ORIGINAL RESEARCH ARTICLE

Traditional Practices and Medicinal Plants Use during Pregnancy by Anyi-Ndenye Women (Eastern Côte d'Ivoire)

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Abstract

The use of plants during pregnancy is a common practice in Africa. In Côte d'Ivoire, despite modern antenatal medical prescriptions, most pregnant women resort to traditional medicine to ensure foetus development and facilitate childbirth. Yet, there is not enough research on the African traditional medicine concerning this aspect of health. Therefore, the plants used by pregnant women need to be better known in order to offer integrated antenatal care. This study analyzes the salience of plants used, the associated practices and reasons of such practices by pregnant women in Yakassé-Féyassé, an Anyi-Ndenye town of the Eastern Côte d'Ivoire. Methods include an ethnobotany survey (freelist method, interview with pregnant women during their antenatal consultation and with specialists). The survey led to a list of 75 plants distributed in 3 class of salience. In addition, 90.3 % of pregnant women use these practices which are nevertheless ignored by Midwives during antenatal visits (*Afr J Reprod Health 2011; 15[1]: 85-93*).

Résumé

Pratiques traditionnelles et les plantes médicinales utilisées pendant la grossesse par les femmes d'Anyi-Ndenye (Côte-d'Ivoire de l'est) : L'utilisation des plantes pendant la grossesse est une pratique commune en Afrique. En Côte-d'Ivoire, malgré les ordonnances médicales prénatales modernes, la plupart des femmes enceintes ont recours à la médicine traditionnelle pour s'assurer le développement des fœtus et pour faciliter l'accouchement. Pourtant, il n'y a pas assez de recherche sur la médicine traditionnelle concernant cet aspect de la santé. Les plantes utilisées par les femmes pendant la grossesse ont, cependant, besoin d'être mieux connues afin d'offrir un suivi prénatal intégré . Cette étude fait une analyse des pantes employées, les pratiques qui y sont liées et les raisons de telles pratiques par les femmes enceintes à Yakassé-Féyassé, une ville Anyi-Ndenye à l'est de la Côte d'Ivoire. Les méthodes comprennent une enquête ethnobotanique (méthode de liste libre, interview avec les femmes enceintes pendant leurs visites de consultation prénatale et avec les spécialistes). L'enquête a abouti à une liste de 75 plantes distribuées en trois classes saillantes. D e plus, 90,3% des femmes enceintes emploient ces pratiques qui sont néanmoins ignorées par les sages-femmes pendant les visites prénatales (*Afr J Reprod Health 2011; 15[1]: 85-93*).

Introduction

Medicinal plants play a significant role during pregnancy, birth and postpartum care in many rural areas of the world [1]. The use of plants to ensure good development of pregnancy and facilitate labour is a particularly well established practice in Africa [2]. In Côte d'Ivoire, despite modern antenatal prescriptions, women use traditional well-known recipes to secure pregnancy, facilitate the delivery after childbirth but also to have a beautiful baby [3]. However, the required positive effect is not always obvious and the effects of such practices on the foetus life or on the pregnant behaviour during labour are not clear [2,4]. Moreover, there is a lack of botanical data on the plants used in this health field. To that extent, the Centre of Research in Ecology (CRE) of the University of Abobo Adjamé (Côte d'Ivoire) initiated a research programme on these plants. This work which constitutes the first stage, aims to inventory, through an ethnobotanical survey, the plants and the associated practices, knowledge and recipes used during the pregnancy by the women of the Anyi linguistic group.

Methods

Study area

The study was conducted in Yakasse-Feyasse, chief town of the Feyasse Canton and one of the principal localities of the Anyi-Ndenye kingdom (Department of Abengourou, Côte d'Ivoire). Yakasse-Feyasse was chosen after a first prospection which showed the topicality of the practices in that locality [5]. The town, located 220 km East of Abidjan, is into a full urbanisation, with 7,502 inhabitants [6]. It has a modern

Health Centre (one Doctor, two nurses and one midwife). The Health Centre received from 2005 to 2009, 470 pregnant women per year on average from Yakasse-Feyasse and 4 satellite villages (Padiegnan, Yaobabikro, Zamaka, Zinzenou). During that period, the Health Centre registered on average, 96 % of normal delivery, with 87 % of the newborn's weight above 2.5 kg.

Method of investigation

The survey was carried out in four steps. First, we open our investigations among the population by "innocent" conversations with men and women, starting by "regretting the disappearance of our traditional values". The conversation began then and moved, by small questions, towards the plants used during the pregnancy.

The second stage consisted in focus group of girls (age ranging from 20 to 37 years) on the traditional practices during the pregnancy. We discussed the same questions with two groups of married men and fathers, around a palm wine pot. These steps are intended whether such practices are still relevant, to make a first inventory of the plants used and to identify people recognized in their medium as specialists of such questions.

In the third stage, 55 pregnant women were individually interviewed according to a questionnaire at the Health Centre of Yakassé-Feyassé, during their antenatal appointment. This step was aimed to evaluate the knowledge of the pregnant women about the plants they use to ensure a good gestation.

For the last step, 8 female traditional healers, identified during previous steps as specialists of pregnancy care, were approached individually for a more direct interview. We requested data on plants used (local name and voucher specimen), instructions, period of the pregnancy recommended for employment, restrictions related to harvest or employment, dosage. The distribution by sex and age group of the population investigated is shown by Table 1.

In the whole, the inventory of plants used was based on freelists method. A freelist interview simply entails listing things in a domain in whatever order they come to mind. It is based on the principle that the most significant items are mentioned by several respondents and thus get a high ranking. It is a well-established ethnobotany method which allows finding the most culturally salient plants of a particular sort or ways to use particular plants [7-9].

Data analysis

Frequency of citation was calculated. It is a good index to evaluate the credibility of the information among the investigated population. In addition to frequency across lists, rank within lists is also an indicator of how important an item (plant) is. Reasonably, the plants that people think of first would seem to have more salience than plants listed later [10]. Yet, rank is conditioned by list length, and thus, Smith's *S*, a formal measure of salience, takes into account both frequency and rank [11-12]. The formula reviewed [13] is:

$$S = \left\{ \Sigma[(L_i - R_j + 1)/L_j] \right\} / N$$

where *S* is the salience of an individual item, *Li* the length of an individual list, and *Rj* the rank of the item in that list. Scores range from 1 (maximal salience: first item on every list) to 0 [10-11]. A high value of *S* indicates the high social knowledge or utilization value of a quoted plant, whereas a low *S* shows a low knowledge or use value [14-15].

Frequency of citation and Smith's *S* were calculated with ANTHROPAC 4.0 [7]. Adjusted R-squared correlation between Smith's *S* and frequency, were calculated with R software [16]. Logistic regression was also computed to evaluate the relation between age, number of pregnancies and the knowledge of medicinal practices used during pregnancy. For P<0.05, correlation between those three variables is significant.

Results

The survey permitted to list 75 taxa (49 freelisted and 26 exclusively given by specialists) distributed in 70 genera and 43 families. The richest ones were Asteraceae (8 species), Amaranthaceae (5 species), and Euphorbiaceae (5). All the plants habits were represented although the herbaceous species were dominant (47.2 %). Leaves (77.3 %) constituted the main part of the drugs, followed by barks (14.7), roots (5.3 %), fruits (1.3 %) and stems (1.3 %).

Table 1: Gender distribution of survey participants

Step	N	Sex		Age			
		Men	Women	<20	20 - 30	31 - 45	46 &+
1	26	9	17	2	6	10	8
2	15	7	8	0	3	5	7
3	55	0	55	13	31	11	0
4	8	0	8	0	1	1	6
Total	*104*	*16*	*88*	*15*	*41*	*27*	*21*
%		*15.4*	*84.6*	*14.4*	*39.4*	*26.0*	*20.2*

Analysis of freelists revealed that people cited from 1 to 28 species per list (mean = 3.9). The Smith's *S* varied from 0.01 to 0.25 and was highly correlated (adjusted R-squared = 0.86) with the frequency with which species appeared in different lists. According to different *S* values calculated, 3 class of salience were considered: the most important plants (*S* > 0.09) like *Ocimum gratissimum, Desmodium adscendens, Pothomorphe umbellata, Solenostemon monostachyus, Eclipta prostrata, Microdesmis keayana* and *Ageratum conyzoides*. The second group concerns the medium salient plants (0.05 < *S* < 0.08) such as *Kalanchoe crenata*, *Sparganophorus sparganophora*, *Aerva lannata*, *Ficus exasperata*, *Cyathula prostrata*, *Nephrolepis biserrata*, etc. The last class concerns less known plants (*S* < 0.05) such as *Oldenlandia affinis, Dracaena mannii, Amaranthus spinosus*.

The list of the inventoried plants, the different parts used, their preferred habitats, their instructions and the period of use are given in Table 2. The salience of freelisted plants through the frequency and the Smith's *S* are indicated in Figure 1.

Most of pregnant women (90.3 %) interviewed during their antenatal consultation said they used plants complementarily to the modern drugs prescribed by the midwife. However, there is not a strong correlation between age, number of pregnancies and the knowledge of the obstetric plants (p=0.34).

As for the reasons of use of plants, 4 main indications were given by women: 1) to ensure the good development of the foetus and to have thus a beautiful baby (51.9 %); 2) to facilitate labour (23.1 %), 3) to prevent or cure malaria (21.1 %), a very frequent affliction during the first trimester of pregnancy; and 4) to prevent the spontaneous abortions and miscarriages (3.8 %). We also noticed some seemingly odd indications like "having a baby with dark complexion" (*Eclipta prostrata*) or "having a cheerful baby" (*Platostoma africanum*) or "making the foetus move" (*Crassocephalum crepidioides*). But for men, the use of plants by pregnant women should be encouraged as it ensures a good health for pregnant women.

On the question asked the pregnant women about who had told them about the plants and how they had obtained them, three categories of answers were given: 1) mother or a close relative (78.3 %); 2) a specialist recognized in the village (17.4 %) and 3) a peddler of medicinal plants (4.3 %).

Generally, the use of plants depends upon the pregnancy stage. For example, from the first signs of pregnancy until the end of the first trimester, plants such as *Desmodium adscendens*, *Sparganophorus sparganophora, Spondias mombin* or *Solenostemon monostachyus* were indicated. The purpose of the use of these plants is to develop the foetus or to prevent miscarriages. During the second trimester, the plants prescribed were intended especially for the foetus development, which included *Ficus exasperata, Hoslundia opposita* or *Trema guineensis*. The last trimester of pregnancy is generally

reserved for plants like *Ageratum conyzoides, Cyathula prostrata* or *Heliospermum indicum* which have the property to ease labour and delivery. *Voacanga africana* is also recommended to stimulate labour. However, this plant is taken only when pregnancy lastes more than 9 months. Plants such as *Euphorbia hirta, Ocimum gratissimum* or *Phyllanthus amarus* were used whatever the stage of pregnancy.

The administration of these plants included an anal route using enema bag (65.6 %), oral route consumed like a "therapeutic meal" (28.7 %) or drink (5.7 %). Certain plants like *Baphia nitida* or *Bidens pilosa* were employed in all the ways.

The "therapeutic meal" is a particular medical administration mode which deserves to be described. A small handle of oil palm (*Elaeis guineensis*) fruit is cooked with 2 or 3 plantains (according to the appetite of the woman). Leaves or bark of the medicinal plant are also cooked with palm fruits and plantains (Figure 2a). After cooking, these particular ingredients are crushed, with a little water, in a mortar (Figure 2b). The extract collected after filtering is cooked again with the ordinary ingredients used for the preparation of sauces (peppers, tomatoes, etc). This special sauce is done with smoked freshwater catfish (*Chrysichthys nigrodigitatus*) locally called "*kondo*" or with the dried legs of blue duiker (*Cephalophus monticola*). The plantains, cooked previously, are pounded to be eaten with the sauce. The pregnant woman eats the entire meal, alone (Figure 2c) or with children delivered easily. At the end of the meal, it is formally forbidden to wash the hands which are then wiped on the belly, from top to bottom, towards the loins (Fig. 2d), by expressing the wish to have a pretty baby and an easy labour. The therapeutic meal is eaten at will, from the 6th month to childbirth. Plants such as *Ricinodendron heudelotii, Dracaena mannii, Pothomorphe umbellata*, *Nephrolepis biserrata*, *Solanecio biafrae, Ocimum gratissimum* or *Microdesmis keayana* are indicated for this employment. *N. biserrata* is used to the 6th and 9th month of pregnancy. Only the epiphytes of the oil palm are utilized. It is recommended to use the young fronds drawn up to the 6th month and the lower fronds, to the 9th month. According to women, this plant has the reputation to make the children particularly solid and quarrelsome.

Discussion

The results of our investigation show that traditional use of plants during pregnancy is still a well established practice. The plants used during pregnancy are largely widespread and easy to find: grass founded around wet corners of concessions (*Sparganophorus sparganophora, Solenostemon monostachyus, Oxalis corniculata*), plants maintained in homegarden or back-yard (*Ocimum gratissimum, Hoslundia opposita, Ageratum conyzoides*) or trees met not far from the village, in fields or opened fallows (*Cola gigantea* var. *glabrescens, Trema guinneensis*).

Table 2: Plants traditionally used by Anyi-Ndenye women during pregnancy; "enm": anal route using enema bag, "drk": drink, "thml": therapeutic meal. Recommended period: trimesters are indicated with bold numerals and months in bracket.

Species	Family	Local names (Anyi)	Drug	Ecology	Instructions	Recommended period
Aerva lannata	Amaranthaceae	Aua nya	leaf	field	enm, thml	**2-3**(6-9)
Ageratum conyzoides	Asteraceae	Ebuakloa	leaf	backyard	enm	**3** (8-9)
Alchornea cordifolia	Euphorbiaceae	Djeka	leaf	wet places, secondary forest	enm	**3** (9)
Alstonia boonei	Apocynaceae	Emian	bark	Cultivated, forest	enm	**1** (1-3)
Althernanthera pungens	Amaranthaceae	Nzadre bowue	leaf	backyard	enm	1 (1-3)
Amaranthus spinosus	Amaranthaceae	Nale bowue	leaf	backyard	enm	**3** (7-9)
Amaranthus viridis	Amaranthaceae	Nale bowue fufue	leaf	backyard	enm	**3** (7-9)
Anchomanes difformis	Araceae	Topi	leaf	field	enm	**3** (9)
Antiaris toxicaria	Moraceae	Bofuan	leaf	forest	enm	**3** (7-9)
Baphia nitida	Fabaceae	Sriman	leaf	secondary forest	enm, thml, drk	**1-2** (3-6)
Bidens pilosa	Asteraceae	Djrandjui	leaf	field, backyard	enm, thml, drk	**2-3** (4-9)
Boerhavia diffusa	Nyctaginaceae	Matran ganganlue	root	field, backyard	enm	
Canna indica	Cannaceae	Kakadro	root	backyard	enm	2 (4-6)
Cissus aralioides	Vitaceae	Ewo toma	stem	forest	enm	**3** (9)
Cleistopholis patens	Annonaceae	Ehutie	bark	forest	thml	2 (6)
Cola gigantea var. glabrescens	Sterculiaceae	Ewale	leaf	secondary forest	enm, thml	**3** (7-9)
Cola nitida	Sterculiaceae	Ewose	bark	Cultivated, forest	thml	2 (4-6)
Costus afer	Zingiberaceae	Anyan	leaf	cultivated	enm	**1-2** (1-6)
Crassocephalum crepidioides	Asteraceae	Puchu puchu	leaf	forest	enm	**3** (7-9)
Cyathula prostrata	Amaranthaceae	Ngukua fufue	leaf	backyard	enm	**3** (9)
Desmodium adscendens	Fabaceae	Aboa ngatie	leaf	understorey, field	enm	**1-3** (1-9)
Diopyros monbuttensis	Ebenaceae	Nyamian baka	bark	forest	enm, thml	1 (1-3)
Dracaena mannii	Agavaceae	Kinsrin kinsrin	leaf	secondary forest	thml	**2-3** (6-9)
Eclipta prostrata	Asteraceae	Moblua	leaf	cultivated	enm	**1-3** (1-9)
Eleusine indica	Poaceae	Sika ndre	leaf	backyard	drk	**3** (7-9)
Elytraria marginata	Acanthaceae	Atremiesan	leaf	House wet places, backyard	enm	**3** (7-9)
Enantia polycarpa	Annonaceae	Sibo kokole	bark	forest	drk	**1** (1-3)
Entandrophragma utile	Meliaceae	Dukuman	bark	forest	thml	2-3 (6-9)
Euphorbia hirta	Euphorbiaceae	Ako dodo	leaf	backyard	enm	**3** (7-9)
Ficus exasperata	Moraceae	Nyengle	leaf	forest	enm, thml	2 (4-6)
Ficus leprieurii	Moraceae	Jango	leaf	forest	enm	2 (4-6)
Ficus sur	Moraceae	Doma	fruit	forest	thml	**2-3** (6-9)
Heliospermum indicum	Boraginaceae	Kosoglo kungo	leaf	backyard	enm	**3** (9)
Hibiscus esculentus	Malvaceae	Ngluman	leaf	cultivated	enm	**3** (9)
Hoslundia opposita	Lamiaceae	Anomalie	leaf	cultivated	thml	2 (4-6)
Illigera pentaphylla	Hernandiaceae	Efinyama	bark	forest	enm	**1-2** (1-6)

Table 2: Plants traditionally used by Anyi-Ndenye women during pregnancy....... *continued*

Species	Family	Local names (Anyi)	Drug	Ecology	Instructions	recommended period
Jatropha gossypifolia	Euphorbiaceae	Aploplo	leaf	backyard	enm	**3** (9)
Kalanchoe crenata	Crassulaceae	Aplombli	leaf	cultivated	enm	**1-2** (2-5)
Landolphia hirsuta	Apocynaceae	Amanle	bark	forest	enm	**2-3** (6-9)
Luffa cylindrica	Cucurbitaceae	Flominan	leaf	village boundery	enm	**3** (9)
Melanthera scandens	Asteraceae	Afufu nya	leaf	field	thml	**3** (7-9)
Microdesmis keayana	Pandaceae	Efima	leaf	forest	thml	**2-3** (6-9)
Microglossa pyrifolia	Asteraceae	Esosonya	leaf	cultivated	enm	**3** (7-9)
Nephrolepis biserrata	Davalliaceae	Butre nya	leaf	epiphyte	thml	**2-3** (6;9)
Ocimum gratissimum	Lamiaceae	Amanyire	leaf	cultivated	enm, thml	**1-3** (1-9)
Oldenlandia affinis	Rubiaceae	Flolo	leaf	backyard	enm	**1-2** (1-5)
Oxalis corniculata	Oxalidaceae	Talie	leaf	House wet places, backyard	enm	**3** (7-9)
Palisota hirsuta	Commelinaceae	Ngesan han	leaf	secondary forest	thml	2 (4-6)
Parquetina nigrescens	Periplocaceae	Ababa nya	leaf	secondary forest	enm	**3** (9)
Paullinia pinnata	Sapindaceae	Trodin	leaf	wet places, secondary forest	enm	**3** (7-9)
Phyllanthus amarus	Euphorbiaceae	Sumasi	leaf	backyard	enm	1-3 (1-9)
Platostoma africanum	Lamiaceae	Srisilie	leaf	cultivated	enm	**3** (7-9)
Portulaca oleracea	Portulacaceae	Ajra nya	leaf	backyard	enm, drk	**3** (7-9)
Pothomorphe umbellata	Piperaceae	Amumu nya	leaf	wet places, secondary forest	thml	2 (6)
Pouzolzia guineensis	Urticaceae	Ngukua	leaf	field	enm	**3** (9)
Pycnanthus angolensis	Myristicaceae	Etine	bark	forest	thml	**2-3** (6-9)
Rauvolfia vomitaria	Apocynaceae	Mulukudua	root	secondary forest	enm	1 (1-3)
Ricinodendron heudelotii	Euphorbiaceae	Api	bark	forest	thml	**3**(7-9)
Scoparia dulcis	Scrophulariaceae	Nyaranyaran	leaf	backyard	enm	**1-2** (1-6)
Secamone afzelii	Asclepiadaceae	Nyablika	leaf	backyard	enm	**3** (7-9)
Sesamum radiatum	Pedaliaceae	Fiandron	leaf	cultivated	enm	**3** (9)
Sida acuta	Malvaceae	Somobla	leaf	backyard	enm	**3** (9)
Sida pilosa	Malvaceae	Ebuabowue	leaf	field	enm	**3** (8-9)
Solanecio biafrae	Asteraceae	Gnanvule	leaf	field	enm, thml	**2-3** (4-9)
Solanum torvum	Solanaceae	Yakandroa	leaf	field	thml	**2-3** (4-9)
Solenostemon monostachyus	Lamiaceae	Nzisiwlolo	leaf	House wet places, backyard	enm	**1-2** (1-6)
Sparganophorus sparganophora	Asteraceae	Sufian	leaf	House wet places, backyard	enm	1 (1)
Spathodea campanulata	Bignoniaceae	Asrele	bark	secondary forest	enm	**1-2** (1-6)
Spondias mombin	Anacardiaceae	Troman	leaf	cultivated	enm	**1-2** (1-6)
Sterculia tragacantha	Sterculiaceae	Kotokie	leaf	secondary forest	enm	**3** (7-9)
Tapinanthus bangwensis	Loranthaceae	Jujire	leaf	forest	enm, thml	**2-3** (4-9)
Trema guineensis	Ulmaceae	Sisian	leaf	secondary forest	enm, thml	**2-3** (4-9)
Turraea heterophylla	Meliaceae	Plele	root	secondary forest	enm	**1-2** (1-6)
Voacanga africana	Apocynaceae	Pakipaki	leaf	secondary forest	enm	**3** (10)
Xanthosoma maffafa	Araceae	Kooko	leaf	cultivated	thml	**1-3** (1-9)

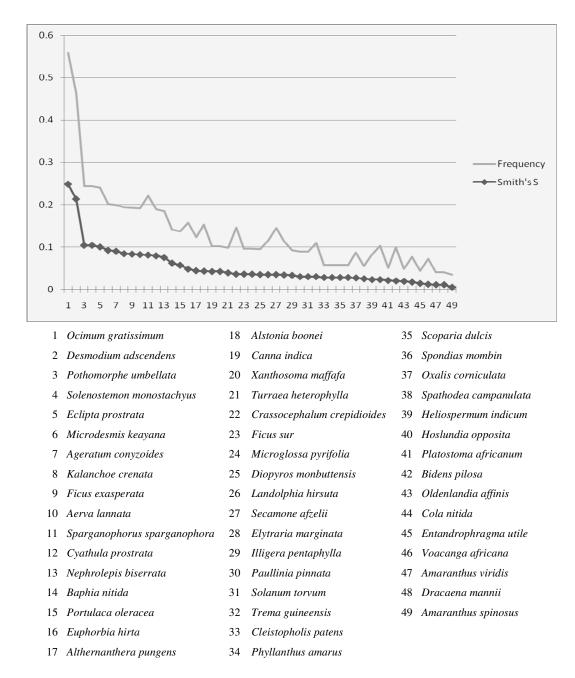| 1	*Ocimum gratissimum*	18	*Alstonia boonei*	35	*Scoparia dulcis*
2	*Desmodium adscendens*	19	*Canna indica*	36	*Spondias mombin*
3	*Pothomorphe umbellata*	20	*Xanthosoma maffafa*	37	*Oxalis corniculata*
4	*Solenostemon monostachyus*	21	*Turraea heterophylla*	38	*Spathodea campanulata*
5	*Eclipta prostrata*	22	*Crassocephalum crepidioides*	39	*Heliospermum indicum*
6	*Microdesmis keayana*	23	*Ficus sur*	40	*Hoslundia opposita*
7	*Ageratum conyzoides*	24	*Microglossa pyrifolia*	41	*Platostoma africanum*
8	*Kalanchoe crenata*	25	*Diopyros monbuttensis*	42	*Bidens pilosa*
9	*Ficus exasperata*	26	*Landolphia hirsuta*	43	*Oldenlandia affinis*
10	*Aerva lannata*	27	*Secamone afzelii*	44	*Cola nitida*
11	*Sparganophorus sparganophora*	28	*Elytraria marginata*	45	*Entandrophragma utile*
12	*Cyathula prostrata*	29	*Illigera pentaphylla*	46	*Voacanga africana*
13	*Nephrolepis biserrata*	30	*Paullinia pinnata*	47	*Amaranthus viridis*
14	*Baphia nitida*	31	*Solanum torvum*	48	*Dracaena mannii*
15	*Portulaca oleracea*	32	*Trema guineensis*	49	*Amaranthus spinosus*
16	*Euphorbia hirta*	33	*Cleistopholis patens*		
17	*Althernanthera pungens*	34	*Phyllanthus amarus*		

Figure 1: Salience of medicinal plants used during pregnancy by Anyi-Ndenye women

There is, however, a lack of correlation between age, number of children and the knowledge of obstetric plants. This situation could be mainly explained by the fact that pregnant women seek help of an advisor (mother or close relative) or a specialist, a kind of a traditional birth attendant, who is knowledgeable about herbs and their uses.

Regarding the birth effects sought by women, the major concern is to have a weighty and healthy child who arouses praise and admiration in the community. The recipes to avoid miscarriages are generally prescribed to first pregnant or women having difficulties in giving birth or to lead a pregnancy to its term.

The preparation of a therapeutic meal for the pregnant women seems to be a singularity of Anyi-Ndenye women. This particular mode of medicinal administration is less reported in the literature, although it seems to be an old practice in Africa. This practice was observed among Yassa of the South Cameroon [17], where therapeutic dish, prepared with plantains, meat, palm oil and medicinal plants was especially intended to care for victims of sorcery.

In the particular case of pregnancy, this practice seems to be beneficial to the pregnant woman. First, it offers the woman a sufficient food rich in calories and oligonutrients essential to foetal development. Indeed, the fruits of oil palm are a significant source of lipids, carotenoids and vitamin A [18], which have a physiological role in cellular differentiation. The nutritional potentials of certain plants used as ingredient of the therapeutic meal such as *Crassocephalum crepidiodes* and *Solanecio biafrae* are good sources of proteins [19].

The obligation to consume all of the therapeutic meal prevents women from suffering from malnutrition due to the lack of appetite or nauseas, frequent demonstrations among pregnant women. Moreover, the small ritual which completes this meal is a significant psychological stimulant.

Some plants listed in this study are known by other people for the same uses. For example, *Nephrolepis biserrata* is used in Ghana to ensure the good development of pregnancy [20]. The strict use of the epiphyte fronds of this species is advised because the fronds of the terrestrial feet, macerated in palm wine, constitute a violent poison [21].

The use of *Solenostemon monostachyus* and *Sterculia tragacantha* by Oubi and Wè, forest people of the South-western Côte d'Ivoire, in cases of difficult childbirth was also reported [21]. For the same indication, *Oxalis corniculata, Hibiscus esculentus, Portulaca oleracea* and *Sterculia tragacantha* are used by Bété people of Côte d'Ivoire [22]. The Oubi and Akyé people usually employ *Microdesmis keayana* to ensure strong health to the pregnant woman [3, 21]. In Côte d'Ivoire and Central Africa, the aerial parts of *Pothomorphe umbellata* are usually given to the women to regulate menses and prevent abortion [23].

Medicinal plants are also used during pregnancy in Occident [4, 24-25]. However, it was noted the insufficiency of scientific data justifying their use. Those studies stated that some anomalies (stain of the amniotic fluid by meconium, respiratory problems of the newborn) were even attributed to the plants used to have an easy childbirth.

However, based on phytochemical or pharmacological tests, the real effects of some plants traditionally used during pregnancy by Anyi-ndenye women are confirmed. For example, it is showed [26] that the well-known *Desmodium adscendens* (S=0.21) prescribed during the first trimester "to stabilize" the pregnancy had relaxing properties on the smooth muscle. Moreover, this plant protects the liver [27], known to have a fundamental role in the good development of pregnancy. A similar positive effect on liver was found in *Phyllanthus amarus* [28], plant used to facilitate childbirth [29]. It was also showed [30-31] that the aqueous extract of *Sesamum radiatum* leaves elicited relaxing properties on the smooth muscle. *Ocimum gratissimum,* another plant widely used by pregnant women to maintain a strong health (S=0.25) was studied and induced significant antinociceptive and anti-inflammatory activities [32].

Figure 2: Cooking and eating of therapeutic meal: a) Pregnant woman assembling the ingredients (here, bananas, oil palm fruits and leaves of *Microdesmis keayana*); b) Another pregnant woman is pounding the ingredients cooked; c) Pregnant women eating the meal; d) children wiping their hands on the pregnant woman's belly, after the meal.

Different extracts from the aerial parts of *Euphorbia hirta*, usually employed to treat colic and pains during pregnancy, showed antibacterial activity against a wide spectrum of both gram-positive and gram-negative bacteria [33]. Similarly, a study [23] suggested that the use of *Pothomorphe umbellata* could be beneficial for pregnant women, because the aerial parts of this plant contain 4-nérolidylcatéchol, a powerful antioxidant with chemopreventative potential. In conclusion, we agree with Sofowara [34] that some of the plants traditionally employed in obstetric field would provide essential nutrients and others components beneficial to the pregnant women. If this study has identified most of the plants used by Anyi-Ndenye women during their pregnancy and the main reasons why they use them, however, some questions have to be raised. For example, what are the pharmacological, toxicological, and clinical as well as psychological effects of these herbs especially when taken complementarily with modern medicine? How can a formal integrated follow-up of pregnancy (traditional practices and modern prescriptions) be built? Complementary studies (toxicological, pharmacological and clinical) are in progress. These studies currently concern two categories of plants: those used to stabilize the pregnancy and those that facilitate childbirth. The objective is to test the relaxing or contracting effects of these plants on the smooth muscle of animals. The following steps will be to find the substances responsible for these effects and test their reactions in the presence of medical molecules regularly prescribed during pregnancy.

Acknowledgements

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