Medicinal plants used to treat and manage menopausal symptoms in Grand-Lahou and Katiola Districts, Cote d'Ivoire

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Research

Abstract

Background: Menopause is a natural physiological process, which can affect physical, psychological and social well-being, to varying degrees depending on the individual. This study aims to contribute to improving of women's health through knowledge of menopausal symptoms and the plants used in their treatment.

Methods: A survey was conducted from August 2016 to August 2017 in Grand-Lahou and Katiola Districts using a semi-structured interview with 267 women going through menopause and nine herbalists.

Results: We found that 25.14% of women in these two localities liable to menopausal symptoms between the age of 40 and 45. The majority of women (62.87%) were menopausal between 45 and 55 years old and 6.58% of them after 55 years old. It appears that these women's health was more affected by hot flashes, joint and muscle pains, headaches and palpitations. Among the women interviewed, 12.29% used modern medicine, 11.18% used traditional medicine and 11.17% used a combination of the two types of medicine. In 60.00% of cases, women who used traditional medicine obtained satisfaction. Of 32 medicinal plants cited for the treatment of menopausal symptoms, *Ocimum gratissimum* L. (Lamiaceae), *Khaya senegalensis* (Desv.) A. Juss. (Meliaceae) and *Landolphia owariensis* P. Beauv. (Apocynaceae) were the most widely used. The plant parts used in the different treatments are mainly the leaves (55.81%) and the stem bark (30.23%).

Conclusions: Ivorian flora abounds in plants that can play a role in the management of menopausal symptoms.

Keywords: Menopausal symptoms, plants, traditional care, Cote d'Ivoire

Background

Menopause is a period of natural hormonal transition in a woman's life. It is often accompanied by a series of faints (hot flashes, joint and muscle pain) that can affect the daily life of women. This is marked the transition from the reproductive phase to the non-reproductive phase and is accompanied by numerous changes that can affect 60 to 80% of women (Gomez-Santos *et al*. 2016, Lumsden & Sassarini 2019). The physiological changes caused by menopause, can put a woman's life in danger, are embarrassing and sometimes disabling (Thurston & Joffe 2011, Ko & Kim 2020). As per World Health Organization (1996), the number of menopausal women estimated at 467 million worldwide in 1990 is expected to reach 1.2 billion by 2030 (Karmakar *et al*. 2017). The proportion of women in menopause increases rapidly with age.

In Côte d'Ivoire, this proportion represents less than 1% between the ages of 30 and 34 and reaches 48% between the ages of 48 and 49 (INS & ICF 2023). In the past, menopausal problems were accepted as an inevitability that women did not talk about, but nowadays, complaints are clearly expressed (Diouf *et al*. 2014). Women are looking for holistic and appropriate care. Over the past decade, studies showed that conventional hormonal treatments can, in some cases, occasion more discomfort than benefit (Al-Safi & Santoro 2014, Raccah-Tebeka *et al*. 2021). Under these conditions and in addition to the high cost of clinical management, women often resort to other alternatives such as medicinal plants for relief (Fah *et al*. 2013, Raccah-Tebeka *et al*. 2021). For example, Pouamon's investigations (Pouamon 2017), carried out in the Treichville and Cocody university hospitals reveal that menopausal women leave gynaecological services after being diagnosed with health problems related to menopause. Instead, they resort to natural remedies, including phytotherapy products. They rely on traditional knowledge transmitted orally from generation to generation (Ranebaye *et al*. 2023) or on the prescriptions of herbalists and traditional therapists. The knowledge of traditional medicine is an important heritage for the populations. According to the WHO (2022), approximately 80% of people in Africa depend on traditional medical systems and indigenous knowledge to address their health care needs. Many studies have made it possible to inventory and catalogued several medicinal plants used in the ivorian pharmacopoeia to treat various pathologies (Tra Bi *et al*. 2008, Koulibaly *et al*. 2016, Moya Bi *et al*. 2021). However, these researches did not mention plants and preparations used to treat menopausal symptoms or the experiences of women during this period of their lives.

In this context, we hypothesized that conducted the present ethnobotanical study in order to identify plants used in the treatment of menopausal symptoms in Grand-Lahou and Katiola Districts, in Cote d'Ivoire. It appears important to fill this hole for better management of menopausal women in Ivory Coast. The aim of this study is to contribute to the improvement of women health and well-being through the knowledge of menopausal symptoms and the plants traditionally used in their treatment. It therefore aims to provide a database on the symptoms experienced by women in the study areas and on the plants used in their treatment.

Materials and Methods

Study area

The study was carried out in Grand-Lahou and Katiola Districts in South and North-central part of Côte d'Ivoire (Figure 1). These Districts were chosen because they belong to two phytogeographic zones characteristic of the Ivorian landscape. Grand-Lahou District is located in the Guinean zone characterized by dense humid evergreen forest between latitudes 5°12' and 5°9' and longitudes 4°56 and 5°70. Katiola is located in the Sub-Sudanese zone, characterized by dense dry forest between 8°10 North latitude and 5°4 West longitude. People in Grand-Lahou District is estimated at 151313 inhabitants with 71019 women. In Katiola, people is estimated at 106905 inhabitants with 51635 women (INS 2014).

Ethnobotanical survey

Two rounds of surveys were conducted in Grand-Lahou and Katiola Districts from August 2016 to August 2017 using a questionnaire. The first investigations were conducted among women in the menopausal period. The sample size was estimated according to WHO recommendations (WHO 1991) and retained 267 women in the two locations. The information sought concerned the experience of menopause, the mode of remediation of symptoms, the plants used in their treatment and the resource persons treating the symptoms (Koné *et al*. 2012, Malan *et al*. 2015). During the surveys, a list of 11 symptoms was considered according to the Menopause Rating Scale (MRS) used by Letombe (2010) and Armo and Sainik (2020). These symptoms were classified according to their intensity in five categories (very intense, intense, moderate, mild and none). In the second part, herbalists indicated as resource persons were interviewed according to their availability. The information collected concerned the local name of the plants, the parts used, the method of preparation and administration, the place of origin of the plants used in the treatment of menopausal symptoms, then the other ailments treated by the plants mentioned and the method of recognizing the symptoms. During the surveys, each plant used in the treatment of

menopausal symptoms was assigned a use score ranging from 0 to 5. The questions were asked either in French or in the local language by means of a guide.
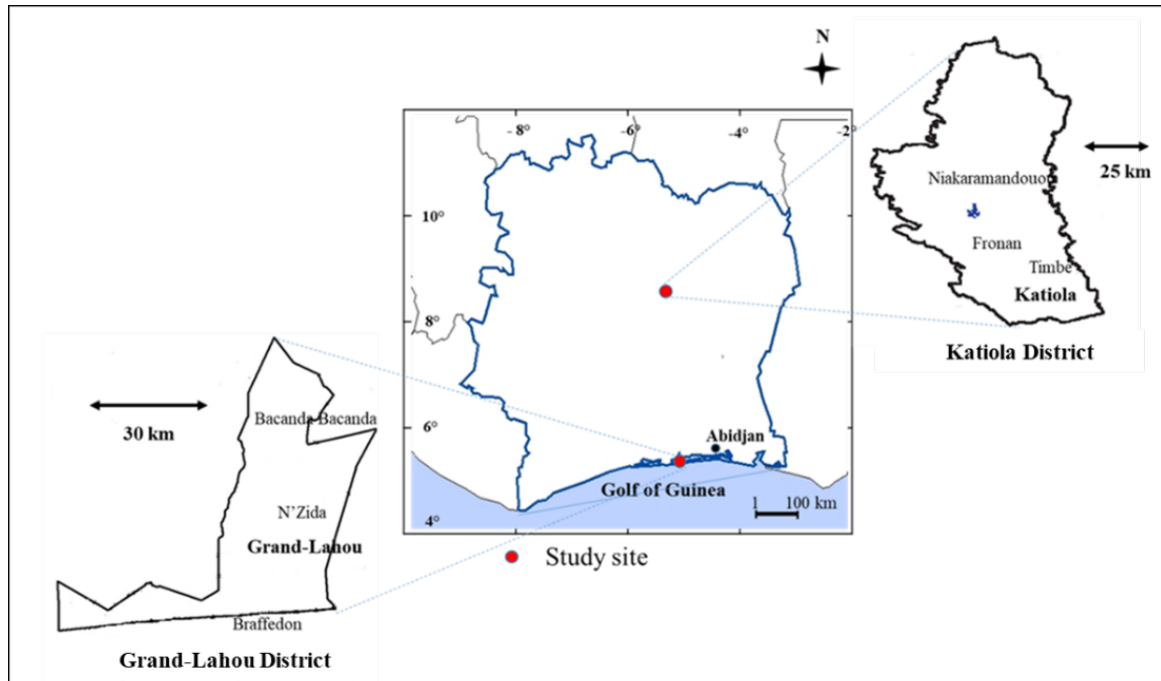

Figure 1. Location of Grand-Lahou and Katiola Districts

Botanical identification

The plant species recorded were identified by comparison with the herbarium of the National Floristic Centre (CNF) of Felix Houphouët-Boigny University in Cote d'Ivoire. The GBIF (Global Biodiversity Information Facility, https://www.gbif.org/) online database was used for the botanical identification of plant species. The family nomenclature was updated according to the APG IV system (APG IV 2016).

Data processing

Six data types were considered during this study, namely socio-demographic data, which are the number of respondents per category (women of menopausal age and herbalists), menopausal status, age range, education level and year of experience of herbalists. All these parameters were expressed as percentages except for the number of respondents and the number of years of experience.

Data on experience of menopause refer to the age of onset of menopause, the symptoms experienced and the classification of symptoms according to the intensity of sensation. These parameters were also expressed as a percentage.

The data on method of remediation of menopausal symptoms refer to the type of medicine used by the women to remedy the symptoms experienced. It was also expressed as a percentage.

Diagnosis of menopausal symptoms data refers to how herbalists recognize symptoms related to menopause. Floristic composition data are the number of species inventoried, their distribution by families, genera and chorological types.

Data on importance of plants used: There are several botanical indices to scientifically evaluate the knowledge and importance of a plant within a population (Hoffman & Gallaher 2007). Frequency of citation (Gillani *et al*. 2024) was used to determine which plants were most commonly used by the respondents. The use agreement value (UAV) described by Ilumbe *et al*. (2014) and consistency (n) used by Azokou *et al*. (2016) were helped to identify the most important plants for treating symptoms. In this study, Consistency indicates the number of times the plant is mentioned to treat the symptoms. Here, we evaluated Consistency when the same herb is mentioned at least twice to treat the same condition. Regarding the UAV, it combined the use value (UV) used in several studies (Phillips et al. 1994, Lassa *et al*. 2022) and the consensus index (CI) as mentioned by Ilumbe *et al*. (2014). AUV was calculated following the formula:

UAV = UV x CI   with   UV(k)=∑_i^n Si/n   and   CI = Na/Nt

If:use score assigned by respondent i and n: number of respondents for the species cited. The UV varies from 0 to 5.

Na:number of people who cited the species for menopause and Nt: total number of respondents. The CI varies between 0 and 1. A low value indicates a disagreement on the use of plants in therapy.

Statistical analysis

Data collected were entered using Epidata v3.1 and transferred to SPSS 20.0 for database setup. Statistical analyses were then performed using XlStat software version 2018.2 (XLSTAT by Addinsoft 2018). The Chi-square (χ^2) test was used to establish a relationship between menopausal women's knowledge of menopausal symptoms and mode of remediation. Correspondence Analysis (CA) was used to classify symptoms according to sensation intensity. The threshold of 0.05 was used to establish these relationships.

Results

Socio-demographic data

Surveys allowed to interview 188 people, including 179 menopausal women and 9 herbalists listed as resourceful persons. All herbalists were women between the ages of 25 and 70. The age of the menopausal women (12 peri-menopausal and 167 menopausal) ranged from 40 to 70 years. Among the latter, 109 (60.89%) were illiterate, 52 (29.05%) had primary education and 18 (10.05%) had secondary education. The majority of herbalists were illiterate (66.7%) compared to 33.3% who had primary education. They had an average of 10.22 years of experience.

Experience of menopause

Results indicated that the age of menopause for 25.14% of women was between 40 and 45 years. The majority of women (62.87%) went through menopause between the ages of 45 and 55, and 6.58% of them after 55 years old. Of these, 5.38% had gone through menopause before the age of 40. According to the results, the average age of menopause in this study was 48.88 ± 4.19 years. Out of 179 women in menopause, 17.87% did not experience any symptoms. The distribution of women in menopause according to the number of symptoms showed that they felt an average of four symptoms among all the symptoms considered. These were joint and muscle pain (60.89%), hot flashes (50.28%), palpitations (43.57%) and headaches (35.19%). The distribution of menopausal women according to symptoms showed that the proportion of those who experienced menopausal symptoms was higher in Katiola than in Grand-Lahou (Figure 2). However, the Chi-square test did not show any significant difference between women in these two districts. The CA was used to classify the symptoms according to the intensity of sensation by the women. The results showed those hot flashes followed by joint and muscle pains are classified as very intense symptoms. They are followed by palpitations and headaches classified as intense symptoms. Mood disorders and insomnia are classified as moderate symptoms (Fig 3). Around 75.72% of women, joint and muscle pain persisted after other symptoms had disappeared. Overall, the women interviewed were unanimous in their view that menopausal symptoms were bothersome.

Women's mode of remediation of symptoms

Out of 179 women, 42 (23.46%) used modern medicine to find out the cause of their discomfort, compared to 40 (22.34%) who used traditional medicine. For the 42 women who consulted modern medicine (in a hospital), 13 (30.95%) discovered that the discomforts they suffered were related to menopause. Symptoms were related to other diseases such as hypertension, ulcers, anaemia. In the case of the traditional diagnosis, only four women (10%) knew that the discomforts observed were related to menopause. The results also showed that 65.36% of women haven't medication to treat menopausal symptoms. Among the 34.64% of women who sought to remedy their menopausal symptoms, 12.29% used modern medicine, 11.18% traditional medicine and 11.17% both medicines. All treatments received by the latter were related to the different symptoms experienced. Of the 40 women who used traditional medicine, 24 women, or 60%, were satisfied. The statistical analyses relating to knowledge of menopausal symptoms and the mode of remediation showed no significant difference (P = 0.48). This indicates that knowledge of menopausal symptoms does not influence the mode of remediation. However, it should be noted that the proportion of women who turn to traditional medicine was significantly higher (40.00%).

Diagnosis of menopausal symptoms by herbalists

The evaluation of the diagnosis of menopausal symptoms showed that for all herbalists (100%) the absence of menstrual periods from the age of 50 years corresponds to menopause. The diagnosis is based mainly on the age of the patient and the symptoms observed. It appears that practitioners confuse many menopausal symptoms with those of other diseases such as malaria, gastrointestinal disorders that they commonly call "stomach sores" and disorders related to the functioning of the

female reproductive system commonly called "**Bobodouman**" (Table 1). For example, for some practitioners, joints and muscle pains are due to haemorrhoids and stomach sores. The treatment prescribed in these conditions depends on the symptoms evoked by women.
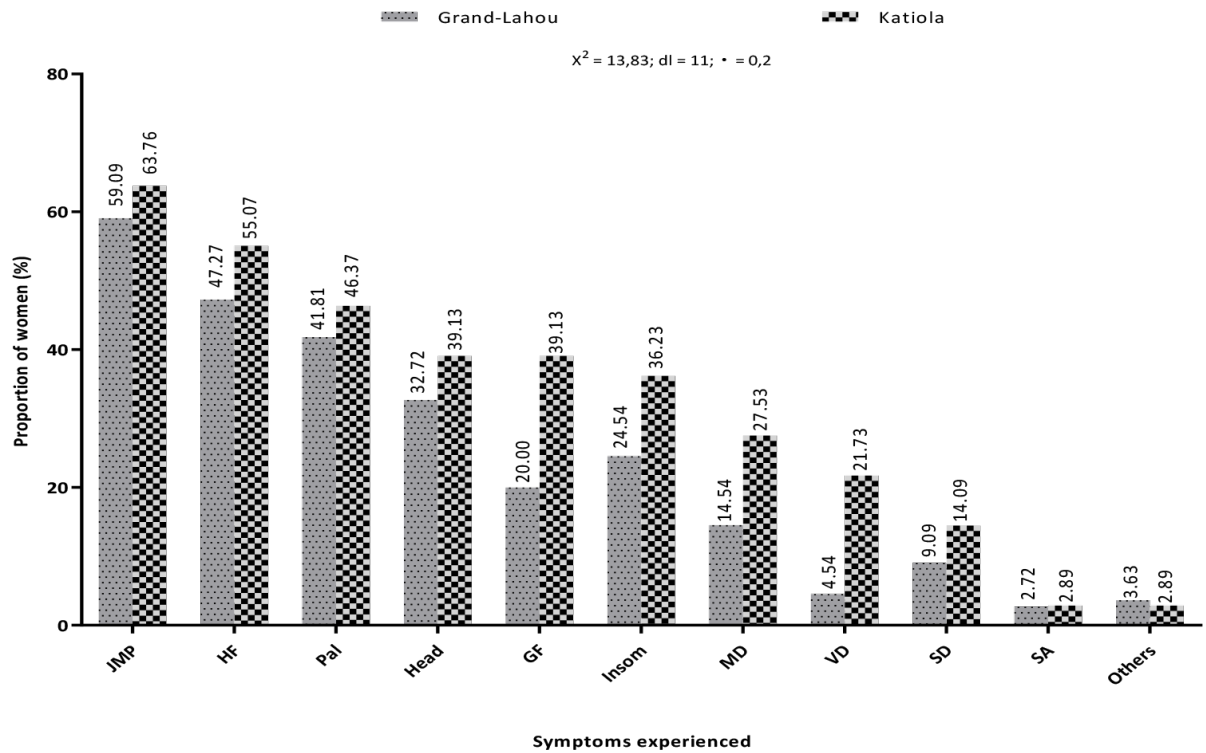

Figure 2. Distribution of menopausal women according to symptoms experienced in Grand-Lahou and Katiola Districts
JMP: Joint and Muscle Pains**; HF:** Hot Flushes**; Pal:** Palpitations**; Head:** Headaches**; Asth:** Asthenia**; Insom:** Insomnia**; MD:** Mood Disorder**;
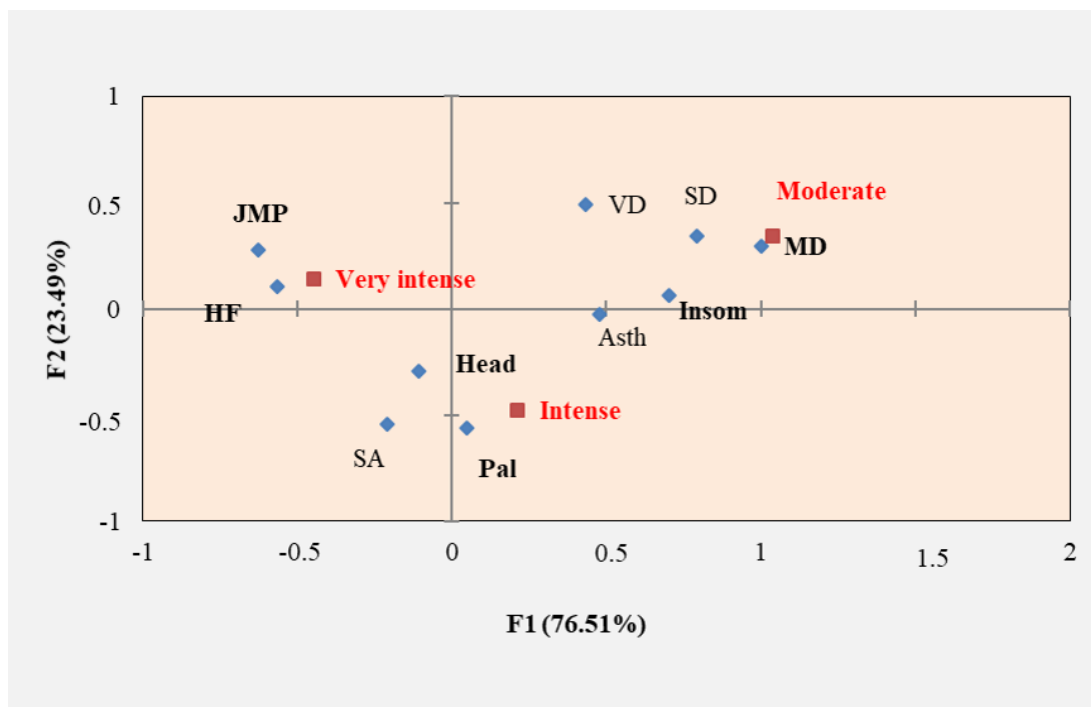VD:** Vaginal Dryness**; SD:** Sexual Disorders**; SA:** Skin Aging

Figure 3. Classification of menopausal symptoms by intensity of sensation by women

Table 1. Symptoms treated by practitioners of traditional medicine and the illnesses with which they are confused

Symptoms treated	Related diseases
Joint and muscle pain	Rheumatism, Hemorrhoids, Belly sores
Hot flashes	Malaria, General tiredness
Headaches	Malaria, Insomnia
Palpitation	Ulcers, Hypertension
Asthenia	Anemia, Malaria
Vaginal dryness	« **Bobodouman** »

Floristic composition of medicinal plants used in the treatment of menopausal symptoms
The results of the study of the taxonomical composition of plants used in the treatment of menopausal symptoms showed 32 medicinal plants belonged to 32 genera and 17 families. Fabaceae family was the most common (5 species). Species from the Guinean-Congolese and Sudanese-Zambezian transition zone (GC-SZ) were the most numerous (31.25%). They are followed by Guinean-Congolese (GC) and Sudan-Zambezian (SZ) species with a proportion of 28.12% each.

Parts used, methods of preparation and administration of the plants used
Plant parts used in the different treatments were mostly leaves (55.81%) and stem bark (30.23%). Root bark (9.30%) and other organs (4.65%) are used very little. Decoction (45.09%) and grinding (37.25%) were the most used preparation methods. Maceration, infusion, trituration and other methods of preparation, with 17.64% of quotations, are not used very much. The various preparations are prescribed orally (35.00%) with an average intake of twice a day or anally (32.00%) with an average intake of twice a week. On average, the treatments lasted one week.

Importance of plants used
The evaluation of the importance of the plants used in the treatment of menopausal symptoms indicated that in the Grand-Lahou area, *Ocimum gratissimum* L., *Landolphia owariensis*, *Ricinodendron heudelotii* (Baill.) Heckel (Euphorbiaceae), *Lannea acida* A.Rich. (Anacardiaceae), *Moringa oleifera* Lam. (Moringaceae), *Phyllanthus amarus* Schumach. (Phyllanthaceae) and *Gymnanthemum amygdalinum* (Delile) Sch.Bip. ex-Walp. (Asteraceae) with values ranging from 2 to 10 were the most important species. In the Katiola area, *Khaya senegalensis* (Desr.) A. Juss., *Moringa oleifera*, *Daniellia oliveri* (Rolfe) Hutch. (Fabaceae), *Nauclea latifola* Sm. (Rubiaceae), *Anogeissus leiocarpa* (DC.) Guill. & Perr. (Combretaceae), *Annona senegalensis* Pers. (Annonaceae) and *Parkia biglobosa* (Jacq.) G.Don (Fabaceae) with values ranging from 2 to 4. *Moringa oleifera* is used in both localities to relieve menopausal symptoms (Table 2). The citation frequencies calculated in the study areas were low. They ranged from 0.86% to 21.55% for the Grand-Lahou locality and from 1.38% to 13.88% for the Katiola locality. The plants with the highest citation frequencies in Grand-Lahou were *Ocimum gratissimum* (21.60%), *Alstonia boonei* De Wild. (Apocynaceae) (10.3%) and *Senna occidentalis* (L.) Link. (Fabaceae) (10.3%). In Katiola, *Anogeissus leiocarpa* had the highest frequency of citation (13.88%). It is followed by *Khaya senegalensis* (FC = 6.94%) and *Alchornea cordifolia* with FC = 5.55% (Table 2). We notice that in Grand-Lahou, the use value was 5 for *Kalanchoe crenata* (Andrews) Haw. var. (Crassulaceae) and *Piptadeniastrum africanum* (Hook.f.) Brenan (Fabaceae). *Ricinodendron heudelotii* had a use value of 4.67 and *Landolphia owariensis* a value of 4.25. As for *Ocimum gratissimum*, *Lannea acida* and *Cryptolepis calophylla* (Baill.) L. Joubert & Bruyns (Apocynaceae), they had a use value of 4. In Katiola, they were *Khaya senegalensis*, *Kigelia africana* (Lam.) Benth. (Bignoniaceae), *Guiera senegalensis* J.F. Gmel. (Combretaceae), *Pericopsis laxiflora* (Benth.) Meeuwen (Fabaceae) and *Securidaca longipedunculata* Fresen. (Polygalaceae) which had a use value of 5. *Moringa oleifera* and *Daniellia oliveri* had a use value of 4.5; *Nauclea latifola* and *Carapa procera* DC. (Meliaceae), a use value of 4 (Table 2). Consensus index revealed low values ranging from 0.01 to 0.09 for Grand-Lahou District and from 0.01 to 0.06 for Katiola District. The highest consensus values were obtained for *Ocimum gratissimum* with CI = 0.09 in Grand-Lahou and for *Khaya senegalensis* with CI = 0.06 in Katiola (Table 2). Combining the UV and IC indexes for all plants involved in the treatment of menopausal symptoms in each locality, *Ocimum gratissimum* (UAV = 0.34), *Landolphia owariensis* (UAV = 0.14), *Ricinodendron heudelotii* (UAV = 0.12) and *Lannea acida* (UAV = 0.10) each had a high UAV in Grand-Lahou. This value was high for *Khaya senegalensis* (UAV = 0.27), *Moringa oleifera* (UAV = 0.12), *Daniella oliveri* (UAV = 0.12) and *Nauclea latifola* (UAV = 0.11) in Katiola (Table 2). Plant species with a consistency greater than or equal to 2 and a high use agreement value such as *Ocimum gratissimum*, *Khaya senegalensis*, *Landolphia owariensis* and *Moringa oleifera* have been shown to be important in the treatment of menopausal symptoms.

Table 2. List of plants used to treat menopausal symptoms in the study areas

Plant species	Family	Chorology	Study area									
			Grand-Lahou					Katiola				
			n	FC	VU	CI	VAU	n	FC	VU	CI	VAU
Ocimum gratissimum L.	Lamiaceae	GC-SZ	10	21.6	4	0.09	0.34	0	0	0	0	0
Khaya senegalensis (Desr.) A. Juss.	Meliaceae	SZ	0	0	0	0	0	4	6.94	5	0.06	0.28
Landolphia owariensis P. Beauv.	Apocynaceae	GC	4	2.59	4.25	0.03	0.15	0	0	0	0	0
Ricinodendron heudelotii (Bail.) Pierre ex Heckel	Euphorbiaceae	GC	3	3.45	4.67	0.03	0.12	0	0	0	0	0
Lannea acida A. Rich.	Anacardiaceae	GC-SZ	3	1.72	4	0.03	0.1	0	0	0	0	0
Moringa oleifera Lam.	Moringaceae	I	2	3.45	3.5	0.02	0.06	2	4.17	4.5	0.03	0.13
Gymnanthemum amygdalinum (Delile) Sch.Bip. ex-Walp.	Asteraceae	GC-SZ	2	5.17	2.5	0.02	0.04	0	0	0	0	0
Bambusa vulgaris Schrad. ex Wendl.	Poaceae		1	1.72	2	0.01	0.02	1	1.39	1	0.01	0.01
Alchornea cordifolia (Schumach. & Thonn.) Müll. Arg.	Euphorbiaceae	GC-SZ	1	9.48	3	0.01	0.03	1	5.56	3	0.01	0.04
Anogeissus leiocarpa (DC.) Guill. Et Perr.	Combretaceae	SZ	0	0	0	0	0	2	13.9	3	0.03	0.08
Annona senegalensis Pers.	Annonaceae	SZ	0	0	0	0	0	2	4.17	2.5	0.03	7
Carapa procera DC.	Meliaceae	GC-SZ	0	0	0	0	0	1	1.39	4	0.01	0.06
Phyllanthus amarus Schum. & Thonn.	Phyllanthaceae	GC	2	5.17	3.5	0.02	0.06	0	0	0	0	0
Parkia biglobosa (Jacq.) R. Br. Ex G. Don	Fabaceae	SZ	0	0	0	0	0	2	4.17	2	0.03	0.06
Piptadeniastrum africanum (Hook.f.) Brenan	Fabaceae	GC	1	0.86	5	0.01	0.04	0	0	0	0	0
Securidaca longipedunculata Fresen.	Polygalaceae	SZ	0	0	0	0	0	1	2.78	5	0.01	0.07
Alstonia boonei De Wild.	Apocynaceae	GC	1	10.3	3	0.01	0.03	0	0	0	0	0
Daniellia oliveri (Rolfe) Hutch. Et Dalziel	Fabaceae	SZ	0	0	0	0	0	2	4.17	4.5	0.03	0.13
Senna occidentalis (L.) Link.	Fabaceae	GS-SZ	1	10.3	3	0.01	0.03	0	0	0	0	0
Nauclea latifolia Sm.	Rubiaceae	GC-SZ	0	0	0	0	0	2	1.39	4	0.03	0.11
Pericopsis laxiflora (Benth.) Meeuwen	Fabaceae	SZ	0	0	0	0	0	1	1.39	5	0.01	0.07

Species	Family	Region	n	FC	CI	UV	UAV	n	FC	CI	UV	UAV
Kalanchoe crenata (Andrews) Haw.	Crassulaceae	GC-SZ	1	2.59	5	0.01	0.04	0	0	0	0	0
Guiera senegalensis J.F.Gmel.	Combretaceae	SZ	0	0	0	0	0	1	1.39	5	0.01	0.07
Heliotropium indicum Linn	Boraginaceae	GC-SZ	1	4.31	2	0.01	0.02	0	0	0	0	0
Kigelia africana (Lam.) Benth.	Bignoniaceae	GC-SZ	0	0	0	0	0	1	1.39	5	0.01	0.07
Cryptolepis calophylla (Baill.) L. Joubert & Bruyns	Apocynaceae	GC	1	0.86	4	0.01	0.03	0	0	0	0	0
Tectona grandis L. f	Verbenaceae	I	1	7.76	1	0.01	0.01	0	0	0	0	0
Combretum molle R.Br. Ex G.Don	Combretaceae	SZ	0	0	0	0	0	1	1.39	3	0.01	0.04
Cleistopholis patens Benth.	Annonaceae	GC	1	0.86	3	0.01	0.03	0	0	0	0	0
Spondianthus preussii var preussii angl.	Euphorbiaceae	GC	1	0.86	3	0.01	0.03	0	0	0	0	0
Margaritaria discoïdea (Baill)	Euphorbiaceae	GC-SZ	1	0.86	5	0.01	0.04	0	0	0	0	0
Annickia polycarpa (DC.) Setten & Maas	Annonaceae	GC	1	0.86	5	0.01	0.04	0	0	0	0	0

Legend:

n: Consistency; **FC**: Frequency of Citation; **UV**: Use Value; **CI**: Consensus Index; **UAV**: Use Agreement Value; **GC**: Taxon from the Guineo-Congolese region (dense humid forest), **SZ**: Taxon from the Sudano-Zambezian region; **GC-SZ**: Taxon from the transition zone between the Guineo-Congolese region and the Sudano-Zambézian region, **I**: Introduced or cultivated taxon

Discussion

Experience of menopause

The aim of this study was to contribute to the improvement of women health through the knowledge of menopausal symptoms and the plants used in their treatment.

In this study, the majority of women (62.87%) reach menopause between the ages of 45 and 55 years old. This result corroborates those of Torgerson *et al*. (1997) who reported that the proportion of French women who reach menopause at this age is high (88%). According to Bagot (2019), this age range corresponds to the age of onset of menopause. The results also showed that 25.14% of women reach menopause between the ages of 40 and 45. This age range seems high compared to the value of 9.7% reported by Torgerson *et al*. (1997) suggesting that in Cote d'Ivoire, a significant number of women enter menopause early.

Among 179 women in menopause period, the symptoms most experienced were joints and muscle pains (60.89%), hot flashes (50.28%), palpitations (44.69%) and headaches (36.31%). Joint and muscle pains, headaches and hot flashes were also the most observed in women in Marrakech (Loukid *et al*. 2007). Although joints and muscle pains are the dominant symptoms, patients report being more affected by hot flashes. According to El Khoudary *et al*. (2019), vasomotor symptoms are most often mentioned and can affect almost 80% of women. Many studies have shown that vasomotor symptoms are independent predictors of increased risk of cardiovascular disease, bone loss, and accelerated bone cell turnover (Avis *et al*. 2015, Thurston *et al*. 2021). In the study areas, about 50% of women experienced, on average, between 1 and 5 symptoms. In Marrakech, more than five symptoms were reported by 78.9% of women (Loukid *et al*. 2007). These figures showed that the menopause could be a driver of enormous troubles and a source of many inconveniences for women.

Women's mode of remediation of symptoms and diagnosis of menopausal symptoms by herbalists

Women interviewed refer either to modern or traditional medicine to find out the origin of the discomfort they feel. However, very few have discovered the link with menopause. This result is justified by the fact that health workers in modern medicine and herbalists have little knowledge of menopausal symptoms. Indeed, the level of knowledge of medical actors is weak concerning menopausal disorders. A policy for their training on menopause should be put in place. Generally, women in this study, whether they know menopausal symptoms or not, do not use any medication to relieve themselves. This observation was made in France in 2003 (Guthrie *et al*. 2003). For Kouamé *et al*. (2018), this is justified by the fact that women consider menopause as a natural state and do not know the risks. Among those who want to get relief, 11.17% used both types of medicine and 11.18% used traditional medicine. Pouamon (2017) reported the attraction of menopausal women to natural remedies including herbal products after a diagnosis of menopause in gynaecological services. Lydia *et al*. (2014) explained this attitude of women by their awareness of the potential and curative capacities of alternative medicines, especially those based on medicinal plants. The high cost of conventional medicine is also a factor favoring the use of herbal medicine (Masengo *et al*. 2021). This study showed that more than half of the women who used traditional medicine products were satisfied. This indicates the potential of traditional medicine in Côte d'Ivoire, and the importance of medicinal plants in the management of menopausal symptoms.

Importance of plants used

In total, 32 medicinal plants used to treat menopausal symptoms were identified. The high number of species reflects the diversity of plants associated with the treatment of menopausal symptoms. To our knowledge, with the exception of *Moringa oleifera* (Atakpama *et al*. 2014), the use of other plants in the treatment of menopausal symptoms is reported here for the first time, although they have been cited in previous ethnomedical works. In terms of phytogeographical distribution, species from the Guinean-Congolese and Sudano-Zambezian regions were the most represented. Species from these areas are regularly used in phytotherapy by Ivorian practitioners (Cissé *et al*. 2020, Soro *et al*. 2023). The consensus index and agreement value for these plants were very low. This indicates that there is no agreement on which plants are used to treat menopausal symptoms. According to Kouamé *et al*. (2018) people regard menopause as a normal physiological state that should not be followed by any signs. Consequently, each practitioner would approach it based on their knowledge about medicinal plants. For this reason *O. gratissimum*, *K. senegalensis* and *L. owariensis* had consistency and highest use agreement values. The use of *O. gratissimum* and *K. senegalensis* is linked to their use in the treatment of several conditions, including dysmenorrhoea, headaches and dysentery (Malan *et al*. 2015, Kpabi *et al*. 2020) similar to menopausal symptoms. As for *L. owariensis*, used in traditional medicine to treat haemorrhoids (Piba 2016) which are directly related to fertility. These results testify to the importance of Ivorian flora and phytotherapy.

Conclusion

The ethnobotanical investigations carried out contributed to a better understanding of the symptoms experienced by women during menopause, and identified 32 medicinal plants that could potentially be used to treat these symptoms. A significant number of women (25.14%) enter menopause early. Hot flushes, joint and muscle pain,s aches affect women's health more during these periods. Among the plants listed, *Ocimum gratissimum*, *Khaya senegalensis* and *Landolphia owariensis* presented the highest values of agreement of use and are the most widely used in the treatment of menopausal symptoms. These species could be investigated with a view to developing alternative therapies for the management of menopausal symptoms.

Declarations

List of abbreviations: JMP: Joint and Muscle Pains; HF: Hot Flushes; Pal: Palpitations; Head: Headaches; Asth: Asthenia; Insom: Insomnia; MD: Mood Disorder; VD: Vaginal Dryness; SD: Sexual Disorders; SA: Skin Aging; GC: Guineo-Congolese; SZ: Sudano-Zambezian; GC-SZ: Guineo-Congolese and Sudano-Zambezian, I: Introduced, CA: Correspondence Analysis, UV: Use Value, UAV: Use Agreement Value, CI: Consensus Index, MRS: Menopause Rating Scale.

Ethics approval and consent to participate: Data were collected with respect for confidentiality, anonymity and consent. All respondents were informed of the purpose of this study.

Consent for publication: not applicable.

Availability of data and materials: Supplementary data available in the article and data generated are available upon request.

Competing interests: The authors declare that they have no conflict of interest regarding this manuscript.

Author contributions: Initiation of the study: Koné Mamidou Witabouna. Development of the protocol: Kouamé Amoin Gervaise, Koné Mamidou Witabouna. Data collection: Kouamé Amoin Gervaise, Piba Serge Cherry. Plant identification: Bakayoko Adama, Tra Bi Fézan Honora, Yao Konan. Data processing and statistical analyses: Yao Konan, Piba Serge Cherry, Ouattara Katinan Etienne, Sylla Youssouf, Kouamé Amoin Gervaise. Writing and correction of the manuscript: all authors.

Acknowledgements

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