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Original Research

Ethnopharmacological Survey of Plants Used for the Treatment of Female Sexual Dysfunction and Infertility in Ilorin, Nigeria

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Abstract

Over generations, several indigenous knowledge on the use of medicinal plants have been lost due to a lack of interest of the upcoming generation and reluctancy of the older generations to pass on their knowledge. This survey was set about to preserve and share the knowledge of the Ilorin Emirate Clan in the management of female sexual dysfunction and infertility (FSDI). The survey was conducted across three major markets (Shao, Jimba-Oja and Oke-Oyi) and ethnobotanical data on medicinal plants, mode of preparation, route of administration and demographic information were collected from volunteers using a semi-structured questionnaire, oral or virtual interviews. A total of 47 plant species belonging to 28 families were identified from 85 willing respondents. *Phyllanthus amarus* Schumach. & Thonn. was the most frequently cited plant with a citation frequency of 31.76% and a fidelity level of 57.75% whereas *Xylopia aethiopica* (Dunal) A.Rich. was the least cited plant with a citation frequency of 1.18% and a fidelity level of 1.12%. The highest informant consensus factor computed for Shao market, Jimba-Oja and Oke-Oyi were 0.93, 0.57 and 0.84 for *P. amarus*, *Sarcocephalus latifolius* (Sm.) E.A.Bruce and *Cassia fistula* L., respectively. This study provides a comprehensive insight into the medicinal plants in our society that are of importance in the management of female sexual dysfunction and infertility. The data collected would promote the conservation of invaluable indigenous knowledge and highlight a broad selection of medicinal plants that could be subjected to further pharmacological and clinical investigation for their potential role in the treatment of FSDI.

Keywords: Ethnopharmacology; Female sexual dysfunction; Infertility; Traditional medicine; Medicinal plants

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Introduction

The prevalence of sexual dysfunction and infertility among women of reproductive age has been a matter of public health concern. The associated social and psychological implications on the individual, immediate family and the society makes it a subject of top-priority calling for swift scrutiny [1]. Medicinal plants are in abundance and are attracting more attention in different parts of Nigeria. Series of researches have been conducted on the plants that are associated with curative potentials on female sexual dysfunction and infertility (FSDI).

Infertility can be described as the inability to conceive after 12 months of unprotected sexual intercourse and pregnancy attempts [2]. It is a global problem affecting people around the world with an estimated 60-80 million couples around the world suffering from infertility annually [3]. The cause and importance may vary according to the geographical location and socio-economic condition. The estimated fertility rate in Canada is 11.5% to 15.7%, Nigeria has a reported rate of 11%; while one out of seven English couples suffers from fertility problems [2-4]. Female infertility is related to a host of factors including but not limited to genetic disorders, lifestyle, reproductive system disease and most importantly, female sexual dysfunction.

Female Sexual Dysfunction (FSD), a group of disorders affecting the sexual response of women in the reproductive age, is an issue of public health importance that requires swift attention [5]. An individual with sexual dysfunction feels extreme distress and interpersonal strain for a minimum of six months except for substance or medication-induced sexual dysfunction [1]. Even though sexual dysfunction can affect males, its prevalence among women is higher [6]. However, the prevalence of FSD varies among communities.

Initially, Masters and Johnson [7] categorized female sexual response cycle into four groups (sexual desire disorders or decreased libido, sexual arousal disorders, orgasm disorders and pain disorders also known as dyspareunia), while the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5), later gave three groups of classification as sexual interest/arousal syndrome, female orgasmic disorder, and genito-pelvic pain/penetration disorder [8]. FSDI range from lack of interest for sexual engagement, disorder relating to the desire for or during a sexual engagement, disorder of arousal, disorder or absence of orgasm, and painful coitus [9]. An individual may have more than one form of sexual dysfunction at the same time [10,11].

Sexual response has been attributed to circulating androgens but is poorly associated with symptoms including low sexual desire, loss of sexual confidence, genital numbness, poor sexual arousal, orgasm, and diminished well-being in postmenopausal women [12,13]. However, several factors ranging from biological (chronic diseases such as diabetes, stroke and multiple sclerosis), emotional, psychological (sexual abuse) and physical factors (harmful practices such as female genital mutilation) can cause FSDI [13-16]. While age is another important factor that causes FSDI, some drugs present

complications that lead to sexual dysfunction [17]. Furthermore, there is an increase in the prevalence of sexual dysfunction among elderly women due to the reduction in sex hormones associated with pelvic anatomy, thereby, affecting libido and vaginal lubrication, hence the difficulty in sex [18].

Being a complex condition with multiple factors, sexual dysfunction does not only affect the patient, but also have negative impacts on the society at large. It can affect the patient's mood, can cause stress, anxiety and depression, and can affect their relationship, daily functioning as well as quality of life leading to low self-esteem or body image issues. More so, the tremendous increase in the rate of infertility in the past few decades [19,20] makes it imperative for healthcare providers and patients to work in close partnership in proffering long lasting solution to FSDI. Despite these negative implications, women with sexual dysfunction, especially from Africa are typically reluctant to discuss sexual matters and seek for help. Hence, there is need for contiguous intervention to provide care for women suffering from FSDI.

Identifying plants and gaining a better understanding of the plants with therapeutic values against FSDI can potentially reduce the effect and burden of the condition on the patient, spouse, family members and the society at large. A survey of medicinal plants precedes every other models of scientific investigations (e.g. *in vitro, in vivo,* phytochemical studies) on plants. Similar studies on the documentation of ethnomedicinal knowledge used for the management of various diseases such as diabetes mellitus, infertility, respiratory diseases and anticancer have been reported [21-25]. Therefore, an archive of these plants would go a long way at providing immediate availability of lists of relevant plants for management of FSDI. Hence, the objectives of this study were to survey plants with therapeutic potentials against FSDI in Ilorin, and to provide an archive of such plants for easy referencing, pharmacological and clinical investigation.

Methods

Study area and respondents

This survey was carried out in Ilorin located within Latitude 8° 29' 47 and 90" North and Longitude 4° 32' 31 and 70" East (Figure 1). The targeted respondents were farmers, herb sellers, herbalists/traditional medicine practitioners, midwives and aged people who have treated or managed FSDI via the use of medicinal plants in their lifetime. Consent of the respondents was verbally sought before an interview and/or administration of questionnaires, which is a semi-structured interview-based report comprising two parts (A and B). Parameters measured in the two parts were demographic information of the respondents, and plant information such as name, part used, mode of preparation as well as their route of administrations (Appendix 1).

Data collection and identification of the plants

Data obtained from our interviews or in the questionnaires were documented for further statistical analysis. The respondents from Shao, Jimba-Oja and Oke-Oyi were approached

during their respective market days for their knowledge on FSDI management. The plants mentioned during this study were obtained and identified taxonomically in the Herbarium Unit of the University of Ilorin, Ilorin, Nigeria, where specimens were deposited and voucher numbers were obtained. In addition to these, the names of the plants were verified online (www.theplantlist.org) and the useful plants of West Tropical Africa, Nigerian was used as a tool to identify the listed plant species [26].

Data analysis

The frequencies and percentages of the demographic data of the respondents were determined using the descriptive statistical analysis. The results of the survey of medicinal plants were analyzed for the Frequency of Citation (FC), Fidelity Level (FL) and Informant Consensus Factor (ICF) measures were quantified.

Frequency of Citation

The relative importance of a particular plant which was based on the number of mentions received by each plant species was computed by adopting the formula proposed by Shinkafi et al. [27].

Equation 1.

$$FC = Nr / N \times 100$$

N_r denotes the number of times a particular species was cited by respondents, while N denotes the total number of the respondents.

Fidelity Level

The potentiality of each plant against FSDI and its preference of use among other plants by herbalists was determined using the method described by Ngoua-Meye-Misso et al. [28];

Equation 2.

$$FL = C\,sc / C\,sr \times 100$$

C_{sc} denotes the frequency of citation of a specific species against FSDI, while C_{sr} denotes the total number of citations of that species among all respondents.

Informant Consensus Factor

The agreement among respondents from Shao market, Jimba-Oja and Oke-Oyi on their preferred choice of plant for the management or treatment of FSDI was computed as described by Fisseha et al. [29] using the formula;

Equation 3.

$$ICF = (N_{ur} - N_t) / (N_{ur} - 1)$$

N_{ur} denotes the number of citations for a specific plant used for FSDI, while N_t denotes the number of plant species reported to cure FSDI.

Results

Demographic information

A total of 133 candidates were approached of which 85 willing respondents were able to provide the required information on the management/treatment of FSDI. Majority of the respondents were female (67.06%) and educated (90.60) within the age range of 21 – 89 (Table 1). Also, 57 of the respondents were categorized as highly sexually active (copulating at least 3-times per week) whereas 9 of the respondents

reported being rarely sexually active (Table 1). In addition, most of the respondents (34.12%) were traditional herbal medicine practitioners who have been practicing the management of FSDI for decades while midwives represent the lowest percentage (9.41%) of respondents (Table 1). Of the 85 respondents, only one (1.18%) of them declared to be barren; whereas a staggering 98.82% of them were fertile albeit with some help especially in the case of those with delayed conception (Table 1). Furthermore, 76.47% of the respondents reported having either treated or received treatment for FSDI; whereas the other 23.53% claimed to have not experienced any FSDI related disease or treatments. Majority of the respondents (44.71%) reported apprentism as their favored means of knowledge transfer; whereas just some selected few (9.41%) were willing to share their knowledge randomly (Table 1). Anorgasmia was the most cited female sexual dysfunction managed or treated; while arousal disorders was the least cited (Table 1).

Figure 1. Map showing location of the study area (Shao, Jimba-Oja and Oke-Oyi)

Table 1. Demographic distribution of the respondents

Parameter(s)		Number	Percentage (%)
Gender	Male	28	32.94
	Female	57	67.06
Level of Education	Uneducated	8	9.41
	Primary school	19	22.35
	High school	36	42.35
	Technical school/college	7	8.23
	Diploma	8	9.41
	First degree	5	5.88
	Postgraduate qualification	2	2.35
Age range	21 – 40	18	21.18
	41 – 60	43	50.59
	Above 60	24	28.23
Sexual alertness	Moderate	19	22.35
	High	57	67.06
	Low	9	10.59
Occupation	Farmer	21	24.71
	Midwife	8	9.41
	Herb sellers	15	17.65
	Traditional medicine practitioners	29	34.12
	Aged people	12	14.11

Fertility profile	Pre-marital pregnancy Post-marital conception (immediate) Delayed conception Baren	7 60 17 1	8.23 70.59 20.00 1.18
Treated/received treatment for FSDI	Yes No	65 20	76.47 23.53
Knowledge transfer	Offspring Apprentice Random Never	17 38 8 22	20.00 44.71 9.41 25.88
Types of FSDI treated	Dyspareunia Anorgasmia Vaginismus Arousal disorder Conception complications Infertility	10 31 11 4 15 14	11.76 36.47 12.94 4.71 17.65 16.47

Plant diversity

A total of 47 plant species have been identified with 28 families of which Rubiaceae and Leguminosae were the predominantly cited families with 4 species each (Table 2). There were three species cited for the families Apocynaceae, Compositae and Solanaceae while families such as Annonaceae, Combretaceae, Connaraceae, Cucurbitaceae, Euphorbiaceae, Malvaceae and Zingiberaceae had two species each with the others presenting with just one species (Table 2).

Table 2. Different plant families and the number of plant species used for the treatment of female sexual dysfunction and infertility

Plant family	Number of plant species	Percentage
Annonaceae	2	4.26
Apocynaceae	3	6.38
Bignoniaceae	1	2.13
Clusiaceae	1	2.13
Combretaceae	2	4.26
Compositae	3	6.38
Connaraceae	2	4.26
Convolvulaceae	1	2.13
Cucurbitaceae	2	4.26
Euphorbiaceae	2	4.26
Gnetaceae	1	2.13
Lauraceae	1	2.13
Leguminosae	4	8.51
Malvaceae	2	4.26
Musaceae	1	2.13
Myrtaceae	1	2.13
Olacaceae	1	2.13
Phyllanthaceae	1	2.13
Piperaceae	1	2.13
Poaceae	1	2.13

Polygalaceae	1	2.13
Rubiaceae	4	8.51
Rutaceae	1	2.13
Santalaceae	1	2.13
Sapotaceae	1	2.13
Solanaceae	3	6.38
Violaceae	1	2.13
Zingiberaceae	2	4.26

Plant parts used

The leaf (34.55%) was the most cited plant part used in the treatment of FSDI while the least cited parts were the nut (1.82%), flower, melon and whole plant (Figure 2). Other parts such as fruits (5.45%), roots (20.00%), seeds (16.36%), bark (9.09%), stem and shell (3.64%) were also mentioned (Figure 2).

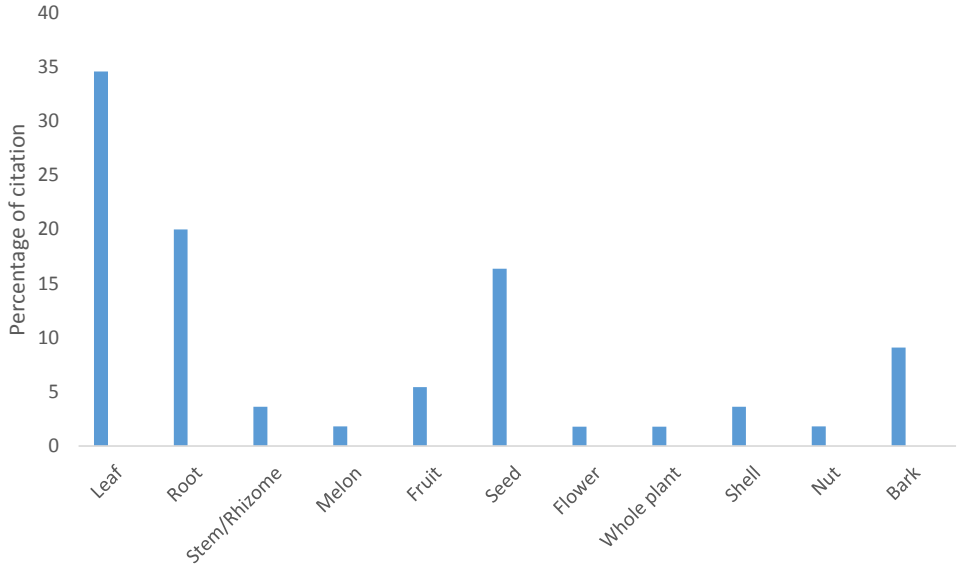

Figure 2. Plant parts used for the treatment of female sexual dysfunction and infertility

Mode of preparation and administration

Of the 47 plants cited, decoction (37.55%) was the most preferred method of preparation followed by infusion (30.33%); whereas, plant press/squeezing (1.20%) was the least preferred method (Figure 3). Other methods of preparation cited include concoction, ethanol extraction, chewing or eating raw and crushing (Figure 3). The preferred route of administration by the respondents was oral (86.45%); whereas the least preferred route of administration was via inhalation (0.85%) (Figure 4).

Citation frequency and fidelity level

Of the 47 plants identified, *Phyllanthus amarus* Schumach. & Thonn., locally known as *eyin olobe*, was the most frequently cited plant with a citation frequency of 31.76% and a fidelity level of 57.75% (Table 3) whereas *Xylopia aethiopica* (Dunal) A.Rich. (*edun alamo*) was the least cited plant with a citation frequency of 1.18% and a fidelity level of 1.12% (Table 3).

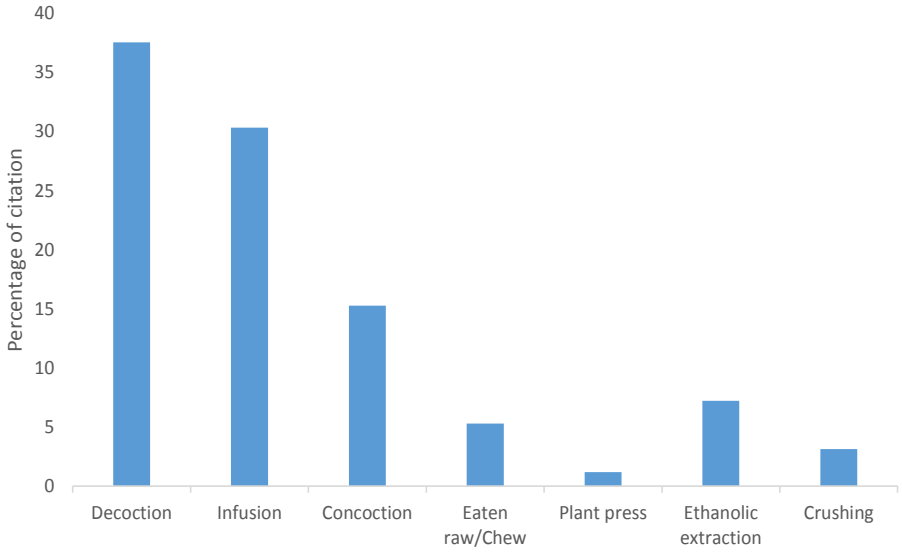

Figure 3. Methods of plant preparation for female sexual dysfunction and infertility

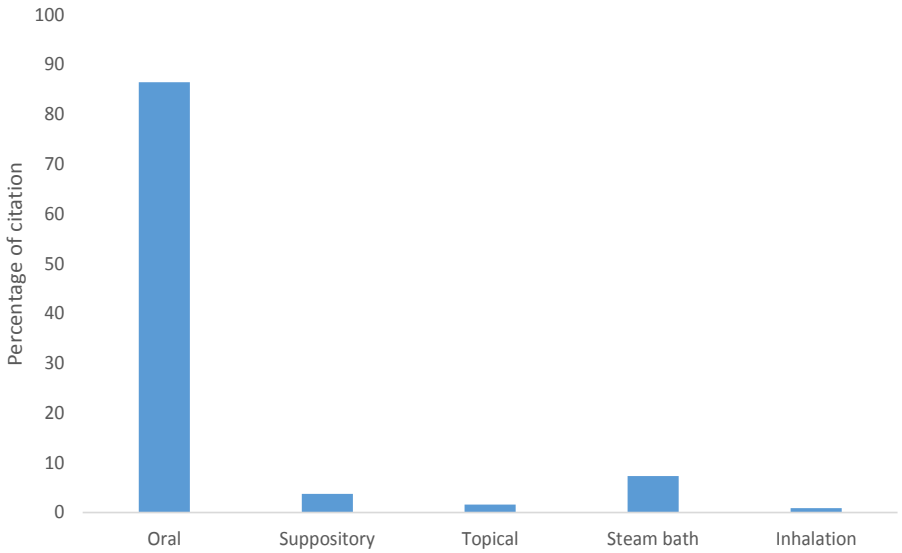

Figure 4. Route of administration for the management of female sexual dysfunction and infertility

Table 3. Medicinal plants used for the treatment of female sexual dysfunction and infertility

S/N	Botanical name	Family name	Common name	Local name(s)	Plant part used	Voucher number	Number of citations	Frequency of citation	Fidelity level
1	*Phyllanthus amarus* Schum & Thonn	Phyllanthaceae	Gale of wind	Eyin olobe	Leaf	UILH/1051	27	31.76	57.75
2	*Sarcocephalus latifolius* (Sm.) E.A.Bruce	Rubiaceae	African peach	Egbesi	Root	UILH/506	19	22.35	40.63
3	*Asclepias syriaca* L.	Apocynaceae	Common milkweed	Modun moro	Bark	UILH/952	18	21.18	38.51
4	*Anogeissus leiocarpus* (DC.) Guill. & Perr	Combretacea	African birch	Ayin / Marke/ Atara	Root	UILH/854	15	17.65	32.09

5	*Cassia fistula* L.	Leguminosae	Purging cassia	Aidan toro	Root	UILH/528	15	17.65	29.42
6	*Peperomia pellucida* L. Kunth	Piperaceae	English cow-foot	Ewe rinrin	Leaf	UILH/1373	15	17.65	23.53
7	*Vitellaria paradoxa* C.F. Gaertn	Sapotaceae	Shea butter	Emi gbegi	Shell and nut	UILH/1276	14	16.47	27.45
8	*Musa paradisiaca* L.	Musaceae	Plantain	Ogede	Fruit	UILH/1182	11	12.94	21.57
9	*Citrullus lanatus* (Thunb.)	Curcubitaceae	Watermelon	Elegede	Fruit	UILH/1149	10	11.76	18.18
10	*Acacia nilotica*	Leguminosae	Egyptian mimosa	Baani/ booni/gab-aruwa	Seed	UILH/1174	8	9.41	17.11
11	*Citrullus colocynthis* L. (Schrad.)	Curcubitaceae	Apple, Wild Gourd	Bara / Egusi elili	Seed	UILH/1056	8	9.41	15.68
12	*Garcinia kola* Heckel	Clusiaceae	Bitter kola	Orogbo	Seed	UILH/1268	8	9.41	14.48
13	*Senna alata* L. (Roxb.)	Leguminosae	Ringworm plant	Asunwon	Leaf and flower	UILH/1069	8	9.41	14.48
14	*Acanthospermum hispidum* DC.	Compositae	Goat's head	Dagunro	Leaf	UILH/1153	7	8.24	14.98
15	*Carpolobia lutea* G. Don	Polygalaceae	Cattle stick	Osunsun	Bark	UILH/1424	7	8.24	13.73
16	*Hybanthus enneaspermus* L. F. Muell	Violaceae	Spade flower	Abiwere	Leaf	UILH/1092	7	8.24	12.68
17	*Newbouldia laevis* (P.Beauv) seem.	Bignoniaceae	Fertility tree	Akoko	Leaf	UILH/1323	7	8.24	12.68
18	*Rauvolfia vomitoria* Afzel.	Apocynaceae	Devil peppers	Asun feyeje	Root	UILH/981	7	8.24	13.73
19	*Tetrapleura tetraptera* (Schum. & Thonn.)	Leguminosae	Aidan tree	Aidan/ Uhio	Seed and leaf	UILH/1131	7	8.24	12.68
20	*Vernonia amygdalina* Delile	Compositae	Bitter leaf	Ewuro	Leaf	UILH/1023	6	7.06	10.66
21	*Annona senegalensis Pers.*	Annonaceae	African custard apple	Abo / Gwan-da-daji	Leaf	UILH/499	6	7.06	11.15
22	*Terminalia glaucescens* Planch.	Combretacea	Tropical carpet grass	Idi / báúshe/ èdò	Root	UILH/1039	6	7.06	9.92
23	*Bambusa vulgaris* Schrad.	Poaceae	Bamboo	Oparun	Leaf	UILH/714	5	5.88	10.69
24	*Cnestis ferruginea* Vahl ex DC.	Connaraceae	Alum plant	Gboyin gboyin, Fura amarya	Root	UILH/1034	5	5.88	10.69
25	*Euphorbia deightonii* Croizat	Euphorbiaceae	Spurge	Oro agogo	Seed	UILH/1423	5	5.88	9.05
26	*Gnetum africanum* Welw.	Gnetaceae	African jointfir	Jenfoko	Leaf	UILH/568	5	5.88	9.05
27	*Aframomum melengueta* K. Schum.	Zingiberaceae	Alligator pepper	Atare	Leaf	UILH/1166	4	4.71	8.56
28	*Citrus aurantiifolia*	Rutacea	Lime	Osan-wewe	Root	UILH/1059	4	4.71	7.85
29	*Rourea coccinea* (Schum & Thonn) Benth	Connaraceae	Crimson thyme	Amuje wewe	Leaf	UILH/729	4	4.71	6.17

30	*Datura stramonium* L.	Solanaceae	Jimson weed	Gegemu	Root	UILH/1256	3	3.53	5.43
31	*Massularia acuminata* (G.Don) Bullock ex Hoyle	Rubiaceae	Chewing stick	Pako ijebu	Stem	UILH/1090	3	3.53	5.88
32	*Solanum macrocapon* L.	Solanaceae	African eggplant	Igba	Shell	UILH/1045	3	3.53	5.88
33	*Aspilia africana* (Pers.) C.D. Adams	Compositae	Bush marigold	Yunyun	Leaf	UILH/371	2	2.35	4.27
34	*Merremia dissecta* (Jacq.) Hallier f.	Convulvulaceae	Alamo Vine	Alamo	Seed and fruit	UILH/1380	2	2.35	3.92
35	*Nicotiana tabacum* L.	Solanaceae	Tobacco	Taba	Leaf	UILH/504	2	2.35	3.61
36	*Olax subscorpioidea* Oliv.	Olacaceae	Breadfruit	Ifon /Berefurutu	Root	UILH/722	2	2.35	3.77
37	*Syzygium aromaticum* L.	Myrtaceae	Clove	Kanafuru	Seed	UILH/1107	2	2.35	3.77
38	*Abelmoschus esculentus* L. (Moench)	Malvaceae	Okro	Ila	Leaf	UILH/1421	1	1.18	2.14
39	*Curcuma longa* L.	Zingiberaceae	Turmeric	Ata ile pupa	Root	UILH/1105	1	1.18	2.15
40	*Glyphaea brevis* (Speng.) Monarch	Malvaceae	Monachino	Atorin	Bark	UILH/783	1	1.18	1.69
41	*Holarrhena floribunda* (G. Don) T. Durand & Schinz	Apocyanaceae	False rubber tree	Dagba	Melon	UILH/787	1	1.18	1.55
42	*Jatropha curcas* L.	Euphorbiaceae	Physic nut	Lapalapa	Leaf	UILH/1030	1	1.18	1.97
43	*Persea americana*	Lauraceae	Avocado pear	Eero igba	Seed	UILH/747	1	1.18	1.97
44	*Spermacoce verticillata* L.	Rubiaceae	Shrubby false buttonwood	Irawo ile	Bark	UILH/767	1	1.18	1.55
45	*Vangueria agrestis* Schweinf. ex Hiern	Rubiaceae	Black aphrodisiac	Bakin gagai	Stem	UILH/955	1	1.18	1.39
46	*Viscum album* L.	Santalaceae	Mistletoe	Afomo	Whole plant	UILH/1210	1	1.18	1.35
47	*Xylopia aethiopica* (Dunal.) A. Rich	Annonaceae	Ethiopian pepper	Edun alamo	Seed	UILH/1089	1	1.18	1.12

Informant consensus factor

The most cited plants from Shao market, Jimba-Oja and Oke-Oyi were *P. amarus, Sarcocephalus latifolius* (Sm.) E.A.Bruce and *Cassia fistula* L., respectively. The highest ICF value computed was 0.93 from Shao market while the least ICF computed was 0.57 from Jimba-Oja (Table 4). Similarly, the least cited plants were *Persea Americana* Mill., *Viscum album* L. and *X. aethiopica* with ICF values of 0.05, 0.12 and 0.00 respectively (Table 4).

Table 4. Informant consensus factor from the three major study area

Study area	Most cited plant	ICF	Least cited plant	ICF
Shao market	*Phyllanthus amarus*	0.93	*Persea americana*	0.05
Jimba-Oja	*Sarcocephalus latifolius*	0.57	*Viscum album*	0.12
Oke-Oyi	*Cassia fistula*	0.84	*Xylopia aethiopica*	0.00

Available evidence of scientific research

The available evidence in open-scientific literature supporting or refuting the traditional claims on the use of the documented plants for FSDI are summarized in Table 5.

Table 5. Available evidence of scientific research

S/N	Plants	Phytochemical constituent(s)	Reported studies supporting or refuting traditional claims
1	*Phyllanthus amarus* Schum & Thonn	Alkaloids, flavonoids, steroids, saponins and tannins [51]	Restoration of sexual competence; attenuation of fluoxetine-induced anti-estrogenic activity [41,42]
2	*Sarcocephalus latifolius* (Sm.) E.A.Bruce	Alkaloids, saponins, tannins and glycosides [52]	-
3	*Asclepias syriaca* L.	Quercetin and glycosides [53]	Not available
4	*Anogeissus leiocarpus* (DC.) Guill. & Perr	Saponins, steroids, phenols, glycosides and alkaloids [54]	Prolongation of estrus cycle and hormonal upregulation [55]
5	*Cassia fistula* L.	Tannins, flavonoids, saponins and glycosides [56]	Antiestrogenic and anti-implantation activity [57]
6	*Peperomia pellucida* L. Kunth	Alkaloids, flavonoids, steroid, glycosides and terpenoids [58]	-
7	*Vitellaria paradoxa* C.F. Gaertn	Alkaloids, phenols, saponins, tannins and polyphenols [59]	-
8	*Musa paradisiaca* L.	Alkaloids, tannins, phenolics, flavonoids and steroids [60]	Antiovulatory and estrogenic activity [61]
9	*Citrullus lanatus* (Thunb.)	Saponins, flavonoids, lycopene and citrulline [62]	Enhanced sexual behavior, improved histoarchitecture of ovary and uterus [62]
10	*Acacia nilotica*	Terpenoids, tannins, alkaloids, saponins and glycosides [63]	Suppression of ovulatory activities and induction of follicular atresia [64]
11	*Citrullus colocynthis* L. (Schrad.)	Quercetin, isosaponarian, myricetin and isovitexin [65]	Improved follicular morphometric disorder in rats induced into polycystic ovarian syndrome state [66]
12	*Garcinia kola* Heckel	Saponins, phenolics, tannins, alkaloids and glycosides [67]	Altered estrous cycle, inhibits ovulation and teratogenic [68,69]
13	*Senna alata* L. (Roxb.)	Saponins, flavonoids, phenolics, alkaloids and cardiac glycosides [70]	Anti-implantation, antigonadotropic and fetotoxic activity [71]
14	*Acanthospermum hispidum* DC.	Alkaloids, saponins, tannins, flavonoids and terpenoids [72]	Abortifacient and teratogenic activity [73]
15	*Carpolobia lutea* G. Don	Terpenoids, polyphenols, alkaloids and saponins [74]	Contraceptive and antiestrogenic activity [74]
16	*Hybanthus enneas-permus* L. F. Muell	Flavonoids, phenols, saponins, glycosides and tannins [75]	Profertility [76]
17	*Newbouldia laevis* (P.Beauv) seem.	Carotenoids, flavonoids, tannins, flavonoids and alkaloids [77]	-
18	*Rauvolfia vomitoria* Afzel.	Alkaloids, saponins, tannins and flavonoids [78]	-
19	*Tetrapleura tetraptera* (Schum. & Thonn.)	Flavonoids, alkaloids, tannins, saponins, steroids, terpenoids and phenols [79]	Impairment of reproductive hormones, estrus cycle and fertility parameters [80,81]
20	*Vernonia amygdalina* Delile	Saponins, tannins, alkaloids, flavonoids and terpenoids [82]	-
21	*Annona senegalensis* Pers.	Terpenoids, saponins, tannins, alkaloids and phenolics [83]	Antifertility effects [83]
22	*Terminalia glaucescens* Planch.	Triterpenes, saponins, alkaloids and phenolics [84]	-

23	*Bambusa vulgaris* Schrad.	Polyphenols, flavonoids, catechins, alkaloids and saponins [85]	Abortifacient activity [86]
24	*Cnestis ferruginea* Vahl ex DC.	Saponin, flavonoids, cardiac glycosides and tannins [87]	-
25	*Euphorbia deightonii* Croizat	Not available	-
26	*Gnetum africanum* Welw.	Tannins, steroids and saponins [88]	Phytoestrogenic [89]
27	*Aframomum melengueta* K. Schum.	Gingerinone, diaryheptanoids, dihydrogingerinone A and B, hydroxyphenylalkanone [90]	Anti-estrogenic activity *in silico* [90]
28	*Citrus aurantiifolia*	N-Methyltyramine, limonene, caneil, linalool, terpinene, citral and pinene [91]	Irregular estrous cycle, deleterious effect on fetal development and female reproductive histology [92,93]
29	*Rourea coccinea* (Schum & Thonn)	Flavonoids, alkaloids and saponins [94]	-
30	*Datura stramonium* L.	Glycosides, saponins, tannins, phenols and lignins [95]	Antiestrogenic and antiovulatory [96]
31	*Massularia acuminata* (G.Don) Bullock ex Hoyle	Triterpenoids, phenolics, gallic acid and flavonoids [97]	-
32	*Solanum macrocapon* L.	Alkaloids, tannins, saponins and coumarins	-
33	*Aspilia africana* (Pers.) C.D. Adams	Alkaloids, glycosides, tannins, saponins, flavonoids and resins [98]	Contraceptive, alteration of estrus cycle and derangement of oocytes and uterine tissues [99,100]
34	*Merremia dissecta* (Jacq.) Hallier f.	Alkaloids, glycosides, tannins saponins, and steroids [101]	-
35	*Nicotiana tabacum* L.	Flavonoids, saponins, tannins, reducing sugar [102]	-
36	*Olax subscorpioidea* Oliv.	Saponins, tannins, cardiac glycosides, flavonoids, alkaloids [103]	-
37	*Syzygium aromaticum* L.	Eugenol, phlobatannins, saponins and flavonoids [104]	Prevents oocyte vitrification and improve blastocyte formation [105]
38	*Abelmoschus esculentus* L. (Moench)	Tannins, steroid, flavonoids, saponins, alkaloids, phenols, and cardiac glycosides [106]	Reduction of follicular atresia with improved ovarian function [107]
39	*Curcuma longa* L.	Carbohydrates, flavonoids, saponins and tannins [108]	Antifertility and contraceptive activities [109,110]
40	*Glyphaea brevis* (Speng.) Monarch	Ferulic, catechuic, flavanols and coumaric acids [111]	-
41	*Holarrhena floribunda* (G. Don) T. Durand & Schinz	Conessine, alkaloids, phenols, saponins and terpenoids [112]	Enhancement of female sex hormones with normal follicle and oocytes [113,114]
42	*Jatropha curcas* L.	Flavonoids, steroids, tannins, triterpenoid and saponins [115]	Anti-implantation, antifertility and abortifacient activities [116,117]
43	*Persea americana*	Alkaloids, glycosides, steroids and triterpenoids [118]	Profertility, anti-endometriosis [119–121]
44	*Spermacoce verticillata* L.	Alkaloids, flavonoids, tannins, saponins and terpenoids [122]	-
45	*Vangueria agrestis* Schweinf. ex Hiern	Phenolic acids, flavonoids and terpene glycosides [123]	-
46	*Viscum album* L.	Coumarins, alkaloids, tannins, flavonoids, glycosides, emodin and reducing sugar [124]	Restoration of polycystic ovarian syndrome conditions [125]
47	*Xylopia aethiopica* (Dunal.) A. Rich	Saponins, alkaloids, tannins, saponins and flavonoids [126]	Pregnancy termination [127]

Key: - There's dearth of scientific information supporting or refuting the traditional claims reported in this study

Discussion

The present study highlights the broad spectrum of plants used for the management or treatment of FSDI in Ilorin, Nigeria. In African culture, a public discussion of sex and related problems is attributed to shamelessness. Such societal belief makes it difficult for people to discuss their problem or ask for help where necessary. A total of 85 respondents of reliable knowledge and character who play vital roles such as councillors, midwives and healers in the community participated in the survey. Most of the respondents (67%) were female which can be attributed to the gender specificity of the survey (FSDI). However, the male respondents (33%) also elicited a wide range of knowledge and understanding about the condition which implies that the women are not completely alone with their problems as the males demonstrate interest and are supportive. Similarly, most of the respondents (90.60%) were educated which might explain the level of interest expressed by the male respondents (to understand a female problem) as education will help in straightening their opinion and bias towards gender inequality. This is similar to the findings of Umair *et al*. [30] where 80.06% of the respondents had some level of education. Also, majority of the respondents were older than 40 years which is a fair indicator of their experience, knowledge and duration of practice as early marriage is a common practice in Ilorin [31].

Furthermore, the sexual alertness of most of the respondents was high as 67.06% reported a sexual activity frequency of 3 times or more weekly whereas 10.59% reported a sexual activity frequency of once per month or longer. Interestingly, age was not a limiting factor for sexual alertness as most of the respondents above 60 years were reported to be moderately active. The fecundity of the Ilorin clan was corroborated by the fact that 98.82% of the respondents were able to produce offspring while their awareness of FSDI as a global problem was highlighted by the fact that approximately three-quarter of the correspondents had treated or received treatment for FSDI at a particular point of their life thereby proffering credence for the authenticity of their information.

Unsurprisingly, a quarter of the respondents declared that they do not intend to transfer their knowledge probably due to the sensitivity of the topic or to protect trade secrets that have been in their family line for generations [32]. However, 44.71% of the respondents would prefer to transfer knowledge through an apprentice who must have served them for 10 years or more. This particular trend and belief in knowledge transfer had contributed a lot to the loss of knowledge over generations as most apprentices lack the patience to complete their training while the offspring have shown little interest in acquiring folkloric knowledge [32] as evidenced by the findings from our survey. Such lack of interest could be attributed to socio-cultural changes, availability of orthodox medicine as well as the increase in digitalization which provides a haven for many youths to interact and escape from the realities of the real world around them. This finding was in contrast to the study reported by Kidane *et al*. [33] and Nguyen *et al*. [34] where vertical transmission (between

family i.e parent to children) was the preferred means of knowledge transfer.

Fertility and sexual problems is a global problem that has plagued many women most of whom suffer in silence and cannot express their sexual desires or difficulties due to various insecurities such as name tags (whore, slut, etc.), gender inequality, religious belief, cultural bias amongst others [35,36]. Anorgasmia was the most cited type of female sexual dysfunction managed or treated which can be attributed to the age group of the sample population.

Rubiaceae and Leguminosae were the most cited families with 4 species each. Previous studies by Sharma *et al*. [37], Chassagne *et al*. [38] and Kidane *et al*. [33] also reported Leguminosae as the most cited plant family. This might be due to its wide spread growth and broad range of species as it is the third largest plant family.

The fidelity level was an index to measure the most favoured plant species for the management or treatment of FSDI by the indigenous people of Ilorin. *P. amarus* had the highest fidelity level which might be attributed to the popularity of the plant amongst the population of the study area and/or availability of the plant [39]. Plant species having high fidelity level are usually considered as important for biological, chemical and pharmacological studies to authenticate their validity for the production of novel drugs and herbal products [30,39]. Hence, it is no surprise that several scientific studies such as antimalarial activity [40], female sexual dysfunction [41,42], hepatotoxicity and nephrotoxicity [43], antiallergic [44], antidiabetic [45], antioxidant [46], anti-inflammatory and antinociceptive activity [47], antitumor and anticarcinogenic activity [48] have been reported on the plant. Three different plants (*P. amarus*, *S. latifolius* and *C. fistula*) were cited at the three different study areas (Shao, Jimba-Oja and Oke-Oyi) as the most commonly used plants for FSDI. The values of ICF computed in the present study are relatively high which is suggestive of a wide knowledge base and practice amongst the respondents. Also, the variation in choice of plants across the study area is a function of availability and dispersal of ethnomedicinal plants.

Our findings revealed that the leaf was the most reported plant part used for the management or treatment of FSDI. This can be attributed to the abundance of bioactive secondary metabolites as the leaf is the major organ for photosynthesis and act as a storage site for exudates or photosynthates some of which are beneficial to human health [30,49]. Furthermore, harvesting of leaves is non-destructive and thus, has no detrimental effect on the survival of medicinal plants whereas other parts like the root, stem and whole plant are destructive which can have a negative impact on plant survival [33]. Also, several studies have reported the use of leaves as the most preferred part for the treatment of various human diseases [30,33,34,50].

Of the 7 methods of preparation reported in this study, decoction (plant parts used are boiled in water until 25% of the original volume is left) was the most cited method of herbal preparation. Previous studies by Chassagne et al. [38], Umair et al. [30] and Nguyen et al. [34] also reported decoction as the most preferred choice of preparation. Similarly, oral administration was

the most cited route of administration while other methods like suppository, topical, inhalation and steambath were also reported. This finding was in compliance with several other previous studies [30,33,34].

The present study did not investigate the use of the plants cited in the management of other ailments in Ilorin. Also, the potency of each of the plants cited was not evaluated with scientific research as it is beyond the scope of the present study.

Conclusion

The present study reported 47 medicinal herbs used by the Ilorin District of Kwara State for the management/treatment of FSDI most of which are yet to be substantiated or refuted with scientific evidence. Hence, the documentation of medicinal plants would enable the forthcoming phytochemical and pharmacological studies necessary to provide bioactive agents that could serve as lead to drug discovery and facilitate the conservation of knowledge. Apparently, herbal medicine is highly relevant and reliable for the management of various ailments particularly FSDI in the health care system of many local people. The survival of folkloric knowledge is increasingly threatened by the lack of interest and over dependence on orthodox medicine most of which are unavailable, expensive and faulted by known complications. Creation of a digital knowledge database, implementation or introduction of policies to promote forestation over deforestation (to mitigate bush burning for firewood and charcoal), control animal migration (to prevent overgrazing) and urbanization could be applied for the conservation of herbal medicinal plants thereby creating more awareness and interest in learning about them.

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Conflict of Interests

The authors declare no conflict of interest.

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References

[1] Rakshith KR, Sinha K, LA VK. Yogic intervention in sexual dysfunction-a review. J Ayurveda Integr Med Sci 2017;2:243-250.

[2] Deyhoul N, Mohamaddoost T, Hosseini M. Infertility-related risk factors: a systematic review. Int J Womens Heal Reprod Sci 2017;5:24-29.

[3] Sudha G, Reddy KSN. Causes of female infertility: a cross-sectional study. Int J Latest Res Sci Technol 2013;2:119-123.

[4] Abarikwu SO. Causes and risk factors for male-factor infertility in Nigeria: a review. Afr J Reprod Health 2013;17:150-166.

[5] Fajewonyomi BA, Orji EO, Adeyemo AO. Sexual dysfunction among female patients of reproductive age in a hospital setting in Nigeria. J Health Popul Nutr 2007;25:101-106.

[6] Lewis RW, Fugl-Meyer KS, Bosch R, Fugl-Meyer AR, Laumann EO, et al. Epidemiology/risk factors of sexual dysfunction. J Sex Med 2004;1:35-39.

[7] Masters WH, Johnson VE. The sexual response cycle of the human female III. The clitoris: anatomic and clinical consideration. West J Surg Obstet & Gynecol 1962;70:248-257.

[8] American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. Washington DC 2013; p 21.

[9] Basson R, Wierman ME, Van Lankveld J, Brotto L. Summary of the recommendations on sexual dysfunctions in women. J Sex Med 2010;7:314-326.

[10] Nicolosi A, Buvat J, Glasser DB, Hartmann U, Laumann EO, et al. Sexual behaviour, sexual dysfunctions and related help seeking patterns in middle-aged and elderly Europeans: the global study of sexual attitudes and behaviors. World J Urol 2006;24:423-428.
[11] Ohl LE. Essentials of female sexual dysfunction from a sex therapy perspective. Urol Nurs 2007;27:57-63.
[12] Nappi RE, Albani F, Santamaria V, Tonani S, Martini E, et al. Menopause and sexual desire: the role of testosterone. Menopause Int 2010;16:162-168.
[13] Schairer LC, Foley FW, Zemon V, Tyry T, Campagnolo D, et al. The impact of sexual dysfunction on health-related quality of life in people with multiple sclerosis. Mult Scler J 2014;20:610-616.
[14] Olarinoye J, Olarinoye A. Determinants of sexual function among women with type 2 diabetes in a Nigerian population. J Sex Med 2008;5:878-886.
[15] Ogbera AO, Chinenye S, Akinlade A, Eregie A, Awobusuyi J. Frequency and correlates of sexual dysfunction in women with diabetes mellitus. J Sex Med 2009;6:3401-3406.
[16] Berg RC, Denison E. Does female genital mutilation/cutting (FGM/C) affect women's sexual functioning? A systematic review of the sexual consequences of FGM/C. Sex Res Soc Policy 2012;9:41-56.
[17] Hafez ESE, Hafez SD. Erectile dysfunction: anatomical parameters, etiology, diagnosis, and therapy. Arch Androl 2005;51:15-31.
[18] Ambler DR, Bieber EJ, Diamond MP. Sexual function in elderly women: a review of current literature. Rev Obstet Gynecol 2012;5:16.
[19] Oehninger S. Strategies for the infertile man. Semin Reprod Med 2001;19:231-238.
[20] Venkatesh S, Deecaraman M, Kumar R, Shamsi MB, Dada R. Role of reactive oxygen species in the pathogenesis of mitochondrial DNA (mtDNA) mutations in male infertility. Indian J Med Res 2009;129:127-137.
[21] Babangida I, Ukwuani-kwaja AN, Sulaimon F, Malami I, Muhammad A, et al. An inventory of medicinal plants used for treatment of cancer in Kwara and Lagos state, Nigeria. Eur J Integr Med 2020;34:101062.
[22] Bahmani M, Nejad MAS, Shah NA, Shah SA, Rafieian-kopaei M, et al. Survey on ethnobotanical uses of anti-cancer herbs in Southern region of Ilam, West Iran. J Biol Res 2017;90:19-25.
[23] Asadbeigi M, Mohammadi T, Rafieian-kopaei M, Saki K, Bahmani M. Traditional effects of medicinal plants in the treatment of respiratory diseases and disorders: an ethnobotanical study in the Urmia. Asian Pac J Trop Med 2014;7:364-368.
[24] Nejad M, Bahmani M, Shah N, Shah SA, Rafieian-kopaei M. Beliefs of herbal therapies of the community of the Ilam city of Ilam province, Iran. J Pharm Pharmacogn Res 2018;6:299-317.
[25] Idu M, Oghale O, Hauwa GJ. Ethnomedicinal survey of plants used in the treatment of female infertility in chanchaga Niger state, Nigeria. Marmara Pharm J 2016;20:269-274.
[26] Burkill HM. The useful plants of West Tropical Africa. Vol. 1. Families AD. Royal Botanic Gardens 1985.
[27] Shinkafi TS, Bello L, Hassan SW, Ali S. An ethnobotanical survey of antidiabetic plants used by Hausa–Fulani tribes in Sokoto, Northwest Nigeria. J Ethnopharmacol 2015;172:91-99.
[28] Ngoua-Meye-Misso R-L, Sima-Obiang C, Ndong JDLC, Ndong-Atome G-R, Ondo JP, et al. Medicinal plants used in management of cancer and other related diseases in Woleu-Ntem province, Gabon. Eur J Integr Med 2019;29:100924.
[29] Mesfin F, Demissew S, Teklehaymanot T. An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. J Ethnobiol Ethnomed 2009;5:1-18.
[30] Umair M, Altaf M, Bussmann RW, Abbasi AM. Ethnomedicinal uses of the local flora in Chenab riverine area, Punjab province Pakistan. J Ethnobiol Ethnomed 2019;15:1-31.
[31] Nuhu FT, Nuhu ST. Opinions and attitudes of some parents in Ilorin, north-central Nigeria, towards child abuse and neglect. South African J Psychiatry 2010;16:27-32.
[32] Weldegerima B. Review on the importance of documenting ethnopharmacological information on medicinal plants. African J Pharm Pharmacol 2009;3:400-403.
[33] Kidane L, Gebremedhin G, Beyene T. Ethnobotanical study of medicinal plants in Ganta Afeshum District, Eastern Zone of Tigray, Northern Ethiopia. J Ethnobiol Ethnomed 2018;14:1-19.
[34] Nguyen XMA, Bun SS, Ollivier E, Dang TPT. Ethnobotanical study of medicinal plants used by K'Ho-Cil people for treatment of diarrhea in Lam Dong Province, Vietnam. J Herb Med 2020;19:100320.
[35] Najafabady MT, Salmani Z, Abedi P. Prevalence and related factors for anorgasmia among reproductive aged women in Hesarak, Iran. Clinics (Sao Paulo) 2011;66:83-86.
[36] Ojomu F, Thacher T, Obadofin M. Sexual problems among married Nigerian women. Int J Impot Res 2007;19:310-16.
[37] Sharma J, Gairola S, Sharma YP, Gaur RD. Ethnomedicinal plants used to treat skin diseases by Tharu community of district Udham Singh Nagar, Uttarakhand, India. J Ethnopharmacol 2014;158:140-206.
[38] Chassagne F, Hul S, Deharo E, Bourdy G. Natural remedies used by Bunong people in Mondulkiri province (Northeast Cambodia) with special reference to the treatment of 11 most common ailments. J Ethnopharmacol 2016;191:41-70.
[39] Altaf M, Javid A, Umair M, Iqbal KJ, Rasheed Z, et al. Ethnomedicinal and cultural practices of mammals and birds in the vicinity of river Chenab, Punjab-Pakistan. J Ethnobiol Ethnomed 2017;13:1-24.
[40] Ojezele MO, Moke EG, Onyesom I. Impact of generic antimalarial or Phyllanthus amarus and vitamin co-administration on antioxidant status of experimental mice infested with Plasmodium berghei. Beni-Suef Univ J Basic Appl Sci

2017;6:260-265.
[41] Nurudeen QO, Yakubu MT. Aqueous extract of Phyllanthus amarus Schum & Thonn leaves attenuated the alterations in fluoxetine-induced anti-oestrogenic activity in female wistar rats. Trop J Nat Prod Res 2020;4:310-314.
[42] Nurudeen QO, Yakubu MT. Aqueous extract of Phyllanthus amarus leaves restores sexual competence in female rats induced into sexual dysfunction by fluoxetine. Niger J Biochem Mol Biol 2016;31:1-14.
[43] Ogunmoyole T, Awodooju M, Idowu S, Daramola O. Phyllanthus amarus extract restored deranged biochemical parameters in rat model of hepatotoxicity and nephrotoxicity. Heliyon 2020;6:e05670.
[44] Abd Rani NZ, Lam KW, Jalil J, Mohamad HF, Mat Ali MS, et al. Mechanistic studies of the antiallergic activity of Phyllanthus amarus Schum. & Thonn. and its compounds. Molecules 2021;26:695.
[45] Oyewole IO, Taiwo AO, Quadri ON. Evaluation of hypoglycemic efficacy of methanolic extracts of moringa oleifera and Phyllanthus amarus in diabetic rats. Biotechnol J Int 2015:98-102.
[46] Hamid S, Andrabi SAH, Shahnaz N. Hand hygiene amongst health workers in a teaching hospital: a study of knowledge, attitude and practices. Pacific J Med Sci 2018;18:35-41.
[47] Adedapo AA, Ofuegbe SO. Anti-inflammatory and antinociceptive activities of the aqueous leaf extract of Phyllanthus amarus Schum (Euphorbiaceae) in some laboratory animals. J Basic Clin Physiol Pharmacol 2015;26:89-94.
[48] Rajeshkumar NV, Joy KL, Kuttan G, Ramsewak RS, Nair MG, et al. Antitumour and anticarcinogenic activity of Phyllanthus amarus extract. J Ethnopharmacol 2002;81:17-22.
[49] Ahmad M, Sultana S, Fazl-i-Hadi S, Ben Hadda T, Rashid S, et al. An ethnobotanical study of medicinal plants in high mountainous region of chail valley (district Swat-Pakistan). J Ethnobiol Ethnomed 2014;10:1-18.
[50] Chekole G. Ethnobotanical study of medicinal plants used against human ailments in Gubalafto district, Northern Ethiopia. J Ethnobiol Ethnomed 2017;13:1-29.
[51] Nurudeen QO, Yakubu MT. Phytochemical composition, mineral contents and amino acid profile of Phyllanthus amarus leaves. Al-Hikmah J Pure Appl Sci 2015;1:1-7.
[52] Godwin OE, Egwaikhide PA, Etim EE. Phytochemical and antimicrobial properties of African peach (Sarcocephalus latifolius). Org Med Chem Int J 2020;9:198-204.
[53] Sikorska M, Matlawska I. Quercetin and its glycosides in the flowers of Aslepias syriaca L. Acta Pol Pharm Drug Res 2000;57:321-324.
[54] Mann A, Yahaya Y, Banso A, Ajayi GO. Phytochemical and antibacterial screening of Anogeissus leiocarpus against some microorganisms associated with infectious wounds. African J Microbiol Res 2008;2:60-62.
[55] Jibril MM, Adeniyi OS, Rayyanu ZS. Effects of aqueous stem bark extract of Anogeissus leiocarpus on the serum levels of progestin and estradiol and the estrous cycle of wistar rat. Acad Anat Int 2016;2:53-56.
[56] Mandlol R, Solanki P, Chouhan R, Baviskar M. Phytochemical screening of Cassia fistula bark and leaves ethanolic extract and FTIR analysis. Int J Res Trends Innov 2018;3:1-5.
[57] Yadav R, Jain GC. Influence of Cassia fistula seeds extract on uterine histoarchitecture and biochemical constituents of ovariectomized female rats. Cibtech J Zool 2012;1:57-66.
[58] Tablang JO, Campos RPC, Jacob JKS. Phytochemical screening and antibacterial properties of silverbush (Peperomia pellucida) against selected cultured bacteria. Glob J Med Plant Res 2020;8:1-6.
[59] Ajijolakewu KA, Awarun FJ. Comparative antibacterial efficacy of Vitellaria paradoxa (shea butter tree) extracts against some clinical bacterial isolates. Not Sci Biol 2015;7:264-268.
[60] Yakubu MT, Nurudeen QO, Salimon SS, Yakubu MO, Jimoh RO, et al. Antidiarrhoeal activity of Musa paradisiaca sap in wistar rats. Evid Based Complement Alternat Med 2015;2015:683726.
[61] Soni P, Siddiqui AA, Dwivedi J, Soni V. Antiovulatory and estrogenic activity of stem of musa paradisiaca in female albino rats. J Appl Pharm Sci 2013;3:102-126.
[62] Anyanwu EG, Atuadu VO, Egwuatu AA, Christian E, Ozoemena CL, et al. Effect of ethanolic rind extract of Citrullus lanatus on hypothalamic-pituitary-gonadal axis structures , sexual behaviour and hormones of female Wistar rats. J Phamacognosy Phytochem 2021;10:60-65.
[63] Banso A. Phytochemical and antibacterial investigation of bark extracts of Acacia nilotica. J Med Plants Res 2009;3:82-85.
[64] Mwangengwa LM, Bakari GG, Kanuya NL, Max RA. Antifertility effects of crude extracts from Acacia nilotica pods and Albizia lebbeck stem bark in female multimammate rats. J Physiol Pathophysiol 2021;12:1-10.
[65] Benariba N, Djaziri R, Bellakhdar W, Belkacem N, Kadiata M, et al. Phytochemical screening and free radicalscavenging activity of Citrullus colocynthis seeds extract. Asian Pac J Trop Biomed 2013;3:35-40.
[66] Barzegar-Bafrouei MH, Khazali H, Kalantar SM, Khoradmehr A. Comparative effect of Citrullus colocynthis hydro-alcoholic extract and metformin on morphometric ovarian follicles disoreders in estradiol valerate induced-polycystic ovary syndrome rats. Galen Med J 2018;7:e1045.
[67] Ukaoma AA, Ukaoma VO, Okechukwu RI, Iwuagwu M. Phytochemical screening and antibacterial properties of Garcinia kola. J Phytopharm 2013;2:34-38.
[68] Akpantah AO, Oremosu AA, Noronha CC, Ekanem TB, Okanlawon AO. Effects of Garcinia kola seed extract on ovulation, oestrous cycle and foetal development in cyclic female sprague - dawley rats. Niger J Physiol Sci 2005;20:58-62.
[69] Essien GE, Nwafor PA. Anticonceptive, estrogenic and antiestrogenic potentials of methanol extract of Garcinia kola

seed in rodents. J Med Plants Res 2014;8:1237-1244.
[70] Adedayo O, Anderson WA, Moo-Young M, Snieckus V, Patil PA, et al. Phytochemistry and antibacterial activity of Senna alata flower. Pharm Biol 2001;39:408-412.
[71] Yakubu MT, Isa MF. Effects of post-coital administration of alkaloids from Senna alata (Linn. Roxb) leaves on some fetal and maternal outcomes of pregnant rats. J Reprod Infertil 2012;13:211-217.
[72] Roy H, Chakraborty A, Bhanja S, Nayak BS, Mishra SR, et al. Preliminary phytochemical investigation and anthelmintic activity of Acanthospermum hispidum DC. J Pharm Sci Technol 2010;2:217-221.
[73] Lemonica IP, Alvarenga CMD. Abortive and teratogenic effect of Acanthospermum hispidum DC. and Cajanus cajan (L.) Millps. in pregnant rats. J Ethnopharmacol 1994;43:39-44.
[74] Ettebong EO, Nwafor PA, Ekpo M, Ajibesin KK. Contraceptive, estrogenic and anti-estrogenic potentials of methanolic root extract of Carpolobia lutea in rodents. Pak J Pharm Sci 2011;24:445-449.
[75] Awobajo FO, Olatunji-Bello II, Adegoke OA, Odugbemi TO. Phytochemical and antimicrobial screening of Hybanthus enneaspermus and Paquetina nigricense. Recent Res Sci Technol 2009;1:159-160.
[76] Chandru G, Jayakumar K, Navaneethakannan D. Effect of raw extract of Hybanthus enneaspermus (L.) F. Muell. on the fertility test in female mice (Mus musculus L). World Sci News 2017;65:160-170.
[77] Ayoola AA, Yusuf AO, Oki DG. Phytochemical screening and proximate analysis of newbouldia laevis and allium sativum. Niger J Anim Sci 2016;18:242-256.
[78] Etim EI, Johnson EC, Bassey US, Nwafor PA. Phytochemical and aphrodisiac studies of ethanol root extract of Rauwolfia vomitoria Afzel (Apocynaceae). J Pharm Bioresour 2018;15:160-165.
[79] Adusei S, Otchere JK, Oteng P, Mensah RQ, Tei-Mensah E. Phytochemical analysis, antioxidant and metal chelating capacity of Tetrapleura tetraptera. Heliyon 2019;5:e02762.
[80] Adienbo OM, Ezeala OS. Disruption of ovarian utilisation of proteins by tetrapleuratetraptera fruit extract impairs estrous cycle and ovarian functions in female rats. J Adv Med Pharm Sci 2021;23:1-8.
[81] Adienbo OM, Ezeala OS. Tetrapleura tetraptera (Schum and Thonn) taub fruit extract impairs reproductive hormones and fertility parameters in female experimental rats. J Adv Med Pharm Sci 2021;23:27-33.
[82] Adeoye AT, Akinrinde AS, Oyagbemi AA, Omobowale TO, Adedapo ADA, et al. Phytochemical, analgesic, in-vitro anti-oxidant and GC-MS analysis of Vernonia amygdalina leaves. African J Biomed Res 2018;21:303-312.
[83] Okello OOP, David N, Oloro J. Anti-fertility activity of aqueous root bark extracts of asparagus africanus lam and annona senegalensis pers combination on female sprague dawley rats. African J Pharm Pharmacol 2019;13:12-16.
[84] Ogundiya MO, Kolapo AL, Okunade MB, Adejumobi JA. Assessment of phytochemical composition and antimicrobial activity of Terminalia glaucescens against some oral pathogens. Electron J Environ Agric Food Chem 2009;8:466-471.
[85] Abe AS, Amonkan KA, Djetouan KMJ, N'Da KP. Phytochemical and acute toxicity study of aqueous extract of Bambusa vulgaris leaves on wistar rats. African J Biol Sci 2020;2:107-114.
[86] Yakubu MT, Bukoye BB. Abortifacient potentials of the aqueous extract of Bambusa vulgaris leaves in pregnant Dutch rabbits. Contraception 2009;80:308-313.
[87] Enemor EC, Ngwoke KG, Gugu TH, Oli AN, Eze CO, et al. Phytochemical analysis and antimicrobial activity of ethanolic stem extracts of cnestis ferruginea on multidrug resistant bacteria isolated from raw retail meat sold in Awka, Nigeria. J Pharm Sci Res 2015;7:1044-1049.
[88] Akin-Osanaiye BC, Ekpeyong EJ, Olobayotan IW. Phytochemical and antimicrobial screening of Gnetum africanum stem and root. Int J Pathog Res 2019:3: IJPR51464.
[89] Udoh FV. Effect of Ethanolic extract from the leaf of Gnetum africanum on endocrine function in female rats. J Nat Sci Res 2012;2:67-71.
[90] El-Halawany AM, Hattori M. Anti-oestrogenic diarylheptanoids from Aframomum melegueta with in silico oestrogen receptor alpha binding conformation similar to enterodiol and enterolactone. Food Chem 2012;134:219-226.
[91] Jain S, Arora P, Popli H. A comprehensive review on Citrus aurantifolia essential oil: its phytochemistry and pharmacological aspects. Brazilian J Nat Sci 2020;3:354-364.
[92] Solomon IP, Oyebadejo SA, Ekong SI, Asuquo IE. Contraceptive effect of citrus aurantifolia juice vaginal douche on reproductive histomorphology of adult female wistar rats 2014;3:16-26.
[93] Salawu AA, Osinubi AAA, Dosumu OO, Kusemiju TO, Noronha CC, et al. Effect of the juice of lime (Citrus aurantifolia) on estrous cycle and ovulation of Sprague-Dawley rats. Endocr Pract 2010;16:561-565.
[94] Klotoé JR, Agbodjento E, Dougnon VT, Yovo M, Sacramento TI, et al. Exploration of the chemical potential and antioxidant activity of some plants used in the treatment of male infertility in southern Benin. J Pharm Res Int 2020;32:PRI.55591.
[95] Nain J, Bhatt S, Dhyani S, Joshi N. Phytochemical screening of secondary metabolites of Datura stramonium. Int J Curr Pharm Res 2013;5:151-153.
[96] Soni P, Siddiqui AA, Dwivedi J, Soni V. Antiovulatory and estrogenic activity of leaves of Datura stramonium Linn. in female albino rats. Asian J Pharm Res Heal Care 2013;5:65-71.
[97] Adeyemi A, Gromek K, Malmir M, Serrano R, Moody J, et al. Chemical profile, phenol content and antioxidant activity of Massularia acuminata, Rhaphiostylis beninensis, Telfairia occidentalis and Platostoma africanum. Planta Med 2014;80:P2B34.

[98] Ubaka MC, Ukwe VC, Okoye CT, Adibe OM. Investigation into the anti-ulcer activity of the aqueous leaf extract of Aspilia africana CD Adams. Asian J Med Sci 2010;2:40-43.
[99]Tejidos T, Estral SEC. Toxic effects of methanolic extract of Aspilia africana leaf on the estrous cycle and uterine tissues of Wistar rats. Int J Morphol 2007;25:609-614.
[100]Etim NN, Oguike MA. Effects of Aspilia africana on conception rates of rabbit does. Anim Reprod 2018;12:336-341.
[101]Joshi R, Meena R, Patni V. Comparative phytochemical analysis of bioactive constituents present in in vitro and in vivo plant parts of Merremia aegyptia and Merremia dissecta. J Pharmacogn Phytochem 2018;7:679-684.
[102]Kazeem MI, Ogungbe SM, Saibu GM, Aboyade OM. In vitro study on the hypoglycemic potential of Nicotiana tabacum leaf extracts. Bangladesh J Pharmacol 2014;9:140-145.
[103]Odoma S, Zezi AU, Danjuma NM, Ahmed A, Magaji MG. Elucidation of the possible mechanism of analgesic actions of butanol leaf fraction of Olax subscorpioidea Oliv. J Ethnopharmacol 2017;199:323-327.
[104]Amin M, Jassal MMS, Tygi S V. Phytochemical screening and isolation of eugenol from Syzygium aromaticum by gas chromatography. Int J Res Phytochem Pharmacol 2013;3:74-77.
[105]Bahmanpour S, Bakhtari A, Abouhamzeh B. Protective effect of vitrified-warmed media with clove bud (syzygium aromaticum) extract on mouse oocytes and resultant blastocysts. CryoLetters 2018;39:288-297.
[106] Abobaker DM, Edrah SM, Altwair K. Phytochemical screening of Abelmoschus esculentus from Leptis area at Al-Khums Libya. Int J Chem Sci 2017;1:48-53.
[107]Majd NE, Azizian H, Tabandeh MR, Shahriari A. Effect of Abelmoschus esculentus powder on ovarian histology, expression of apoptotic genes and oxidative stress in diabetic rats fed with high fat diet. Iran J Pharm Res 2019;18:369-382.
[108]Al-Daihan S, Al-Faham M, Al-shawi N, Almayman R, Brnawi A, et al. Antibacterial activity and phytochemical screening of some medicinal plants commonly used in Saudi Arabia against selected pathogenic microorganisms. J King Saud Univ 2013;25:115-120.
[109]Garg SK. Effect of Curcuma longa (rhizomes) on fertility in experimental animals. Planta Med 1974;26:225-227.
[110]Naz RK. Can curcumin provide an ideal contraceptive? Mol Reprod Dev 2011;78:116-123.
[111]Olugbodi JO, Tincho MB, Oguntibeju OO, Olaleye MT, Akinmoladun AC. Glyphaea brevis–in vitro antioxidant and in silico biological activity of major constituents and molecular docking analyses. Toxicol Vitr 2019;59:187-196.
[112]Patrice KM, Véronique PB, David L, François-Xavier E. Antibacterial activities of the extracts and conessine from Holarrhena floribunda G. Don.(Apocynaceae). African J Tradit Complement Altern Med 2007;4:352-356.
[113] Ekpe IP, Yisa BN. Effects of methanolic root extract of holarrhena floribunda on liver enzymes and histopathology of the ovaries and testes tissues in wistar rats. Asian J Res Reports Endocrinol 2019;AJRRE48706.
[114]Dennis A, Udosen EO, Ekam VS, Ekpe IP. Effects of methanolic root extract of holarrhena floribunda on the lipid profile and sex hormones in wistar rats. Asian J Res Biochem 2018;3: AJRB.46154.
[115]Uche FI, Aprioku JS. The phytochemical constituents, analgesic and anti-inflammatory effects of methanol extract of jatropha curcas leaves in mice and wister albino rats. J Appl Sci Environ Manag 2008;12:33-40.
[116]Alwi NA, Sukardi S. Anti implantation effects of Jatropha curcas crude oil when fed to pregnant Sprague dawley rats during the early gestation period. Adv Life Sci Technol 2013;14:547-549.
[117] Airaodion AI, Ogbuagu EO. Abortifacient properties of ethanolic leaf extract of Jatropha curcas Linn. in female wistar rats. Asian Res J Gynaecol Obstet 2020;4:ARJGO.59092.
[118]Rafique S, Akhtar N. Phytochemical analysis and antioxidant activity of Persia americana and Actinidia deliciosa fruit extracts by DPPH method. 2018;29:2459-2464.
[119]Minko Essono S, Mvondo MA, Ngadjui E, Kemka Nguimatio FX, Watcho P. The ethanol extract of avocado (Persea americana Mill.(Lauraceae)) seeds successfully induces implant regression and restores ovarian dynamic in a rat model of endometriosis. Evid Based Complement Alternat Med 2020;2020:8521831.
[120]Ali FA, Hasan HF. The ameliorative effects of Persia americana pulps alcoholic extract on fertility of female rats treated with cyclophosphoamide. Journal of Natural Sciences Research 2016;6:93-100.
[121]Orabueze IC, Babalola R, Azuonwu O, Okoko I-I, Asare G. Evaluation of possible effects of Persea americana seeds on female reproductive hormonal and toxicity profile. J Ethnopharmacol 2021;273:113870.
[122]Garba S, Adeyemi MM, Musa LK. Anthelmintic activities of hexacosa-9 , 11-dienoic acid and 3-hydroxyurs-12-en-28-oic acid isolated from spermacoce verticillata. Chem Sci Int J 2019;28:CSIJ.51053.
[123]Avula B, Bae J, Wang Y, Wang M, Osman AG, et al. Chemical profiling and characterization of phenolic acids, flavonoids, terpene glycosides from Vangueria agrestis using ultra-high-performance liquid chromatography/ion mobility quadrupole time-of-flight mass spectrometry and metabolomics approach. Biomed Chromatogr 2020;34:e4840.
[124]Shah SS, Rehman YU, Iqbal A, Rahman ZU, Zhou B, et al. Phytochemical screening and antimicrobial activities of stem , leaves and fruit extracts of Viscum album L. J Pure Appl Microbiol 2017;11:1337-1149.
[125]Oseni FA, Salau AK, Afolabi-Balogun NB, Balogun EA. Effects of aqueous extract of Viscum album (Linn.) leaf on some biochemical parameters and ovarian morphology of oestradiol valerate-induced polycystic ovarian syndrome rats. Int J Biol Chem Sci 2019;13:2521-2532.

[126]Aguoru CU, Pilla C, Olasan JO. Phytochemical screening of Xylopia aethiopica with emphasis on its medicinally active principles. J Med Plants Res 2016;10:306-309.
[127]Odesanmi OS, Olayemi A, Omotosho OE, Ogunlana OO, Onwuka F, et al. Effects of combinations of ethanolic extracts of Blighia sapida and Xylopia aethiopica on progesterone, estradiol and lipid profile levels in pregnant rabbits. Sci Res Essays 2013;8:969-972.