Plants and Traditional Contraceptive Practices: An Ethnobotanical Study among the Anyi Ndenye in Eastern Côte d'Ivoire

ABSTRACT

In recent years, plants and traditional practices in reproductive health have become an increasingly subject to ethnobotanical research. However, certain aspects of this health domain, such as family planning, remain understudied.

Aims: This study aims to understand the practices and plants used by the Anyi Ndenye for family planning. Specifically, the study seeks to analyze the perception of the Anyi Ndenye regarding to the use of contraceptive plants, assess the diversity of contraceptive plants, and explore associated knowledge.

Study Design: Documenting all contraceptive practices in Ndenye cultural area.

Place and Duration of Study: The study was conducted in three districts of the Ndenye Kingdom from 2016 to 2021

Methodology: An ethnobotanical survey, based on free lists and semi-structured interviews, was used for ethnobotanical data collection from 253 individuals. Population's perception, was determined by Index of Consent and knowledge that we proposed. Knowledge Sharing Level Assessment was determined by Correspondence Analysis, was carried out by first grouping the surveyed individuals into five age groups based on physiological maturity (18-24 years, 25-35 years, 36-45 years, 45-50 years, and ≥51 years). knowledge level was highlighted by Frequency of Citation and Smith Index.

Results: 24.5% of individuals were willing to provide information regarding contraceptive plants. The study identified 33 plants belonging to 31 genera and 20 families, with Euphorbiaceae and Solanaceae being the most requested. The most contraceptive plant mentioned was Parquetinanigrescens. Leaves and barks were the most commonly used parts for preparing various recipes. These recipes were primarily administered rectally after sexual intercourse. Some similarities have been observed among age groups regarding the sharing of information about plants used. However, there were some specificities for each age group.

Conclusion: Documenting all contraceptive practices in Anyi Ndenye cultural area led us to undertake ethnobotanical studies. According to the literature, contraceptive plants remain a relatively unexplored area in reproductive health and could be an interesting research subject. This work serves as a starting point for research on contraceptive plants in Côte d'Ivoire.

Keywords: Reproductive Health, contraceptive plants, AnyiNdenye, Côte d'Ivoire

1- INTRODUCTION

The use of herbal medicine by Humans dates back a long time. It remains relevant, as despite the advancements in modern medicine, nearly 80% of the population in Africa relies on plants for their

healthcare [1]. According to WHO, to date, 170 out of the 194 WHO Member States acknowledge the use of traditional medicine, seeking WHO's assistance in building a body of evidence and reliable data on traditional medicine practices and products. Phytotherapy's areas of intervention include family planning, defined as the means to avoid unwanted pregnancies, choose the desired number and timing of children, and space births appropriately for the health of both mother and child.
This planning is facilitated through the use of contraceptive and/or interruptive methods [3]. As several authors have shown [2], in traditional African societies, fertility is closely linked to tribal preservation, and large families were highly valued, making contraception a less discussed topic [4]. This observation partly justifies the scarcity of ethnobotanical studies on the subject compared to other health aspects. Nevertheless, the availability of various synthetic contraceptives in the market, each with limited success or side effects, has sparked a renewed interest in plants containing contraceptive agents [5,6,7]. The initial step in this lengthy process is to document all contraceptive practices across different cultural areas. In this context, this study was conducted among the Anyi Ndenye, a significant tribe within the larger Akan group known for its extensive knowledge of reproductive health plants [8]. Thus, this study aims, firstly, to analyze the perception of the Anyi Ndenye regarding the use of contraceptive plants, secondly, to assess the population's level of knowledge, and finally, to catalog practices associated with the use of contraceptive plants.

2- MATERIALS AND METHODS

2.1- Study Area

The survey was conducted in three districts of the Ndenye Kingdom, corresponding to three Sub-prefectures in the Indénié-Djuablin Region: Amélékia, Bettié, and YakasséFeyassé. The region is located in the East of Côte d'Ivoire, between latitudes 5°53' and 7°10' North and longitudes 3°10' and 3°4' West (Fig. 1.). It covers an area of approximately 6,900 km². The region is home to a population of 716,443 inhabitants, including 23,238 in Amélékia, 24,983 in Bettié (Sub-prefecture), and 36,838 in YakasséFeyassé [9]. It experiences a subequatorial climate regime [10]. with an average annual precipitation of 118.50 mm and an average annual temperature of 26.5°C. The original vegetation belongs to the mesophilic sector of the Guinean domain according to Guillaumet and Adjanohoun (1971) [11]., specifically the "semi-deciduous forest with *Celtis* spp. and Triplochiton scleroxylon K. Schum." type. However, in the southern tip of this region, the vegetation is part of the ombrophilous sector characterized by the presence of evergreen dense humid forests with *Eremospatha macrocarpa* (Mann & Wendl.) Wendl. and *Diospyros mannii*Hiern.

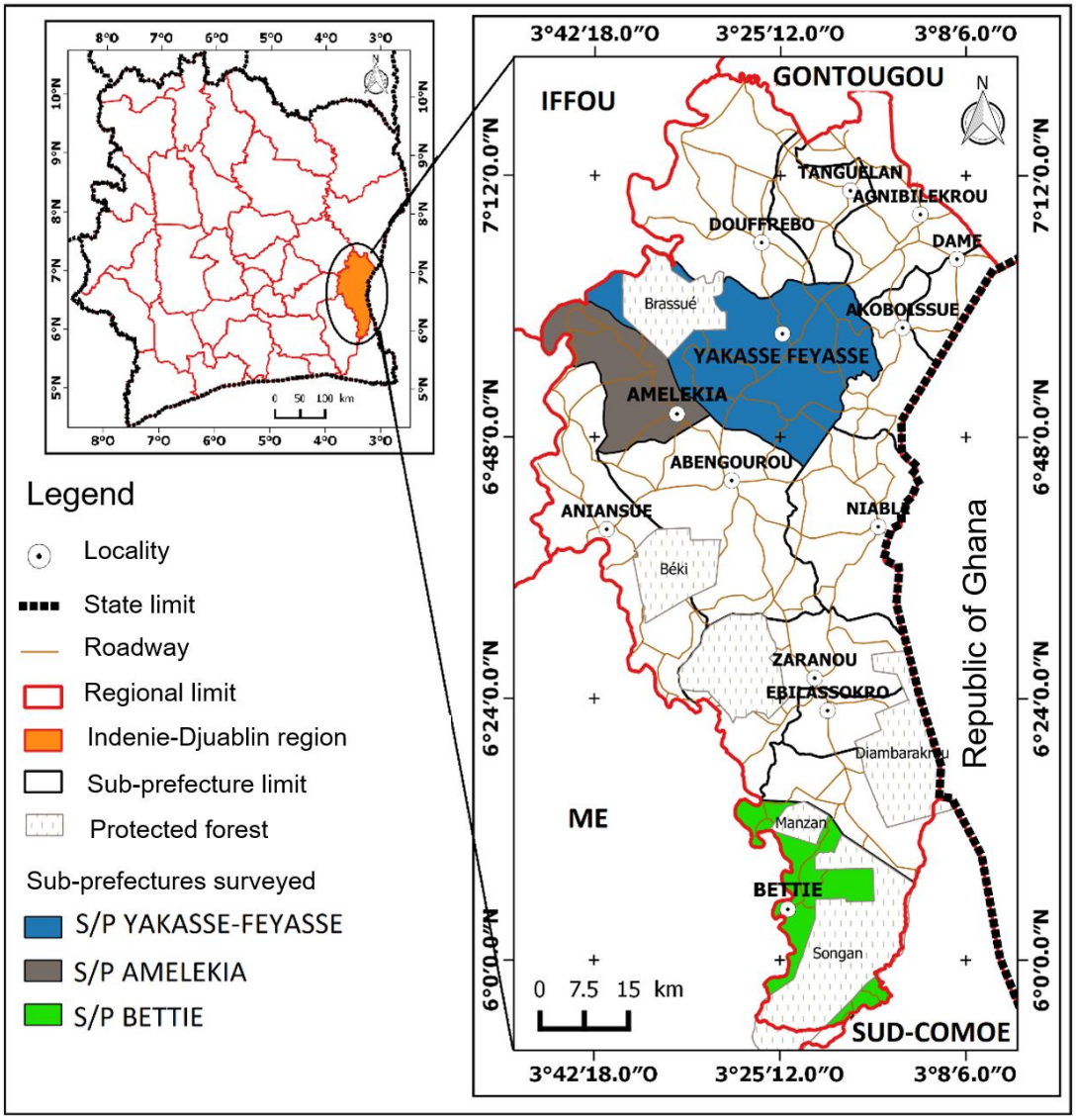

Fig. 1. Map depicting the location of the Indénié-Djuablin region

2.2- Methods

2.2.1- Ethnobotanical Data Collection

Three successive approaches were employed for ethnobotanical data collection. The first step involved household visits (door-to-door approach) within the study area. This technique served to gain the population's perception on the study subject and identify specialists through snowball sampling in the relevant field. Interviews were conducted using the free-listing technique. Subsequently, identified specialists were individually interviewed at their homes using a semi-structured interview format. Following these phases, series of field trips were conducted with previously identified individuals in the surrounding "bushes." This step facilitated the collection of plant specimens mentioned for botanical identification. Finally, the collected plants were later utilized in the "Show-and-tell" approach to confirm local names and gather additional information from individuals with mobility challenges. Before the interviews, the purpose of the survey was explained and the free and informed consent was recorded using a dictaphone. The survey was conducted with consenting persons; however, the number of non-consenting persons was counted.

2.2.2- Data processing

2.2.2.1- Analysis of the population's perception

The initial analysis aimed to assess the perception of contraception in the surveyed villages using the following Equation (1) that we propose:

$$Ic = \frac{N_c}{N_t} \text{ x } 100 \qquad (1)$$

where *Ic* is the index of consent and knowledge, *Nc* is the number of individuals consenting to participate in the survey and having knowledge on the subject, and *Nt* is the total number of individuals approached in the survey.

2.2.2.2 - Evaluation of the population's knowledge level

The knowledge level of Anyi Ndenye regarding the use of contraceptive plants was assessed using two indices. These are the citation frequency (Equation 2) and the Smith index (Equation 3). These indices were chosen because they are based on the "respondent consensus," meaning the level of agreement among a population of interviewees [12]. The citation frequency ranges from 0 (little-known plant) to 100 (widely known plant). As for the Smith index, it ranges from 0 (low salience for the community) to 1 (very high salience). Additionally, indices such as saturation level and respondents' competence were determined to evaluate the overall knowledge level of informants on the addressed theme. Saturation level can be defined as the point where each new interview produces only previously mentioned data [13]. Respondents' competence is a scatter plot reflecting the proximity matrix of informants. The arrangement of points in relation to the regression line indicates proximity (points aggregation) or lack thereof (dispersion of points) in the given responses. Saturation reached early in the survey and respondents' competence in a compact scatter plot on the regression line suggest widely shared knowledge in the surveyed community [14].

$$\boldsymbol{fc = \frac{n}{N} \times 100} \qquad (2)$$

$$\boldsymbol{S_a = \frac{\sum_{i=1}^{N} \frac{L_i - R_a + 1}{L_i}}{N}} \qquad (3)$$

In these formulas, *fc* is the citation frequency, *n* is the number of respondents mentioning the plant, *NN* is the total number of individuals interviewed during the survey, S_a is the Smith index [15],L_i is the length of a citation list, and R_j is the rank of a citation in the list. These indices were calculated using the Excel complement FLAME 1.1 [16].

2.2.2.3- Knowledge Sharing Level Assessment

To highlight the level of knowledge sharing, respondents were initially grouped into five age categories based on physiological maturity (18-24 years, 25-35 years, 36-45 years, 45-50 years, and ≥51 years). Subsequently, using plant lists, similarities between these age groups were determined through the Sørensen similarity index [17], as given by equation (4).
Finally, a Correspondence Analysis (CA) was performed on a contingency table containing species in rows and age groups in columns. This analysis serves to visually depict similarities and divergences between age groups and identify species associated with each age group. These analyses were conducted using R software version 3.6.1 [18].

$$\boldsymbol{S = \frac{2 \times a}{(2 \times a + b + c)}} \qquad (4)$$

In equation 4, where *S* is the Sørensen coefficient, *'a'* represents the number of species specific to the first group, *'b'* represents the number of species specific to the second group, and *'c'* represents the number of species common to both groups.

RESULTS

3.1- Population Perception

During the survey, 253 individuals (men and women) were approached. Only 62 individuals were willing to provide information regarding contraceptive plants, constituting 24.5% (Table 1). The highest value was recorded in the Canton of Amélékia (Ic=35%).

Table 1. Contraception Perception in SurveyedVillages

Canton	Number of people approached (Nt)	Number of consents (Nc)	Consents rate (Ic)
Béttié	84	18	21,42%
YakasséFeyassé	89	16	17,98%
Amélékia	80	28	35%
Total	**253**	**62**	**24,5 %**

3.2 - Knowledge of contraceptive plants by the populations

The ethnobotanical survey allowed the identification of 33 species distributed across 31 genera belonging to 20 families, with the most represented being Euphorbiaceae and Solanaceae (four species each). *Parquetinanigrescens* (Afzel.) Bullock (Fig. 2.) was the most cited, however, with a low citation frequency of 17.74% (Table 2).

Saturation level for plants used as contraceptives was derived from 18 free lists out of a total of 62 free lists (Fig .3.). These lists range from 1 to 11 plants, with an average of 2 plants mentioned per list. The disparity in responses is evident through scattered data points in terms of informant competence (Fig. 4.).

Fig.2. *Parquetinanigrescens (Afzel.) Bullock*

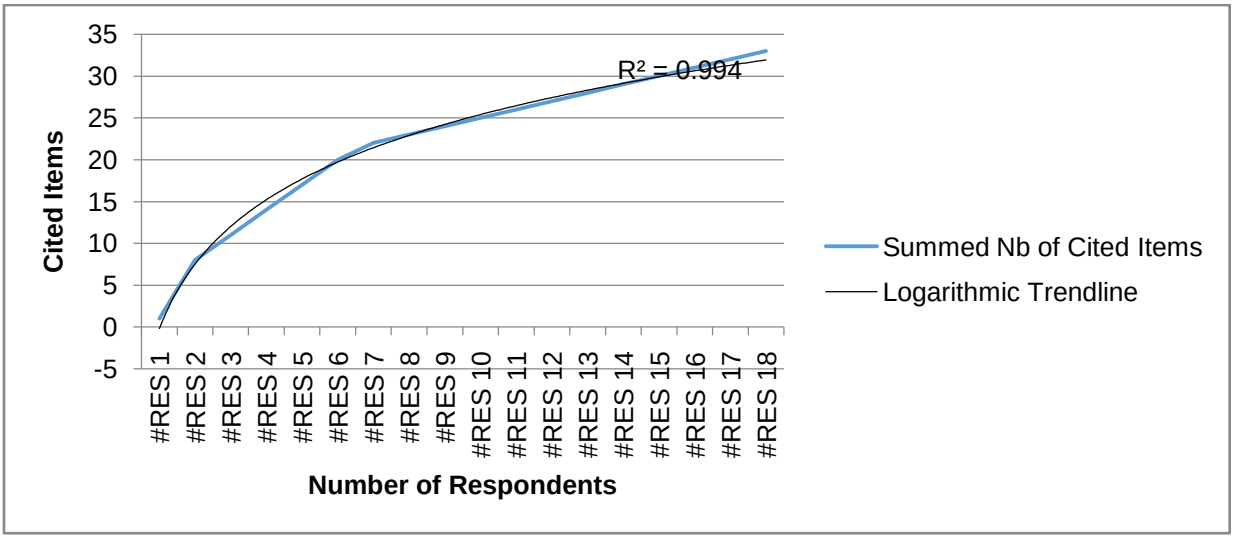

Fig. 3. Saturation level of information on contraceptive plants among the Anyi Ndenye.

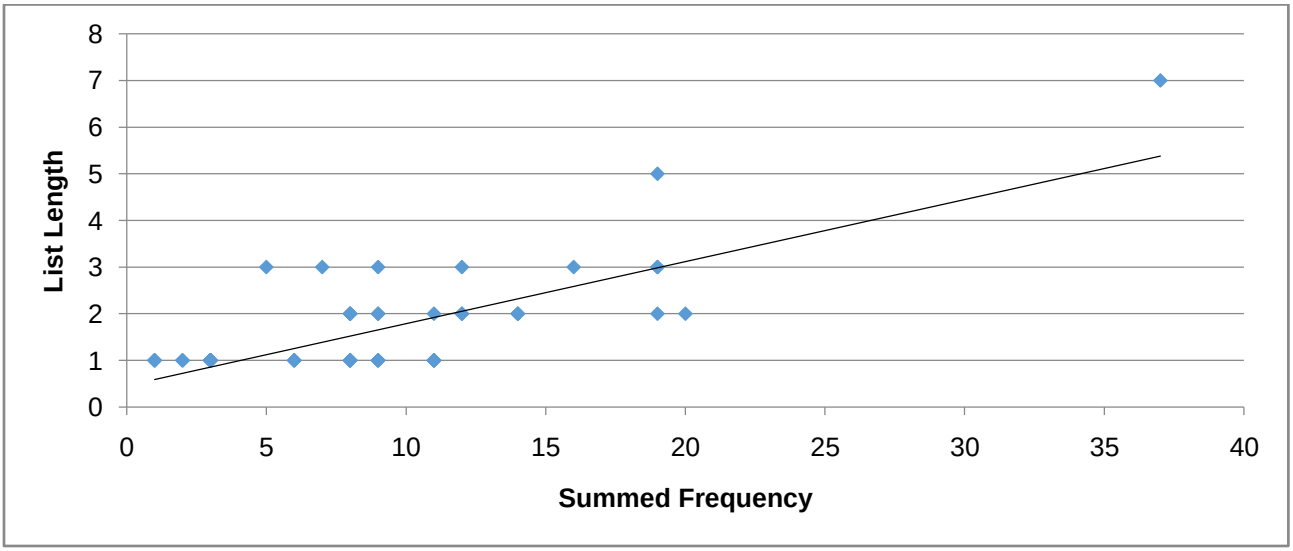

Figure. 4. Informants' perspectives on contraceptive plants among the Anyi Ndenye.

As shown in Table 2, Parquetinanigrescens is the most mentioned, albeit with a low citation frequency of 17.74%.

Table 2: Expertise of the Anyi Ndenye in the Use of Plants as Contraceptives.

Species	Local name	Family	Citation Frequency (%)	Smith Index	Part used and mode of use
Alchornea cordifolia (Schumach. & Thonn.) Müll. Arg.	*Djéka*	Euphorbiaceae	9.68	0.073	Macerated fresh leaves reduced to a paste taken as an enema
Alternantherasessilis(L.) R.Br. ex DC.	*Klomodja*	Amaranthaceae	4.84	0.048	Macerated fresh leaves reduced to a paste taken as an enema
*Azadirachta indica*A.Juss.	*Djénébakaa*	Meliaceae	1.61	0.005	Macerated fresh leaves reduced to a paste taken as an enema
Boerhavia diffusa L.	*Mantranganganlouwe*	Nyctaginaceae	1.61	0.016	Macerated fresh leaves reduced to a paste taken as an enema
*Caricapapaya*L.	*Boflê-nya*	Caricaceae	1.61	0.010	Macerated fresh leaves reduced to a paste taken as an enema
Chassaliakolly(Schumach.) Hepper	*Gbandjin-gbandjin*	Rubiaceae	1.61	0.016	Macerated fresh leaves reduced to a paste taken as an enema
Chromolaena odorata (L.) R.M. King & H. Rob.	*Amandê*	Asteraceae	12.90	0.124	Macerated fresh leaves reduced to a paste taken as an enema
*Clerodendrummannii*Baker	*Allokoya*	Combretaceae	3.23	0.032	Macerated fresh leaves reduced to a paste taken as an enema
*Coffeacanephora*Pierre ex A. Froehner	*Kafé*	Rubiaceae	4.84	0.043	Macerated fresh leaves reduced to a paste taken as an enema
*Cola gigantea*A. Chev.	*Ewale*	Malvaceae	4.84	0.048	Macerated fresh leaves reduced to a paste taken as an enema
*Combretumzenkeri*Engl. &Diels	*Efron*	Combretaceae	4.84	0.048	Macerated fresh leaves reduced to a paste taken as an enema
*Cyathulaprostrata*var. *pedicellata* (C.B. Clarke) Cavaco	*Mantan-mantan*	Amaranthaceae	1.61	0.016	Macerated fresh leaves reduced to a paste taken as an enema
*Diospyrosmonbuttensis*Gürke	*Gnamianbaka*	Ebenaceae	4.84	0.043	Macerated fresh leaves reduced to a paste taken as an enema
Entandrophragmaangolense(Welw.) C.DC.	*Doukoumanbla*	Meliaceae	3.23	0.016	Macerated bark fragments reduced to a paste taken as an enema
Euadeniatrifoliolata(Schumach. & Thonn.) Oliv.	*Epou*	Capparaceae	1.61	0.016	Macerated root fragments reduced to a paste taken as an enema
*Euphorbiahirta*L.	*Akododo*	Euphorbiaceae	1.61	0.016	Macerated fresh leaves reduced to a paste taken as an enema
*Ficus exasperata*Vahl	*Djidjiré*	Moraceae	1.61	0.008	Macerated fresh leaves reduced to a paste taken as an enema
*Gossypiumhirsutum*L.	*Djesse*	Malvaceae	9.68	0.062	Macerated fresh leaves reduced to a paste taken as an enema
*Jatropha curcas*L.	*Ploplo*	Euphorbiaceae	3.23	0.022	Macerated fresh leaves reduced to a paste taken as an enema
*Microdesmiskeayana*J. Léonard	*Efima*	Pandaceae	1.61	0.011	Macerated fresh leaves reduced to a paste taken as an enema
Nicotiana tabacum L.	*Bondo*	Solanaceae	14.52	0.124	Macerated fresh leaves reduced to a paste taken as an enema
*Ocimumamericanum*L.	*émian*	Lamiaceae	3.23	0.024	Macerated fresh leaves reduced to a paste taken as an enema

*Ocimumgratissimum*L.	*Magninin*	Lamiaceae	9.68	0.089	Macerated fresh leaves reduced to a paste taken as an enema
Parquetinanigrescens(Afzel.) Bullock	*Ababagna*	Apocynaceae	17.74	0.168	Macerated fresh leaves reduced to a paste taken as an enema. Friction leaves taken as a beverage
*Passiflorafoetida*f. glabra A. Fern. & R. Fern.	*éwoaliè*	Passifloraceae	1.61	0.008	Ground seeds taken in capsule form
Ricinuscommunis L.	*Atindé*	Euphorbiaceae	3.23	0.008	Macerated fresh leaves reduced to a paste taken as an enema
Senna hirsuta(L.) H.S. Irwin & Barneby	*Ekindaloua-biezoua*	Fabaceae	1.61	0.003	Macerated fresh leaves reduced to a paste taken as an enema
*Solanum lycopersicum*L.	*Tomati-nya*	Solanaceae	12.90	0.091	Macerated fresh leaves reduced to a paste taken as an enema
Solanum macrocarpon L.	*Tropo-nya*	Solanaceae	3.23	0.023	Macerated fresh leaves reduced to a paste taken as an enema
*Solanum torvum*Sw.	*Gnakandroua*	Solanaceae	1.61	0.005	Macerated fresh leaves reduced to a paste taken as an enema
Tectona grandis L.f.	*Teck-nya*	Verbenaceae	6.45	0.044	Macerated fresh leaves reduced to a paste taken as an enema
Theobroma cacao L.	*Koko-nya*	Malvaceae	1.61	0.014	Macerated fresh leaves reduced to a paste taken as an enema
*Vismia*guineensis (L.) Choisy	*kosha*	Hypericaceae	3.23	0.032	Macerated bark fragments reduced to a paste taken as an enema

3.3- Correlation between the level of knowledge and the age of those with knowledge

In terms of similarity, the speciescomposition of the age group 25-35 years is similar to that of the age group 36-45 years, while 36-45 years is similar to ≥51 years (Table 3). This explains the proximity of these classes and the dispersion of others on the Correspondence Analysis (CA) graph (Fig. 5.). Furthermore, CA highlights the species associated with each age group. Species such as *Ocimumamericanum* and *Solanum torvum* were most frequently mentioned by individuals aged 18 to 24 years, while *Euphorbia hirta* is the most cited by the 45-50 age group.

Table 3: Correlation between knowledge and age regarding contraceptive plants among the Anyi Ndenye through the analysis of similarities.

	18-24 years	25-35 years	36-45 years	45-50 years	≥51 years
18-24 years	–				
25-35 years	0.47	–			
36-45 years	0.23	**0.55**	–		
45-50 years	0.31	0.4	0.34	–	
≥51 years	0.17	0.32	0.6	0.22	–

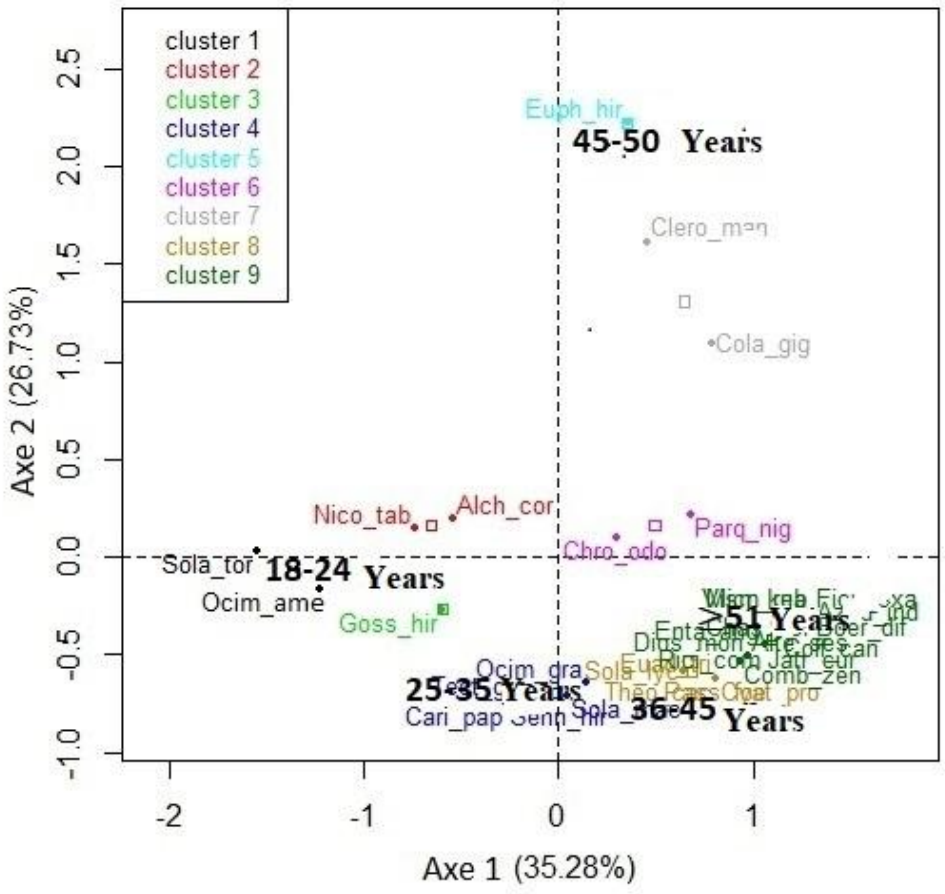

Fig.5. Contraceptive Plants Mentioned According to Age Groups in Ndenye

3.4- Practices Associated with the Use of Contraceptive Plants

The collective knowledge of the Anyi Ndenye regarding the use of contraceptive plants is summarized in Table 2. Four parts of plants are utilized in recipe preparation, in order of importance: leaves (85%), roots (6%), bark (6%), and seeds (3%). Concerning administration methods, the majority (91%) of recipes are taken as enemas using a pear. However, some recipes are administered orally as a beverage (6%) and vaginally in the form of a suppository (3%). Regardless of the administration method, all recipes are taken within hours after sexual intercourse.

4- DISCUSSION

Fertility has been and will remain a major concern for humans, irrespective of civilization and era [19]. In the Western world, contraceptive practices have evolved with scientific advances in physiology, endocrinology, and galenics. These advances have led to a broader, varied, and reliable array of birth control methods in the 21st century, overshadowing natural methods in favor of chemical means. However, contraceptive use varies significantly from one continent to another. Sub-Saharan Africa has the lowest usage, with 28% of women employing contraception [20]. Several studies highlight the reasons for this situation [21,22,23]. Most of these studies quantitatively describe factors associated with modern contraceptive use in urban settings [24]. Yet, few studies have addressed the issue of a centuries-old traditional alternative to state-provided methods, namely contraceptive plants [25,26]. Generally, ethnobotanical studies focus on plants and their uses. Those that follow a so-called quantitative approach aim to assess the knowledge around plants or the importance of the use of these plants in a given community. However, there are few tools to assess the level of knowledge of the subject itself in the survey population. It is this gap that the proposed index of consent and knowledge (*Ic*) can fill. It is a very simple index that indicates whether the topic addressed by the researcher is easy or that the information is widely shared in the investigation community. Our findings reveal an Ic of 24.5%. This information on consent and knowledge implies that only 24,5% of surveyed individuals use or have knowledge of contraceptive plants. Although low, this value aligns with the national modern contraceptive prevalence of 22% [27]. In a similar study in a rural commune in Mali[28] it was also observed that there was limitedawareness of contraceptive plants.

In rural Sub-Saharan Africa, contraceptives are primarily viewed as means of birth spacing replacing traditional periods of abstinence [29]. In these settings, high fertility remains valued as children are fundamental to the family economy. This, coupled with inadequate awareness campaigns on family planning [30], partly justifies the reluctance of some rural women toward so-called modern contraceptive methods, as observed [31].among the Senoufos in northern Côte d'Ivoire. In this group, medical-magical practices (amulets) and the use of plants like *Jatropha curcas* L. were preferred over medical contraceptives. While our study did not identify the use of amulets, it highlighted a greater diversity of plants. Indeed, our informants cited 33 plant species as contraceptives, with a prevalence of Euphorbiaceae and Solanaceae. In western Ghana, also among the Akan people across the border, it was identified only eight contraceptive plants, with a prevalence of Euphorbiaceae[32]. Compared to their counterparts in western Ghana, Anyi-Ndenye women are familiar with a wider variety of contraceptive plants. However, there was no real consensus on a specific plant in this area, with citation frequencies ranging from 1.6% to 17.7%, implying that information about contraceptive plants is not widely shared in the community. This justifies the division of generations linked to plant groups. For example, young girls aged 18-24 only know about five plants, compared to the 21 plants known by those aged 36-45 years This difference could suggest a gradual abandonment of contraceptive plants by the younger generation, in line with the profound changes traditional societies undergo [28].

Among the plants mentioned as contraceptives, some like *Parquetinanigrescens*, *Ficus exasperata, Euphorbia hirta, Cyathulaprostrata,* and*Boerhaviadiffusa* are frequently used by the same people during pregnancy, especially in the third trimester [8]. However, plants used during the third trimester usually induce strong uterine contractions, facilitating an easy delivery [33]. Strong uterine

contractions, as known, reduce the chances of egg implantation in the uterine wall, thus preventing pregnancy. This is, in fact, the basic principle of emergency contraceptives or the morning-after pill. The post-coital use of all the listed plants suggests that they function similarly to a morning-after pill.
Some plants listed, though little known in our study area, are also used by other peoples for their contraceptive properties. For example, ripe *Carica papaya* seeds and mature *Jatropha curcas*seeds are used as emergency contraception among the Senoufo women [31]. Similarly, *Azadirachta indica* seeds are used as a contraceptive in Ghana [32]. The fruits and seeds of *Carica papaya* act as emergency contraception by hindering implantation. The same authors reveal the contraceptive effect of *Azadirachta indica* related to the reduction of follicles and disruption of the follicular cycle. Regarding *Jatropha curcas*, studies show that the leaves and seeds are rich in triterpenoid saponins with a spasmogenic effect [34 - 36]. It was also demonstrated that *Solanum* plants (especially *S. xanthocarpum*) contain active principles inhibiting ovarian function, altering uterine structure, and preventing implantation, thus controlling fertility in female albino rats [37]. The prevalence of Solanaceae in our list may not be coincidental. Alongside confirmed contraceptive plants, some, such as *Diospyros monbuttensis*, *Euadeniatrifoliolata*, *Theobroma cacao*, and *Vismiaguineensis* (L.) Choisy, were mentioned for the first time as contraceptives, to our knowledge. However, medicinal plants associated with anti-fertility properties are numerous and generally underexplored, particularly in sub-Saharan Africa [37].

5- CONCLUSION

The Anyi Ndenye, representing a significant tribe in the larger Akan group, are known for their extensive knowledge of reproductive health plants. Documenting all contraceptive practices in this cultural area led us to undertake ethnobotanical studies. Consequently, from our study, 33 contraceptive plants were identified. These contraceptive plants were known as such by 24,5% of the surveyed individuals. Nevertheless, the diversity of organs used and the mode of administration reveal a good understanding of plant diversity among the population. However, according to the literature, contraceptive plants remain a relatively unexplored area in reproductive health and could be an interesting research subject. Phytochemical, pharmacological, and toxicological studies are waited for these plants to be valued as credible alternatives to modern contraception.

CONSENT

The authors declare that they obtained consent from the informants regarding the survey.

REFERENCES

1. WHO (World Health Organization). WHO establishes the World Center for Traditional Medicine in India. Accessed on November, 20, 2023 Available:
https://www.who.int › ... › Press releases › item, 2022.
2. UNFPA (United Nations Population Fund). Accessed on July, 07, 2023 Available:
https://www.coped.org.IMG » reproductive health.
3. Guillaume A and Du Lou AD. Limitation of births among women in Abidjan, Ivory Coast: contraception, abortion or both? International Perspectives on Family Planning. 2002; 4–11. English
4. Sewani-Rusike CR. Plants of Zimbabwe used as anti-fertility agents. African Journal of Traditional, Complementary and Alternative Medicines, 2010; 7 (3): 253 – 257
5. Singh R, Kakar S, Shah M, Jain R. Some Medicinal Plants with Anti-Fertility Potential: A Current Status. Journal of Basic and Clinical Reproductive Sciences. 2018; 7 (1): 7-19.
6. Goswami P, Laskar MA, Basak M. A Review on Medicinal Plants of North Eastern Region with Potential Antifertility Activity. Asian Journal of Pharmaceutical Research and Development. 2020; 8(3): 162-165.
7. Zhang Ruo-P, Luo Jia-H, Lu Hui-X, Zhang Li-R, Dong Zhao-M, Xu An-L, Duan Bao-Z, Zhao Wen-Z. Ethnobotanical survey of antifertility medicinal plants in Dali District, Yunnan Province, China. African Journal of Reproductive Health. 2022; 26 (5):107
8. Malan DF. &Neuba DFR. Traditional practices and medicinal plants use during pregnancy by Anyi-Ndenye women (Eastern Cote d'Ivoire). African Journal of Reproductive Health. 2011; 15(1): 85-93.
9. RGPH (General Population and Housing Census), 2021. Global Results, INS, https://www.plan.gouv.ci/assets/fichier/RGPH2021- RESULTATS-GLOBAUX-VF.pdf French
10. Koné M, Kouadio K, Kouadio YL, Neuba DFR. and Malan DF. Degradation of dense tropical rainforest, case of the Indénié-Djuablin region in eastern Ivory Coast. Journal of Animal & Plant Sciences 2014; 21(3):3324-3338. English
11. Guillaumet JL and Adjanohoun E. The natural environment in Côte d'Ivoire: The vegetation of Côte d'Ivoire. ORSTOM Memoirs, Paris 1971; (50):61-261. English
12. Albuquerque UP, Medeiros PM, Almeida AL, Monteiro JM, LinsNeto EMF, Melo JG & Santos JP. Medicinal plants of the caatinga (semi-arid) vegetation of NE Brazil: A quantitative approach. Journal of Ethnopharmacology. 2007; 114:325–354.
13. Marshall B, Cardon P, Poddar A, & Fontenot R. Does sample size matter in qualitative research? A review of qualitative interviews. IS research. Journal of computer information systems. 2013; 54:11-22.
14. Malan DF &Neuba DFR. Wild edible plants in the Ehotilé, a fishing people around Aby lagoon (eastern littoral of Côte d'Ivoire): Knowledge and availability. Journal of Applied and Natural Science. 2021; 13:59-70.
15. Sutrop U. List task and a cognitive salience index. Field Methods. 2001; 13(3) : 263-276.
16. Pennec F, Wencélius J, Garine E, Raimond C, Bohbot H. 2012. FLAME 1.1 Free-List Analysis under Microsoft Excel.

17. SØrensen T. A Method of Establishing Groups of Equal Amplitudes in Plant Sociology Based on Similarity of Species Content and Its Application to Analyzes of the Vegetation on Danish Commons. Kongelige Danske VidenskabernesSelskab, BiologiskeSkrifter. 1948; 5:1-34.

18. R Core Team. 2019. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

19. Bodet A. History of contraception: from pregnancy to desired pregnancy. Doctoral thesis, Angers University. 2014 ; 164 pp. English

20. Christin-Maitre S. Contraception throughout the world. Medicine/science. 2022; 38 (5): 457-463. DOI: https://doi.org/10.1051/medsci/2022058 English

21. Faye A, Hamady MMO., Leye MMM, Seck I, Tal-Dia A, Tine JA, Wone I. Factors associated with the use of modern contraception in the commune of Aioun in Mauritania. Health Sciences .2015 ; 3(1): 77-80. English

22. Abdel-Mahamoud A, Attho-Touré H, Di-Guisto C, Mahamat Nadjib A, Brunet-Houdard S, Marret H, Rusch E, Grammatico-Guillon L. Use of modern contraception by women, multicenter mixed study in Chad. Journal of Epidemiology and Public Health. 2017; 65(2): S62. https://doi.org/10.1016/j.respe.2017.03.045 English

23. Mukendi DM, Mukalenge FC, Ali MM, Mondo TMN, Utshudienyema GW. Knowledge, attitudes and practices of adolescents and teachers regarding contraception: results of a qualitative study carried out in the Democratic Republic of Congo. The Pan African Medical Journal. 2021; 38(121). doi: 10.11604/pamj.2021.38.121.21678. PMID: 33912291; PMCID: PMC8051221. English

24. Coulibaly M., Doukouré D., Kouamé J., Ayékoé I.A., Mélèdje-Koumi M.D., Malik S., Sackou-Kouakou J., Aké O., Tiembré I., Kouadio L. 2020. Obstacles socioculturels liés à l'utilisation de la contraception moderne en Côte d'Ivoire. SantéPublique 4 (32) : 389 - 397

25. Saravanan K., Priya G. and Renuka C., 2012. Medicinal plants with potential antifertility activity- A review of sixteen years of herbal medicine research (1994-2010). International Journal of PharmTech Research 4(1) : 480-494.

Atsukwei D, Ejike Daniel E, Dele Adams M, Adamu Tende J, Olugbemi Tope O, &Danmallam L. Contraceptive Effect of Ethanolic Extract of Dioscorea villosa Tuber on Reproductive Hormones of Female Wistar Rats. International Journal of Biochemistry Research & Review. 2014. 5(2), 135–144. https://doi.org/10.9734/IJBCRR/2015/13433

27.PMA Data-Côte d'Ivoire. 2020. Accessed on November, 17, 2023 Available:
https://fr.pmadata.org/sites/default/files/data_product_results/PMA2020-Cote%20d%E2%80%99Ivoire-R2-FP-Brief-FR.pdf

28. Diallo I & Guindo A. Traditional and modern contraceptive practices among rural women in Mali: the example of the commune of Sanando. Space, Territories magazine. Societies and Health. 2020; 3 (6): 133-151. French

29. Désalliers J. Hormonal contraceptives in rural Burkina Faso: negotiated marital relations or clandestine female use? Somewhere else. 2009; 4 (52): 31 – 47 English
30. Mukendi DM, Mukalenge FC, Ali MM, Mondo TMN, Utshudienyema GW. 2021. Connaissances, attitudes et pratiques des adolescents et des enseignants en matière de contraception: résultats d'une étude qualitative réalisée en République Démocratique du Congo. The Pan African Medical Journal 38(121). Doi: 10.11604/pamj.2021.38.121.21678. PMID: 33912291; PMCID: PMC8051221.

31. Ainyakou TG, Coulibaly Z & Coulibaly KS. Social Practices of Women's Reluctance to Modern Contraceptive Methods in Korhogo. International Journal of Applied Linguistics, Literature and Education. 20214; (2):52-62. French
32. Dali GLA, Pappoe ANM and Akotoye HK. Plants used as abortifacients and contraceptives in some communities on the fringes of subri river forest reserve in Ghana. African Journal of Reproductive Health. 2019; 23 (4):92
33. N'guessan K, Zirihi N. G &Boraud NKM. Ethnopharmacological study of plants used to facilitate childbirth, in Abbey and Krobou country, in the south of Ivory Coast. International Journal of Biological and Chemical Sciences. 2010; 4 (4): 1004-1016. French
34. Bouquet A, Debray M. Medicinal Plants of Ivory Coast. Louis Jean Printing House: Paris (France) 1974; 13-88
35. Oliver-Bever B. Medicinal Plants in Tropical West Africa II: Plants acting on the new system. Journal of Ethnopharmacology. 1983; 7: l-93.
36. Laxane S, Swarnkar SK and Kenanora M. Jatropha curcas: A systemic review on pharmacological, phytochemical, toxicological profiles and commercial applications. Journal of Pharmaceutical, Biological and Chemical Sciences. 2013; 4(1): 989–1010.
37. Singh SP, Singh SP. Antifertility effects of Solanum xanthocarpum seeds on female albino rats. Journal of Applied and Natural Science. 2013; 5 (1): 153-156