traditionally in the treatment of mental disorders were documented. These include 50 from Kano state, 23 from Katsina state, and 17 from Kaduna state. Consequently, these plants should be scientifically experimented and if found to be effective they can be used as lead material for the development of herbal medicine for the management of mental illness. The outcome of this survey also reported wide ranges of mental disorders. These include insomnia, epilepsy, mental illness and evil spirit; with few cases of anxiety and depression. Similar findings were reported in other surveys (Abubakar et al., 2022; Ior et al 2017).

The highest mentioned medicinal plants from Kano state were *Securidaca longepedunculata*, *Jatropha curcas*, *Solanum aethiopicum*, *Artemesia annua*, *Terminalia macroptera*, and *Aristolochia albidia*. The most commonly reported plants in Katsina state were *Allium sativum*, *Artemesia annua*, *Nigella Sativa*, and *Securidaca longepedunculata*. In Kaduna state, *Securidaca longepedunculata*, *Jatropha curcas*, and *Nigella Sativa* were the most commonly used plants. Similar ranges of medicinal plant were reported in previous ethno-botanical surveys (Mounkoro et al., 2020; Ibrahim et al. 2007; Kyolo et al., 2022). Furthermore, in Kano state the most mentioned plants families include *Combretaceae*, *Moraceae*, *Euphorbiaceae*, and *Fabaceae*. In Katsina state include *Aristolochiaceae*, *Fabaceae*, and *Solanaceae*. Lastly, in Kaduna state the most commonly reported plants families used in the management of neuropsychiatric disorders were *Euphorbiaceae* and *Moraceae*. Other ethno-botanical surveys reported comparable outcome (Mounkoro et al., 2020; Ibrahim et al. 2007; Kyolo et al., 2022).

Conclusion

Ethno-botanical survey conducted across the Northwestern part of Nigeria produced data on the availability of medicinal plants for the management of neuropsychiatric disorders. A total of 226 traditional medicine practitioners, herbalist and herb sellers were interviewed. This generated a total of 90 different medicinal plants with various claims in the treatment of neuropsychiatric disorders across the 3 states. Consequently, there is abundance of medicinal plants with various claims in the treatment of neuropsychiatric disorders. This suggested that these plants should be scientifically experimented and if found to be effective they can be used as lead material for the development of herbal medicine for the management of mental illness

Acknowledgement

This research group is grateful to the all staff of the Faculty of Pharmaceutical Sciences, and the Directorate of Research, Innovation and Partnership (DRIP), Bayero University, Kano, Nigeria.

Conflict of Interest

This manuscript is part of the project of National Research Fund (nrf) under the Tertiary Education Trust Fund (TETFund), Nigeria.

Funding Information

The manuscript is sponsored by the National Research Fund (nrf) under the Tertiary Education Trust Fund (TETFund), Nigeria. GRANT NO: TETF/R&D/CE/NRF/2020/CC/114/VOL-I

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