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ETHNOBOTANICAL PLANTS USED FOR FERTILITY CONTROL AND DELIVERY ENHANCEMENT AMONG AKOKO AND OSE ABORIGINES IN ONDO STATE, NIGERIA

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ABSTRACT

The aboriginal people in parts of Akoko and Ose areas of Ondo State have dialectical convergence, which is a peculiar greeting known as "HAO". The people revel in their knowledge of herbal medicine and efficacy of herbs especially for fertility, pregnancy controls and delivery enhancement processes. In the developed countries, fertility control and ease of childbirth are controlled through orthodox practice, while in the developing countries, traditional methods are sometimes adopted. On this basis, an ethnobotanical survey was conducted among the HAO people, to identify and document medicinal plants used for fertility control and delivery enhancement processes. Traditional medical practitioners, traditional birth attendants, herb sellers, traders, and farmers in the respective Local Governments were interviewed using a semi-structured questionnaire. A sample size of 300 respondents was randomly selected. The questionnaire considered the local plants' names, common names, species, families, plants parts used, and methods of preparation and administration. Data obtained were processed and subjected to descriptive and inferential statistics. Analysis of variance (ANOVA) revealed significant differences ($p \leq 0.05$) among species occurrence and location for both fertility control and delivery enhancement processes. Occurrence of species for fertility control and delivery enhancement processes ranged from the lowest in *Citrus sinensis* (0.67) and *Acanthus montanus* (0.67), to the highest in *Sida acuta* (13.33) and *Carica papaya* (7.33) respectively. The results also revealed that 27 plant species belonging to 19 families were responsible for delivery enhancement processes, while 20 plant species belonging to 15 families were responsible for fertility control. Four (4) species of Malvaceae and Euphorbiaceae were responsible for delivery enhancement processes and fertility control. Since ethno-medicines are affordable, accessible and available to all, it is therefore recommended that there should be experimental validation of efficacy, establishment of effective dosage and prompt revitalization strategy to protect indigenous knowledge from complete desertion.

Keywords: Ethnomedicinal plants, fertility control, delivery enhancement, indigenous knowledge.

INTRODUCTION

The use of natural products with its healing properties is as old as human civilization and for a long period, minerals, animals and plant products were the main sources of drugs (Illamola *et al*., 2020). As many as 80% of the world's populace depends on traditional medicine for their primary health care needs (WHO, 2017). It is also estimated that 85% of the population in developing countries depends mainly on traditional healthcare systems (Centre for Gender and Social Policy Studies, 2012). African continent have a long history with the use of plants and in some African countries, up to 90% of the population rely on medicinal plant as a source of drugs (Hostettmann *et al*., 2000). As a matter of fact, the knowledge and the uses of indigenous ethnomedicinal plants have been acquired and improved- over in this present generation, as medicinal plants are now recognized nationwide, both by rural communities and urban regions (Manju and Ahad, 2021). Most people in the rural areas at some stage in their life turn to traditional health care because of accessibility, availability, affordability and inherent trust in the method (Ogbe *et al*., 2009; Tarun *et al.,* 2014). The traditional use of plants in treating ailments by the rural dwellers is a common practice that has been used and found effective even when the use of orthodox has failed. However, the abundance of information on the traditional medicinal uses of plants in Africa is presently in danger of disappearing since the knowledge of how to use medicinal plants is mostly passed down orally and is poorly documented (Gurib- Fakim, 2006), although written information has been produced for some specific regions. Moreover, the most serious threat to local medicinal plants knowledge,

however, appears to be due to cultural change, particularly the influence of modernization and the western worldview (Voeks and Leony, 2004), which has contributed to under mining traditional values among the young people (Giday*et al.,* 2003). The documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day (Balick and Cox, 1996). In Nigeria, despite the modern family planning techniques adopted by medical practitioners in the hospital as a way to reduce population rate and caesarean section carried out so as to safe life when complications arise, most women still depend on traditional medicine to ensure safe family planning, and safe child delivery process, especially in the rural communities (Peprah *et al.,* 2019). Population explosion is an extra burden on all aspects of development, education, health care, housing sanitation and environment (Pradhan *et al.,* 2012). Over- population, unwanted pregnancy, followed by unsafe abortion can be avoided by use of "Contraceptives". To find lasting solutions to this over-population problem that the world is facing presently, there are needs for the reduction in the size of family at large, thus the use of fertility control or contraceptives sets in. The use of contraceptives, especially herbal contraceptives nowadays is of great significance, because it is believed to be an effective way or method to checkmate the problem of rapid population growth. The use of contraceptive has numerous health benefits such as preventing unplanned pregnancies, ensuring optimum spacing between births, reducing maternal and child mortality, and improving the lives of women and children in general (Anthony *et al.*, 2018). The popularity of herbal medicines among pregnant women can be mainly attributed to the belief that herbal products, being natural, are safe with fewer adverse effect compared to conventional drugs (Ernst, 2002; Barnest *et al.*, 2018; Peprah *et al.*, 2019). The indications for the use of herbal medicines during pregnancy may vary across regions and countries, and can be mother- or child-related (Illamola *et al.*, 2020). Herbal medicines may be used sometimes as part of maternal care to treat pregnancy-related problems, and often to improve the well-being of the mother and/or the unborn child. The most commonly reported indications are nausea and vomiting, prevention of miscarriage, preparation for and/or facilitation of labor, improvement of fetal outcomes, common cold or flu, gastrointestinal problems (such as: constipation, flatulence, pain conditions), relief of anxiety, treatment and/or prevention of anemia, and treatment of edema (Kennedy *et al.*, 2013; John and Shantakumari, 2015; Illamola *et al.*, 2020). Labour comes with pain, hence expectant mothers would desire for procedures and materials that would quicken the process and provide relief to the extreme pain. Women in developing countries are known to patronize traditional medicines; hence, it is most probable that traditional medicines will be used for labour purposes. (Ameade *et al.*, 2018).

MATERIALS AND METHODS

The study was conducted between May 2022 and March 2024, in three (3) different local government areas of Ondo State which comprises of: Ose Local Government with latitude 7^0 03 ^{1}17.82 ^{11} N, and longitude 5^0 44 ^{1}35.88 ^{11} E; Akoko South East Local Government with latitude 7^0 31 ^{1}37 ^{11} N and longitude 5^0 46 ^{1}6 ^{11} E; and Akoko South West Local Government with latitude 7^0 23 ^{1}51.6 ^{11} N and 5^0 41^1 40.7 ^{11}E respectively (Figure 1). The communities, in each studied local government area are as follows:

1. Ifira-Akoko, Ipe- ,Akoko, Ipesi-Akoko and Sosan in Akoko South East Local Government Area;
2. Ikun Akoko and Oba- Akoko in Akoko South West Local Government Area and
3. Afo, Idoani, Idogun, and Imeri in Ose Local Government Area.

These communities have a unique greeting, which is "HAO" but different languages or dialect. This makes them to be referred to as "HAO" speaking people of Ondo State, Nigeria. The study area was selected with special considerations that they have very low access to primary health care services, had knowledge on the uses of plants, as well as their remoteness.

This ethnobotanical information were collected through visits to the "Akoko and Ose" communities to document their indigenous knowledge (IK) regarding medicinal plants used to aid and to facilitate birth process, to reduce the time and associated pain of labour, and plants

used as contraceptives. The main respondents during the study were Traditional Medical Practitioners (TMPs), Traditional Birth Attendants (TBAs), Herb-sellers, Farmers, and Traders who gained information on the use of herbs either by inheritance or by training were questioned. A total of 300 respondents (30 respondents each from 10 different communities of 3 local government areas of the same senatorial district were interviewed with the aid of semi-structured questionnaire matrix. This allowed for focused, conversational and two-way communication between the interviewer and the person being interviewed. Before recording the information and knowledge of the healers, prior informed consents were sought and the purpose of the study explained to the respondents. The semi-structured interviews and discussions were held with the specialist resource users and other knowledgeable people by use of interview schedules for each respondent. The respondents consisted of men and women, young and elderly people of age, ranging from 20 years to over 90 years of age were randomly chosen (129 males and 171 females) and the objectives of this study were explained to them in their local language-Yoruba. Relevant information on the plant species; their local names, parts used, growth habit, methods of cultivation, medicinal uses, and methods of preparations, modes of administrations, dosage and duration of treatment (where specified) were gathered for permanent records.

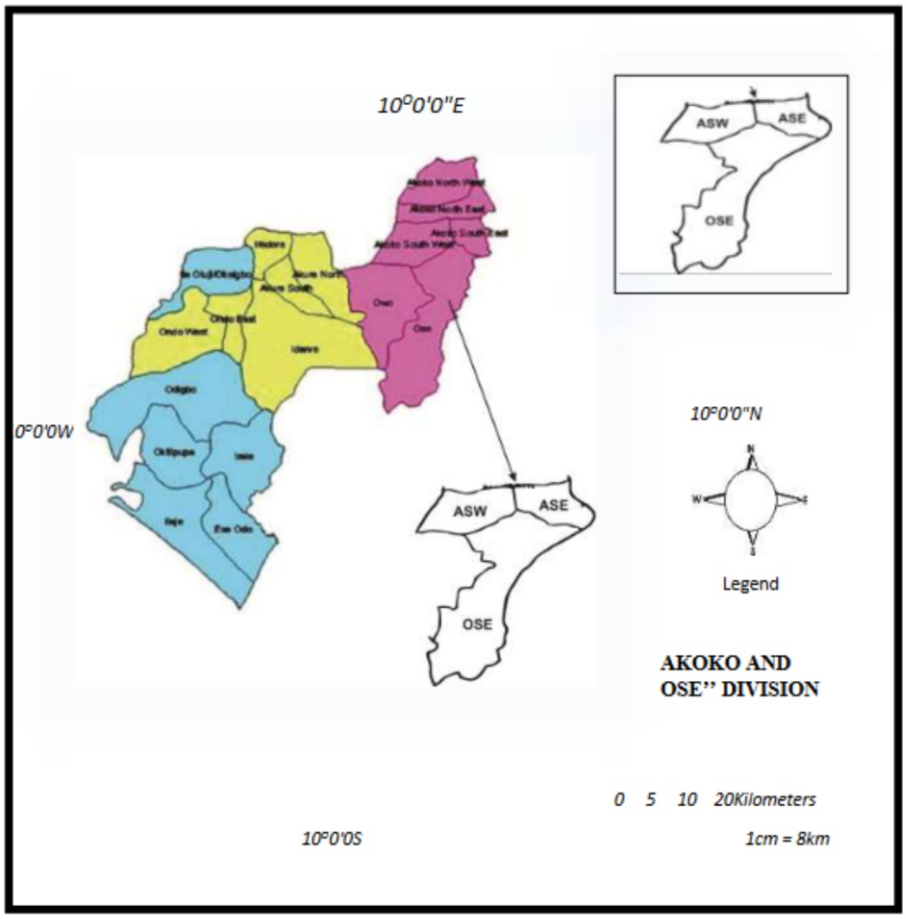

Figure 1: Map of Ondo State showing the Local Government Areas that specifies the "Akoko and Ose" Division. Source: *Ministry of Works in Akure*
ASE=Akoko South East Local Government, ASW= Akoko South West Local Government, OSE= Ose Local Government.

Data collection: Respondents were approached one by one according to the sampling techniques explained, and interviewed after their consent and data were recorded confidentially in questionnaire. The family names of the plants were arranged alphabetically alongside their scientific names, local names, plant parts used, growth habits, common names, methods of cultivation, medicinal uses, sex, age, and methods of preparation.

Statistical Analysis: A descriptive method using frequencies and percentages were used to analyze the socio- demographic data of the respondents. The results of the ethnobotanical survey were analyzed using four quantitative measures: Analysis of variance (**ANOVA**), Informant Consensus Factor (**ICF**), Relative Frequency of Citation (**RFC**) and Use- Value (**UV)**.

Analysis of Variance (Anova): Data collected were subjected to Analysis of Variance (ANOVA) and means separated with Duncan's Multiple Range Test (DMRT) at $P \leq 0.05$ using SPSS version 20.

Relative Frequency of Citation (R*FC)* (%): According to (Tardio and Pardo-de-Santayana, 2008)**,** Relative Frequency of citation was calculated using the formula:

Relative Frequency of Citation

$$(RFC) = \frac{\text{Number of informants who mentioned the use of species (Ns)}}{\text{The total number of respondents interviewed (N)}}$$

Where Ns = Number of informants who mentioned the use of species

N = Total number of informants that cited the species to treat any given disease.

Use - Value: According to Phillips *et al. (*1994), UV (Use-Value) was calculated using the formula:

$$UVs = \frac{\Sigma Us}{ns}$$

Where; UVs = Use Value for the species

Σ Us = Sum of the uses mentioned for a species

N = Total number of Respondents

Generally, UV is calculated to; Calculate for individual plants to give a quantitative measure of its relative importance to the informants objectively; and to determine the extent of medicinal use for a given plant species.

ICF Formula:

ICF = (Nur - Nt) / (Nur - 1)

Where:

- Nur = Number of use-reports (i.e., the total number of times a plant species is mentioned for a particular use)
- Nt = Number of taxa (i.e., the number of plant species mentioned for that use)

Calculating ICF for Delivery Enhancement:

- Nur = 190 (total use-reports for delivery enhancement)
- Nt = 27 (number of plant species mentioned for delivery enhancement)

ICF = (190 - 27) / (190 - 1) = 163 / 189 ≈ 0.86

Calculating ICF for Fertility Control:

- Nur = 110 (total use-reports for fertility control)
- Nt = 20 (number of plant species mentioned for fertility control)

ICF = (110 - 20) / (110 - 1) = 90 / 109 ≈ 0.83

Interpretation:

- ICF values range from 0 to 1.
- Higher ICF values indicate higher consensus among informants regarding the use of plant species for a particular purpose.
- ICF values closer to 1 indicate high consensus, while values closer to 0 indicate low consensus.
- In this case, the ICF values suggest a relatively high level of consensus among informants regarding the use of plant species for delivery enhancement (ICF ≈ 0.86) and fertility control (ICF ≈ 0.83)

RESULTS

The socio- economic classification of respondents within the Akoko and Ose people of Ondo State, Nigeria is as shown in Table 1. A total of three hundred (300) informants comprising 171 men and 129 women, were involved in the study area. The age group of the respondents that were active is between 36 to 80 years. They have the highest percentage of response in these studies. Among these respondents, traditional medical practitioner (TMP), traditional birth attendant (TBA), herb sellers and famers are notable (Table 1). The economic status (80%) of this study area was largely small communities.

Table 1: Socio Economic Classification of Respondents in Akoko and Ose People of Ondo State.

FEATURE	DESCRIPTION	FREQUENCY			AVERAGE TOTAL	POR (%)
		ASE	ASW	OSE		
Gender	Male	57	25	47	129	43.00
	Female	63	35	73	171	57.00
Age	20 - 35 years	11	2	3	16	5.33
	36 - 50 years	33	21	36	90	30.00
	51 - 65 years	42	23	41	107	35.67
	66 - 80 years	32	10	33	75	25.00
	81 - 95 years	2	3	7	12	4.00
Literacy status	Literate	88	47	89	224	75.00
	Illiterate	32	13	31	76	25.33
Religious	Christianity	70	28	80	178	59.33
	Islam	13	12	7	32	10.67
	Traditionalist	37	20	33	90	30.00
Occupation	Trading	14	8	16	38	12.67
	Farming	20	8	21	49	16.33
	(HEB)	21	11	19	51	17.00
	TBA	27	14	28	69	23.00
	TMP	38	19	36	93	31.00
Economic Status	Medium	-	30	30	60	20.00
	Small	120	30	90	240	80.00
	Large	-	-	-	-	-

POR: Percentage of respondents; HEB: Herb-seller; TBA: Traditional birth attendant; TMP: Traditional medical practitioner. ASE: Akoko South East, ASW: Akoko South West, OSE: Ose

Field observation revealed that the respondents were well familiar, and knowledgeable with medicinal values of plants in their environment. Information on medicinal plants used for fertility control and delivery enhancement in the studied area is presented in Table (2a and 2b). information like: Plant's botanical names, family, local names, English names,

Table (2*a*): Plant Species Responsible for Fertility Control Among Akoko and Ose People of Ondo State, Nigeria.

S/N	PLANT SPECIES (BOTANICAL NAME)	LOCAL NAME	FAMILY	COMMON NAME
1	*Abrus precatorius L.*	Ojuo logbo	Papilionaceae	Crab's eye/ rosary pea
2	*Acanthus montanus (Ness) T. Anderson*	Ahon- ekun	Acanthaceae	Leopard's claw
3	*Alchornea laxiflora (Benth.) Pax & K. Hoffim.*	Pepe	Euphorbiaceae	Three-vined beat string
4	*Allium sativum L.*	Alubosa ayun	Liliaceae	Garlic
5	*Boerhavia diffusa L.*	Etiponla	Nyctaginaceae	Punarnava
6	*Bryophyllum pinnatum (Lam.)*	Abamoda	Crassulaceae	Resurrection plant, Life plant
7	*Carica papaya L.*	Ibepe	Caricaceae	Pawpaw
8	*Citrus aurantifolia (Christm& Panzer) Swingle*	Osan wewe	Rutaceae	Lime
9	*Citrus limon (L).Osbeck*	Osan laimu	Rutaceae	Lemon
10	*Curcuma longa L*	Ajoo	Zingiberaceae	Turmeric
11	*Elaeis guineensis Jacq.*	Adin	Arecaceae	Red palm oil
12	*Euphorbia hirta L.*	Iroko iju	Euphorbiaceae	Asthma weed Herb
13	*Manihot esculenta Crantz.*	Ege	Euphorbiaceae	Native cassava
14	*Musa paradisiaca L*	Ogede agbagba	Musaceae	Plantain
15	*Ricinus communis L.*	Ewe Lala	Euphorbiaceae	Castor bean / castor oil plant
16	*Senna alata (L.) Roxb*	Asunwon- oyinbo	Fabaceae	Ringworm Plant
17	*Piper guineense Schumach. & Thonn*	Iyere	Piperaceae	African pepper
18	*Vernonia amygdalina Delile*	Ewuro	Asteraceae	Bitter leaf
19	*Zea mays L.*	Agbado	Poaceae	Maize
20	*Zingiber officinale Roscoe.*	Ginija /Atale	Zingiberaceaes	Ginger

Table 2(b): Plant Species Used for Delivery Enhancement Among Akoko and Ose People of Ondo State, Nigeria.

S/N	PLANT SPECIES (BOTANICAL NAMES)	FAMILY	LOCAL NAMES	COMMON NAME
1	*Abelmoschus esculentus* (L.) Moench	Malvaceae	Ila	Okra or Lady's finger
2	*Aframomum melegueta* K. Schum	Zingiberaceae	Ataare	Alligator Pepper
3	*Alchornea cordifolia* (Schum & Thonn.)	Euphorbiaceae	Ipa	Christmas bush.
4	*Cissampelos owariensis*P. Beauv. Ex DC.	Menispermaceae	Jemijoko/ jokoje	Velvet leaf
5	*Citrus sinensis* (L.) Osbeck	Rutaceae	Oronbo, Osan-minmu	Sweet Orange
6	*Commelina diffusa*. Brum. F.	Commelinaceae	Itopere	Spreading day flower
7	*Corchorus olitorius* L.	Malvaceae	Ewedu	Jute plant
8	*Elaeis guineensis* Jacq.	Arecaceae	Mariwo ope	Red palm oil
9	*Glypheae brevis* (Spreng.) Monach.	Malvaceae	Atori	Masquerade tree
10	*Jatropha curcas* L.	Euphorbiaceae	Lapalapa Funfun	Physic nut
11	*Kigelia africana* (Lam.) Benth.	Bignoniaceae	Pandoro	Cucumber plant
12	*Lagenaria breviflora (*Benth.) Roberty.	Cucurbitaceae	Okiri / tagiri	English white colocynth
13	*Leea guineensis*G. Don	Vitaceae	Alugbokita	West indian holly
14	*Mangifera indica* L.	Anacardiaceae	Mangoro	Mango tree
15	*Momordica charantia* L.	Cucurbitaceae	Ejirin were	Africa cucumber/ balsam pear
16	*Musa paradisiaca* L	Musaceae	Ogede agbagba	Plantain
17	*Myrianthus arboreus* P. Beauv	Moraceae	Ewe ade / obisere	Giant yellow mulberry
18	*Newbouldia laevis* Seem.	Bignoniaceae	Igi Akoko	Fertility tree / tree of life
19	*Scoparia dulcis* L.	Plantaginaceae	Eleminirin	Sweet broom weed
20	*Secamone afzelii* (Schult.) K. Schum	Asclepiadaceae	Alu / arilu	Secamone
21	*Sida acuta Burm* F.	Malvaceae	Iseketu	Wire weed /tea weed
22	*Spondias mombin* L.	Anacardiaceae	Iyeye /okikan	Yellow mombin
23	*Talinum triangulare* (Jacq.) Willd.	Portulacaceae	Egure	Water leaf /water lettuce
24	*Tragia benthamii* Baker	Euphorbiaceae	Esinsin	Tragia
25	*Uraria picta* (Jacq.) DC.	Fabaceae	Alaparada	Dabra
26	*Uvaria afzelii* Sc. Elliot	Annonacaeae	Eleruju/ eru-iju	Cluster pear
27	*Vitex doniana* (Sweet)	Verbenaceae	Oori/ Oriri	Black plum

The results of analysis of variance (ANOVA) for species occurrence for fertility control and delivery enhancement are presented in Table (3a and 3b). ANOVA revealed significant different for both fertility control and delivery enhancement across government areas under investigation.

Table 3(a): Analysis of Variance for Plant Species Used for Fertility Control.

Source of variation	DF	Sum of square	MS	F
Species	19	150.33	7.91	1.85*
Location	2	23.63	11.82	2.77*
Error	38	162.37	4.27	

Table 3(b): Analysis of Variance for Plant Species Used for Delivery Enhancement.

Source of variation	DF	Sum of square	MS	F
Species	26	623.65	23.99	8.27*
Location	2	27.88	13.94	4.81*
Error	52	150.79	2.90	

**: S*ignificant at $P \leq 0.05$; ns: not Significant.

The Relative Frequency of Citation (RFC) shows the local importance of each plant species, while (Use Value) UV is calculated to determine the extent of medicinal use for a giving plant species (Table 4a & 4b). Plants with wide therapeutic uses or those that are widely accepted for the cure of a particular ailment will score a high UV. The relative frequency of citation positions correspond with the fact that this plant was reported by high number of informants, four plant species, *Carica papaya*, (7.33%), *Piper guineensis* (5.00%), *Allium sativum* (2.67%) *and Citrus aurantifolia* (2.67%) had the highest relative frequency of citation (RFC) ; these same plant species, i.e *Carica papaya* (0.20), *Piper guineensis* (0.14), *Allium sativum* (0.07) *and Citrus aurantifolia* (0.07) also had the highest use value (UV) for fertility control in the study area, Hence, *Sida acuta* (13.33%), *Corchorus olitorius* (9.33%), *Abelmoschus esculenta* (4.67%) and *Talinum triangulare* (4.00%) had the highest relative frequency of citation (RFC); also high use value (UV) of (0.21) for *Sida acuta, (0.15*) for *Corchorus olitorius,* (0.07) for *Abelmoschus esculenta* (0.06) and (0.06) *for Talinum triangulare* for delivery enhancement (Table 4a and 4b) respectively. The mean values for occurrence (MVO) of plants species responsible for fertility control and delivery enhancement across the three local government areas are also presented in Table 4a &4b. In the analysis of the three surveyed locations, *Carica papaya* exhibited the highest mean value (2.91), while *Piper guineense* followed closely with a mean value of (2.52). These findings suggest that *Carica papaya* and *Piper guineense* were the most frequently encountered plant species in the observations for fertility control. In contrast, *Acanthus montanus* and *Manihot esculenta* had the lowest mean value of (0.33), indicating their infrequent occurrence across the three local government areas for fertility control which is presented in Table 4a. Across the three locations examined for delivery enhancement, *Sida acuta* exhibited the highest mean value (2.67), indicating it had the most frequent occurrences among all observed plant species while *Corchorus olitorius, Abelmoschus esculentus***,** followed closely with a mean value of (1.76). These findings suggest that *Sida acuta* were the most frequently encountered plant species in the observations. Conversely, four plant species (*Aframomum melegueta, Cissampelos owariensis, Jatropha curcas,* and *Myrianthus arboreus*) displayed the lowest mean value (0.33), signifying their limited occurrences across the three locations under investigation for delivery enhancement which are presented in table 4b.

Table 4(a): Relative Frequency of Citation (RFC) (%), Use Value (UV) and Mean Values for Occurrence (MVO) of Plant Species Used for Fertility Control.

S/N	PLANT SPECIES (BOTANICAL NAME)	(RFC)%	(UV)	(MVO)
1	*Abrus precatorius* L.	1	0.03	1.00 ± 1.00^{ab}
2	*Acanthus montanus* (Ness) T. Anderson)	0.67	0.02	0.33 ± 0.67^{a}
3	*Alchornea laxiflora* (Benth.) Pax & K)	1.33	0.04	0.88 ± 1.33^{ab}
4	*Allium sativum* L.	2.67	0.07	$0.88\pm2S.67^{ab}$
5	*Boerhavia diffusa* L.	1.33	0.04	1.33 ± 1.33^{ab}
6	*Bryophyllum pinnatum* (Lam.)	1.33	0.04	0.88 ± 1.33^{ab}
7	*Carica papaya* L.	7.33	0.20	2.91 ± 7.33^{c}
8	*Citrus aurantifolia* (Christm & Panzer) Swingle	2.67	0.07	1.76 ± 2.67^{ab}
9	*Citrus limon* (L).Osbeck.	1.67	0.05	1.20 ± 1.67^{ab}
10	*Curcuma longa* L.	1	0.03	0.58 ± 1.00^{ab}
11	*Elaeis guineensis* Jacq.	1.33	0.04	0.67 ± 1.33^{ab}
12	*Euphorbia hirta* L.	1	0.03	1.00 ± 1.00^{a}
13	*Manihot esculenta* Crantz	0.67	0.02	0.33 ± 0.67^{a}
14	*Musa paradisiaca L.*	1.33	0.04	0.88 ± 1.33^{ab}
15	*Ricinus communis* L.	1.67	0.05	0.67 ± 1.67^{ab}
16	*Senna alata (L.)* Roxb.	1	0.03	0.58 ± 1.00^{ab}
17	*Piper guineense* Schumach. & Thonn	5	0.14	2.52 ± 5.00^{bc}
18	*Vernonia amygdalina* Delile	1.67	0.05	0.88 ± 1.67^{ab}
19	*Zea mays* L.	1.33	0.04	1.33 ± 1.33^{ab}
20	*Zingiber officinale* Roscoe.	0.67	0.02	0.67 ± 0.67^{a}

RFC: Relative Frequency of Citation, UV: Use Value, Mean values followed by similar superscripts within a column are not significantly different from one another at $P \leq 0.05$ using DMRT

Table 4(b): Relative frequency of Citation (RFC) (%), Use Value (UV) and Mean Values for Occurrence (MVO) of Plantspecies Used for Delivery Enhancement.

S/N	PLANT SPECIES (BOTANICAL NAME)	(RFC)%	(UV)	(MVO)
1	*Abelmoschus esculentus* (L.) Moench	4.67	0.07	1.76 ± 4.67^{b}
2	*Aframomum melegueta* K. Schum	1.67	0.03	0.33 ± 1.67^{ab}
3	*Alchornea cordifolia* (Schum & Thonn.)	1	0.02	0.58 ± 1.00^{a}
4	*Cissampelos owariensis* P. Beauv. Ex DC .	1.33	0.02	0.33±1.33ab
5	*Citrus sinensis* (L.) Osbeck	0.67	0.01	0.67±0.67a
6	*Commelina diffusa*. Brum.	1.33	0.02	1.33±1.33ab
7	*Corchorus olitorius* L.	9.33	0.15	1.76±9.33c
8	*Elaeis guineensis* Jacq.	1.67	0.03	0.88±1.67ab
9	*Glypheae brevis* (Spreng.) Monach.	1.33	0.02	1.33±1.33ab
10	*Jatropha curcas* L.	1.33	0.02	0.33±1.33ab
11	*Kigelia africana* (Lam.) Benth.	1	0.02	0.58±1.00a
12	*Lagenaria breviflora* (Benth.) Roberty	0.67	0.01	0.67±0.67a
13	*Leea guineensis* G. Don	1.67	0.03	0.67±1.67ab
14	*Mangifera indica* L.	0.67	0.01	0.67±0.67a
15	*Momordica charantia* L.	1	0.02	1.00±1.00a
16	*Musa paradisiacal* L.	1.33	0.02	0.88±1.33ab
17	*Myrianthus arboreus* P. Beauv	0.67	0.01	0.33±0.67a
18	*Newbouldia laevis* Seem.	2	0.03	1.15±2.00ab
19	*Scoparia dulcis* L.	1	0.02	1.00±1.00a
20	*Secamone afzelii* (Schult.) K. Schum	1	0.02	0.58±1.00a
21	*Sida acuta Burm.*F.	13.3	0.21	2.67±13.33d
22	*Spondias mombin* L.	3.33	0.054	1.20±3.33ab
23	*Talinum triangulare* (Jacq.) Willd.	4	0.06	1.15±4.00ab
24	*Tragia benthamii* Baker	2	0.03	0.58±2.00ab
25	*Uraria picta (Jacq.)* DC	2.67	0.04	0.67±2.67ab
26	*Uvaria afzelii* Sc. Elliot	1.33	0.02	0.88±1.33ab
27	*Vitex doniana* (Sweet)	1.33	0.02	0.67±1.33ab

RFC: Relative Frequency of Citation, UV: Use Value, Mean values followed by similar superscripts within a column are not significantly different from one another at $P \leq 0.05$ using DMRT.

The results obtained for fertility control in Table 5a and 5b revealed that, Leaves constitute the major part used; Leaves (30.0%), followed by Roots (25.0%), Seeds (20.0%), Fruits (15.0%), Bark (5.0%), Bulb (5.0%).,likewise in Table 5b it was revealed that the leaves constituted the major part used for delivery enhancement; Leaves (81.48%), Fruits (11.11%), Seeds (3.7%), and Roots (3.7%).

Table 5(a) Frequency (Frq) and Percentage (%) of Plant Parts Used for Fertility Control.

PPU	PLANT SPECIES	FRQ	(%)
LEAVES	*B. pinnatum, V. amygdalina, A. laxiflora, Z. mays, A. montanus, E. hirta.*	6	30
ROOTS	*C. longa, C. limon, M. esculentus, C. papaya, Z. Officinale*	5	25
SEEDS	*A. precatorius, R. communis, P. guineense, E. guineensis.*	4	20
FRUITS	*B. diffusa, C. aurantifolia, M. paradisiaca*	3	15
BARK	*S. alata*	1	5
BULB	*A. sativum*	1	5
TOTAL		20	100

PPU=Plant Part Used FRQ = frequency, % = percentage.

Table 5(b) Frequency (Frq) and Percentage (%) of Plant Parts Used for Delivery Enhancement

PPU	PLANT SPECIES	FRQ	(%)
LEAVES	*C. owariensis, C. olitorius, G. brevis, E. guineensis, J. curcas, L. guineensis, M. indica, M. charantia, S. afzelii, M. paradisiaca, S. acuta, S. mombin, T. benthamii, T. triangulare, U. picta, M. arboreus, C. diffusa, V. doniana, A. cordifolia, C. sinensis, S. dulcis, N. leavis.*	22	81.48
FRUIT	*A. esculentus, K. africana, L. breviflora.*	3	11.11
ROOT	*U. afzelii.*	1	3.7
SEED	*A. melegueta.*	1	3.7
TOTAL		27	100

PPU=plant part used, FRQ = frequency, % = percentage.

Table (6a and 6b) shows the methods of preparation and modes of administration of plant species used for fertility control and delivery enhancement. The tables revealed how the Akoko and Ose aborigines prepare and administer these plant species for their well-being.

Table 6(a) Methods of Preparation and Modes of Administration of Plant Species Used for Fertility Control.

S/N	PLANT SPECIES	LOCAL NAME	METHOD OF PREPARATION	MODES OF ADMINISTRATION
1	*Abrus precatorius* L.	Oju ologbo	The seed is grinded into powdery form.	The seed power *A. precatorius* is taken as drugs.
2	*Acanthus montanus* (Ness) T. Anderson)	Ahon- ekun	Grind the leaves of *E. hirta*, with seeds of *A. melegueta*, cook for five minutes,	Consume once in a month after menstruation
3	*Alchornea Laxiflora*(Benth.) Pax & K)	Pepe	Crush fresh *A. laxiflora* leaves with water and filter, Add small salt and little potash. Place it inside dew until dawn.	Drink before breakfast.
4	*Allium sativum* L.	Alubosa ayun	Chewing	Chewing regularly or To be chewed immediately after sex
5	*Boerhavia diffusa.* L	Etiponla	Get 9 fruits of *B. diffusa*, with 9 pieces of A. melegueta and 9 local rings, and soak everything for nine days.	Use the ring, when you want to have sexual intercourse.
6	*Bryophyllum pinnatum*(Lam.)	Abamoda	Chewing	Chewing regularly.
7	*Carica papaya* L.	Ibepe	Peel male *C. papaya* root, add sizeable *Aframomum melegueta* seed, grind both together, little palm oil, and cook with catfish.	Use after menstruation, for 3 days.
8	*Citrus aurantifolia* (Christm& Panzer) Swingle	Osan wewe	Pound the roots of *S. afzelii*, with A. melegueta, add little potash, and add fruits of *C. aurantifolia* and boil for 10 minutes.	Consume after sexual intercourse
9	*Citrus limon* (L).Osbeck..	Osan laimu	Extract juice of fruit *Citrus limon*	Juice to be drunk regularly

S/N	PLANT SPECIES	LOCAL NAME	METHOD OF PREPARATION	MODES OF ADMINISTRATION
10	*Curcuma longa* L.	Ajoo	Blend the dried roots of *C. longa* to powdery foam.	The powder is drank after menstruation for 3 days.
11	*Elaeis guineensis* Jacq.	Adin	Get the local oil extract of *E. guineensis* seeds, locally known as Adin, add little *A. sativum*, and little A. melegueta seeds. Soak all together in a container.	Consume after sexual intercourse.
12	*Euphorbia hirta*L.	Iroko iju	Grind the leaves of *E. hirta* with A, melegueta, cook	Consume once in a month after menstruation.
13	*Manihot esculenta* Crantz	Ege	Dried peeled powered cassava root is soaked with illicit gin.	Consume 1 spoonful of the mixture after sexual intercourse.
14	*Musa paradisiaca* L.	Ogede agbagba	Extract the juice of fresh fruit.	To be drunk Regularly
15	*Ricinus communis* L.	Ewe Lala	Get 1 seed of *R. communis*, and swallow once in a year	Take 1 seed of R. communis orally for a year as contraceptives
16	*Senna alata* (L.) Roxb.	Asunwon-oyinbo	Pieces of bark of *S. alata* with seeds of *Aframomum melegueta*, soaked with illicit gin.	Drink regularly
17	*Piper guineense* Schumach. & Thonn	Iyere	Seeds pounded and extract with illicit gin	Drink regularly
18	*Vernonia amygdalina* Delile	Ewuro	Get an empty shell or case of a snail, put water into the shell, wrap the ring with *V. amygdalina*, and immerse the wrapped ring in the case or shell for nine days.	Use the ring at time of sexual Intercourse
19	*Zea may* L.	Agbado	Dried leaves of *Z. mays* with dried seeds of Alligator pepper soak both together with illicit gin.	Consume 1 spoonful of the mixture daily.
20	*Zingiber officinale* Roscoe.	Ginija /Atale	Wash the ginger and grate. Boil for 5 minutes.	Drink regularly

Table 6(b) Methods of Preparation and Modes of Administration of Plant Species Used for Delivery Enhancement

S/N	PLANT SPECIES	LOCAL NAME	METHODS OF PREPARATION	MODES OF ADMINISTRATION
1	*Abelmoschus esculentus* (L.) Moench	Ila	Cook the fruits of *A. esculentus* for 2 minutes.	Consume at the time of child delivery.
2	*Aframomum melegueta* K. Schum	Ataare	Chewing	Chew 9 seeds of *A. melegueta* at the period of child labour
3	*Alchornea cordifolia* (Schum & Thonn.)	Ipa	Chewing	Chew a few leaves of *A. cardiflolia* at the hours or days of delivery.
4	*Cissampelos owariensis* P. Beauv. Ex DC.	Jemijoko / jokoje	Grind the leaves of *C. owariensis* with 1 *U. picta* and cook, put little salt and oil	Consume at 7th months old pregnancy until the time of delivery
5	*Citrus sinensis* (L.) Osbeck	Oronbo, Osan- minmu.	Pluck the leaves of *C. sinensis* and mixed with native soap.	Use to bath when the pregnancy is at 9 month
6	*Commelina diffusa. Brum.* F.	Itopere	Crush the leaves of *C. diffusa*, and purged with warm water	Consume at the time of child labour
7	*Corchorus olitorius* L.	Ewedu	Crush plenty leaves of *C. olitorius* in water and sieve.	Drink a glass cup of the extract at regular intervals during labour for quick delivery
8	*Elaeis guineensis* Jacq.	Mariwoope	Crush fresh leaves of *E. guineensis*	Consume at the hour of child labour.
9	*Glypheae brevis* (Spreng.) Monach.	Atori	Mix the leaf of *G. brevis* with native soap.	Use it to bath as at 9th month's pregnancy.
10	*Jatropha curcas* L.	Lapalapa Funfun	Mix the leaf of *J. curcas* with native soap.	Use to bath when the pregnancy is 9 months.
11	*Kigelia africana*(Lam.) Benth.	Pandoro	Mix the dried flower of *K. africana* with native soap	Use it to bath as at 9 months
12	*Lagenaria breviflora*(Benth.) Roberty	Okiri / tagiri	Cut the fruit of *L. breviflora,* boil for 20 minutes.	Drink a glass cup, at the time of child labour.
13	*Leea guineensis* G. Don	Alugbokita	Crush the leaves of *L. guineensis*	Drink a glass cup, at the time of child labour
'14	*Mangifera indica L.*	Mangoro	Get 9 dried leaves of *M. indica,* put in a pot, and add water and 1 local egg with it to boil.	Eat the boiled egg when cool and drink the water of *M. Indica* at the time of labour.
15	*Momordica charantia* L.	Ejirin were	Collect the leaves of *M. charantia*, and mixed with native soap.	Use as sponge to bath with native soap at 9 months.

S/N	PLANT SPECIES	LOCAL NAME	METHODS OF PREPARATION	MODES OF ADMINISTRATION
16	*Musa paradisiaca* L	Ogedeagbagba	Mix the leaves of *M. paradisiaca* with native soap.	Use it to bath as at 9 months pregnancy.
17	*Myrianthus arboreus* P. Beauv	Ewe ade / obisere	Mix the leaves of *M. arboreus* with native soap	Use to bath at exactly when the woman is labouring
18	*Newbouldia laevis* Seem.	Igi Akoko	Grind the fresh leaves of *N. laevis* with *A. melegueta*, add little salt and oil, then cook for 5 minutes.	Consume during child labour
19	*Scoparia dulcis* L	Eleminirin	Grind the leaves of *S. dulcis*, add little salt and break 1 local egg with it, cook for five minutes	Consume during child labour
20	*Secamone afzelii* (Schult.) K. Schum	Alu / arilu	Grind 9 leaves of *S. afzelii i*together with 1 leaf of *U. picta,* cook with catfish for five minutes.	Consume at the time of child labour
21	*Sida acuta Burm F*	Iseketu	Uproot the leaf of *S. acuta* wash, and squeeze	Drink the juice at the time of child labour.
22	*Spondias mombin* L.	Iyeye /okikan	Crush the leaves of *S. mombin*	Consume at the time of child labour.
23	*Talinum triangulare* (Jacq.) Willd.	Egure	Crush the leaves of *T. triangulare.*	Consume at the time of child labour.
24	*Tragia benthamii* Baker	Esinsin	Grind the leaves of *T. benthamii* with *A. melegueta* and cook	Consume when the pregnancy is due.
25	*Uraria picta* (Jacq.) DC	Alaparada	Grind 9 leaves with of *U. picta* together 9 pieces of *A. melegueta*, add little oil and salt and cook.	It can be used as from 5 months old pregnancy to the time of delivery
26	*Uvaria afzelii* (Sc. Elliot)	Eleruju/ eru-iju	Grind the roots of *U afzelii* together with *A. melegueta*, and cook.	Consume at the time of child labour
27	*Vitex doniana* (Sweet)	Oori/ Oriri	Chew 7 pieces of *A. melegueta* with leaves of *V. doniana*	Chew at hour of labour.

Figure 2 (a and b) shows a bar chart representing the percentage and frequency of methods of preparations, having tinctures (20%) as the highest preparatory methods of plant species used for fertility control and concoction (30%) also been the highest for delivery enhancement, respectively.

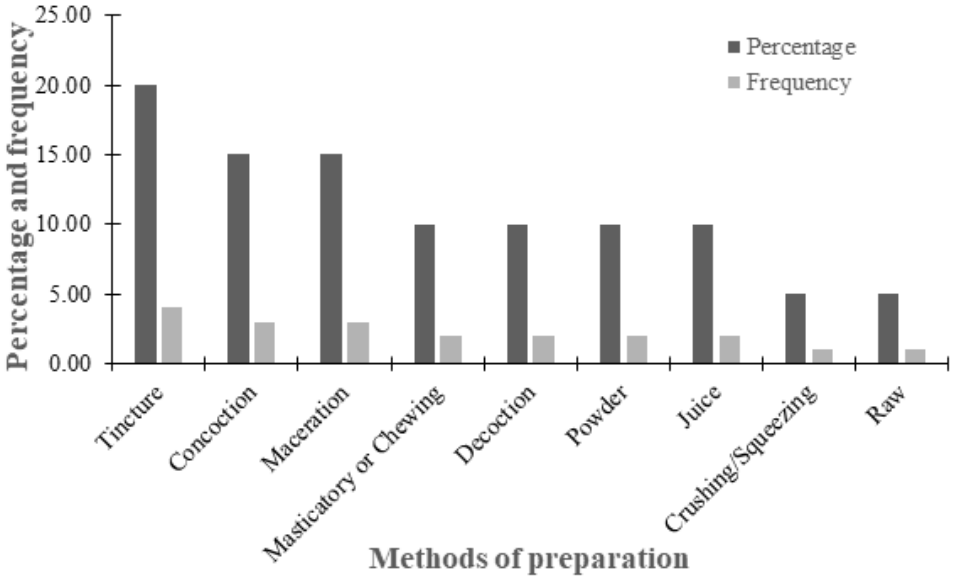

Figure (2a): Bar chart showing the percentage and frequency of methods of preparation of identified medicinal plant species used for fertility control.

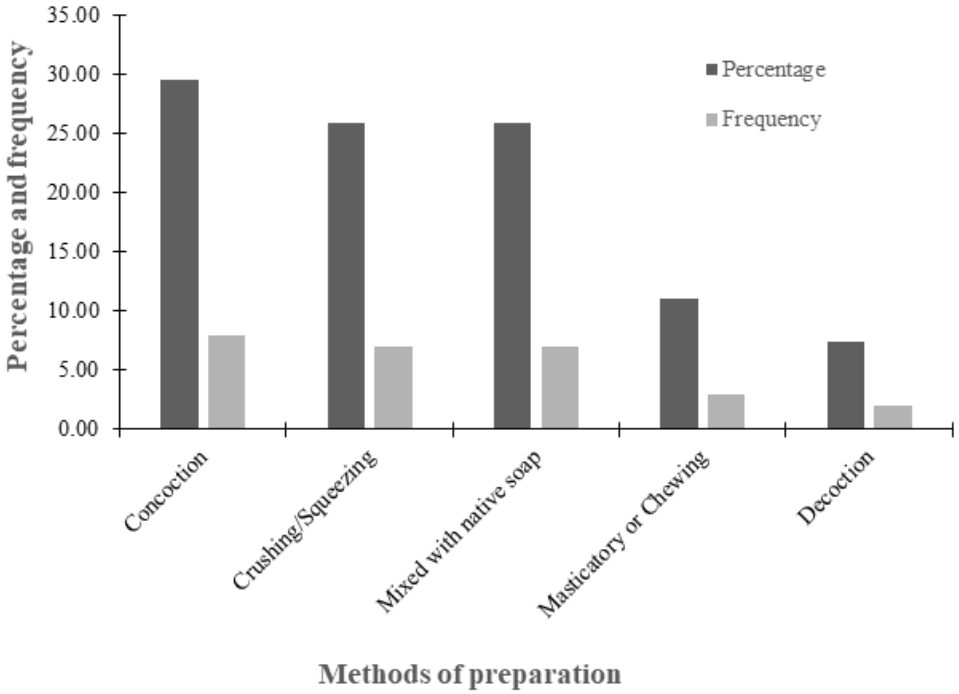

Figure 2(b): Bar chart showing the percentage and frequency of methods of preparation of identified medicinal plant species used for delivery enhancement.

DISCUSSION

Ethnobotany has played important roles for the development of new drugs for many centuries and becoming increasingly important in defining strategies and actions for conservation or reculperation of residual forests (Pandey and Tripathi, 2017). The information collected from different groups of people for the same condition would not only be documented but also can be comparatively analyzed with ease providing further information as to similarity, differences or frequency with which a particular plant is used for the same condition, which is a good indication of efficacy (Maregesi *et al.*, 2007). The highest numbers of respondents in this study are women. This gender disparity is consistent with other studies conducted in rural area of Nigeria, where women were more likely to participate in community-based research (Odebumi *et al.,* 2022). This could be due to the fact that women are more concerned with maternal healthcare and were easily accessed during the study. The current results corroborate the findings of (Odebumi *et al.,* 2022), which reported the dominance of female participants with herbal knowledge in an ethnobotanical survey done in Ogbomosho South and North local government area of Oyo State, Southwestern, Nigeria. The age distribution showed that the most active group of respondents were within the age range of 51-65 years old. This has to do with the fact that the elderly people that are of age, are the main custodian of traditional knowledge because they might have inherited the knowledge from their fore fathers and mothers and this knowledge has been passed on from one generation to another. The impact of this however poses a serious threat to the indigenous knowledge because it may eventually be lost following the demise of the older generation (Akanji *et al.,*2021: Falemara *et al.,* 2021). Majority of the respondents have small economic status, indicating limited financial resources. This emphasizes the need for economic empowerment initiatives targeting vulnerable populations. Field observation revealed that the respondents were well familiar, and knowledgeable with medicinal values of plants in their environment. The use of these plant species for both fertility control and delivery enhancement highlights the significance of traditional knowledge and cultural practices among the Akoko and Ose people. Members of the family Malvaceae were frequently used for fertility control. This had been reported by Adeola *et al.,* 2023, medicinal plants in Ogotun- Ekiti, Ekiti state, Nigeria". Whereas for delivery enhancement, the family Euphorbiaceae (3 species) had the highest occurrence, this also supported the work of Mukali *et al.* (2021). It was

observed in the study that, *Musa paradisiaca* and *Elaeis guineensis* appeared for fertility control and delivery enhancement, the presence of *Musa paradisiaca* and *Elaeis guineensis* in both suggests that these plants are used for multiple purposes, specifically for fertility control. This indicates that these plants have multiple uses in traditional medicine, which is not uncommon. Many plants have been found to have various bioactive compounds that can be used to treat different health conditions. In this case, *Musa paradisiaca* and *Elaeis guineensis* are both used for: Delivery enhancement: possibly to facilitate childbirth or ease labor pains and Fertility control: possibly to prevent or terminate pregnancy, or to regulate menstrual cycles. The same plants are used for different purposes, showcasing the versatility and may indicate their cultural significance and importance in traditional medicine. There are reasonable similarities that abound among the species identified by respondents in the three locations used in this study thus: suggesting that the aboriginals with similar culture are likely to have similar knowledge of the same plant species. Plants have given not only for fundamental human needs, but also for medicinal therapy from the beginning of humanity (Manju and Ahad, 2021). Traditional medicinal practices have a wide acceptability among "Akoko and Ose" people, probably because they believe in its effectiveness. This also may be due to lack of access to modern health care delivery system in the area. In addition, residents in the area are likely to find traditional medicines cheaper and available as compared to orthodox medicine. Most of the plants like, *Sida acuta, Abelmoschus esculentus and Talinum triangulare* are reported to be oxytocic (Kamatenesi-Mugisha, 2007). They are used to induce and maintain labour, help remove the retained placenta, regulate post-partum bleeding and as abortificients. These plant species increase the spontaneous activity of the uterus causing increase in contractions (Kamatenesi-Mugisha, 2007). Medicinal plants used to speed birth are usually taken towards the end of gestation period or at the on-set of labour pains. Plants that produce uterine contractions have similar action as that of oxytocin hormone, produced on the posterior lobule of the hypophysis, which stimulates the uterus (Pamplona-Roger, 2000). The traditional birth attendants, mothers-in-law, mothers, or the expectant mother herself mainly prescribes these herbal remedies to induce labour. Pamplona-Roger (2000), reported that if such oxytocic plants are used during the first months of pregnancy, they could induce an abortion. This has been observed with some medicinal plants such as *Vernonia amygdalina*. Awe, (1990) reported that the infusions of leaves of Vernonia amygdalina are used as abortificients in women. Some plants used by traditional birth attendant may also have harmful effects, when taken in larger quantities, which can lead to the death of the unborn baby. High prevalent use of herbal medicine among African rural population is associated with a lack of access to public health care, as well as with social and cultural influence (Sindiga, 1995). A significant proportion of women worldwide use herbal medicines for the same purpose among other reasons (Ernst, 2002, Ramasubramaniam *et al.*, 2015). The use of herbs by the women of these communities is to shortening the duration of labour, but most women in developed countries use herbal remedies as the principal method of managing pain and enhancing delivery (Tournaire and Theau- Yonneau, 2007). Population control has now assumed great significance in many developing countries and attracted the attention of governmental and other nodal agencies. Therefore, search for harmless, inexpensive, and effective oral agents for fertility control in human has a tremendous importance for the use of plant preparations, and medicament for pregnancy interception. Plant parts used as medicine were collected by healer themselves from natural resources (Akanji *et al.,* 2021). The survey revealed four kind of plant parts used as medicinal materials for delivery enhancement; it is revealed that leaves were the most frequently used plant-part (Odelade *et al.*, 2024; Azam *et al.*, 2016; Adebisi *et al.*, 2018).This may be explained by the fact that leaves are the site of photosynthesis and therefore the repository of most secondary metabolites. Although the use of leaves may seem less dangerous to the plants' biodiversity than the use of barks or whole plants. It can also contribute to the effect of global warming by reducing the carbondioxide uptake and oxygen production.

CONCLUSION

The documented medicinal plants were very useful for women to ease delivery and to control

fertility, when especially to those people who cannot afford modern medical care and in cases where access to modern heath facilities was not easy. Knowledge and use of herbal medicine for treatment of various ailments among the local people is still part of their life and culture, this calls for preservation of the integrity of the forest and indigenous knowledge of herbal medicinal uses.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

AUTHORS' CONTIBUTIONS

O. E, Ige conceived and designed the study and also supervised the project. While B. M, Oluwajuyigbe collected data, performed statistical analysis and drafted the manuscript**.**

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