ISSN 2349-7823

International Journal of Recent Research in Life Sciences (IJRRLS)
Vol. 7, Issue 4, pp: (33-43), Month: October - December 2020, Available at: www.paperpublications.org

Production and Development of Herbal Contraceptives in Nigeria – A Necessity

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Abstract: **Contraception is a means or method to prevent pregnancy. Contraceptives are the devices, agents, drugs, etc used in prevention of pregnancy. Basic methods of contraception are: (i) modern methods, and (ii) traditional / herbal methods. Modern method involves the use of vaginal ring, cervical caps, hormonal implants, patch, injections, diaphragm, male/female condoms, spermicides, pills, vasectomy, male/female sterilization, intrauterine device (IUD), intrauterine system (IUS), etc. Traditional/herbal methods involve the use of medicinal and antifertility plants, herbal remedies and recipes, natural family planning methods and other inexplicable traditional forms. Despite these methods, contraceptive prevalence in Nigeria is low. The necessity of producing and developing herbal contraceptives is long overdue in Nigeria due to the adverse effects, cost, inaccessibility, unavailability and undesirability of the modern methods especially to rural dwellers in Nigeria. This paper therefore reviews the necessity of producing and developing herbal contraceptives from the abundance of medicinal plants with antifertility potentials, indigenous knowledge and prescriptions of traditional medicine practitioners (TMPs) in Nigeria.**

Keywords: **Contraception, family planning, herbal contraceptives, medicinal plants, antifertility.**

1. INTRODUCTION

There is a great concern of population growth worldwide such that several methods are being used to reduce both men and women total fertility rate, especially in developing countries (Lampiao, 2011). Many authors raised the alarm that a stage would reach in the world when food supply would not match its population growth; this expansive population growth rate has been attributed to some factors, the major of which is low contraceptive usage (Olugbenga-Bello *et al.* 2011; Ajayi *et al.* 2018). Population growth and control has remained an issue of concern to many developing nations (Bala *et al.* 2014; Ndikom *et al.* 2018). Nigeria remains a focus for increasing contraceptive use, as it is one of the most populous countries in Sub-Saharan Africa (Blackstone and Iwelunmor, 2017). 54.7% of Nigeria's population is in the 15 – 64 age bracket, with early onset of sexual activity estimated at just over 16 years, and a low contraception rate of 13% (Ogbe *et al.* 2009). To address the population growth and the strain that it places on societal resources, there is an increased focus on strategies to reduce fertility rates, which has been incorporated in the Millennium Development Goals to improve maternal and child health (Blackstone and Iwelunmor, 2017). Generally, contraception, also known as birth control and fertility control, is a method or device used to prevent pregnancy (Bhakta and Das, 2018; Eremutha and Gabriel, 2018; Aina and Aina-Pelemo, 2019), and is therefore an effective population control strategy as well as an integral part of family planning. Similarly, emergency contraception is the use of a drug or device to prevent pregnancy after an unprotected sexual intercourse (Ezebialu and Eke, 2013). Since the dawn of history, women and men have wanted to be able to decide when and whether to have a child, hence contraceptives have been used in one form or another for thousands of years throughout human history and even prehistory (Okunade *et al.* 2016). According to United Nations (UN, 2017), in almost all regions of the world, contraceptives are used by the majority of women in the reproductive age range (15-49 years) who are married or in a union. Worldwide in 2017, 63 per cent of these women were using some form

of contraception. Contraceptive use has been above 70 per cent in Europe, Latin America, the Caribbean and Northern America, while being below 25 per cent in Middle and Western Africa. According to Bhakta and Das (2018), the most effective methods of birth control are sterilization by means of vasectomy in males and tubal ligation in females, intrauterine devices (IUDs) and implantable contraceptives. This is followed by a number of hormonal contraceptives including oral pills, patches, vaginal rings, and injections. Other effective methods include barriers such as condoms, diaphragms, contraceptive sponge, and cervical caps, in addition to basal body temperature method, rhythm method and other fertility awareness methods. The least effective methods are spermicidal and withdrawal by the males before ejaculation. All available types of contraception have both strengths and weaknesses, and no method is medically suitable, appropriate and acceptable for all couples in all circumstances (UN, 2015). Several hormonal contraceptives have been developed and practiced till date but they did not meet the demand of developing countries as they are chemical based, expensive, sophisticated and have some side effects (Bala *et al.* 2014). As women from rural areas and developing countries found difficulty in accessing modern contraceptives, herbal contraceptives provide an opportunity for them to use, as this is cheaper, potentially more efficient with lesser side effects (Bala *et al.* 2014). Herbal contraception offers alternatives for women who have problems with or lack access to modern contraceptives options particularly women living in the rural areas in developing nations with very high populations like India, China, Africa (Nigeria) and Bangladesh (Pradhan *et al.* 2012). Moreover, there are risks associated with modern contraceptive methods as reported by Bala *et al.* (2014), Schwandt *et al.* (2015), Bhakta and Das (2018), Aina and Aina-Pelemo (2019), hence there is need to produce herbal contraceptives in Nigeria as alternatives to counteract the risks. Comparatively, herbal contraceptive plants have been found to be more effective than contraceptive pills. For example, a comparative study between dried fruit extract of *Xylopia aethiopica*, a herbal contraceptive plant, and Ibuprofen inhibiting effects on some reproductive hormones was conducted by Onuka *et al.* (2017). Results revealed that *Xylopia aethiopica* dried fruit extract caused significant reduction in serum estrogen and progesterone level compared to Ibuprofen, and, therefore, yielded better results.

2. CATEGORIES OF HERBAL CONTRACEPTIVES

According to Bala *et al.* (2014), herbal contraceptives may be categorized into the following:

1. Antifertility drugs: These are the drugs that obstruct the formation of gametes and interfere with the process of fertilization.

2. Antiovulatory drugs: These are the antifertility agents that induce infertility by suppressing the ovulation. These drugs are incorporated either orally or by injection.

3. Anti-implantation drugs: These are the agents that prevent the attachment or penetration of fertilized ovum into the uterus.

4. Abortifacients are those drugs or substances which causes early expulsion of foetus.

3. BENEFITS OF CONTRACEPTION

Generally, contraception has numerous health benefits such as preventing unplanned and unintended pregnancies, ensuring optimum and healthy spacing between births, reducing maternal and child mortality, enhancing attainment of development goals, and improving the lives of women and children in general (Solanke 2017; Ajayi *et al.* 2018; Chukwuji *et al.* 2018; Aina and Aina-Pelemo, 2019). Unintended pregnancy remains a major challenge to the reproductive health of women especially in developing countries (Ezebialu and Eke, 2013). Family planning aids in the protection of women from high risk pregnancies, unsafe abortions, reproductive tract infections and STIs including HIV/AIDS (Chipeta *et al.* 2010; Ogboghodo *et al.* 2017). Contraceptive use helps couples and individuals realize their basic right to decide freely and responsibly if, when and how many children to have. The growing use of contraceptive methods has resulted in not only improvements in health-related outcomes such as reduced maternal mortality and infant mortality, but also improvements in schooling and economic outcomes, especially for girls and women (UN, 2017). It is currently beyond contradiction that contraception has tremendous positive impact on health and quality of life. Contraceptive use can significantly avert the soaring prevalence of unplanned pregnancies and STD acquisition (Eniojukan *et al.* 2015). According to Schwandt *et al.* (2015), in Nigeria, increasing use of contraception remains a formidable challenge in the face of a high total fertility rate (5.7 births per woman) and a substantial unmet need for contraception (estimated at

20.2% of married women). Modern contraceptive prevalence remains at a low 10.5% among both married and unmarried sexually active women, with the male condom as the most popular modern method (5% currently using). Injectables and pills (2%) comprise the other most common methods, with lactational amenorrhea, IUDs, and sterilization making up the remaining method mix (2% combined). Five percent of women use traditional methods. Other benefits, advantages/disadvantages, challenges and probable solutions on the use of contraceptives in Nigeria were listed by Aina and Aina-Pelemo (2019). Shah *et al.* (2009) also listed some antifertility and abortifacient herbal drugs.

Generally, cultural acceptability, better compatibility with the human body, lesser side effects and effectiveness are benefits of traditional medicines as reported by Shah *et al.* (2009). Ayyuba and Ahmad (2018) opined that traditional contraceptive methods (TCMs) were used by our ancestors for a long time in child spacing before the advent of the modern contraceptive methods, but even with the introduction of the modern methods some women prefer and are still using traditional contraceptive methods. Bala *et al.* (2014) and Bhakta and Das (2018) stated that people are becoming more interested to use herbal products than the chemical/synthetic ones as the herbal products are comparatively safer and can be used for a long period of time without any negative impact on health. The herbal products are much more effective though less potential but better than that of the commercially available chemical and hormonal products used as birth control tools. Longer usage of those commercially available products will make the user infertile and also susceptible to many life threatening diseases. Nature is the best source of all the herbal products that could be used in diversified field of human usage in life as per need. So by keeping the negative effects of the contraceptive pills and other synthetic products in check, we should pay more attention on production, development and commercialization of herbal products for the betterment of human beings irrespective of sex.

The use of phyto-medicine in family planning both locally and internationally cannot be over emphasized as various plant species are being used for prevention against fertility in Nigeria and in other countries (Aiyeloja *et al.* 2010). According to Bala *et al.* (2014), considering women healthcare, it has become important to use herbal antifertility agents which can interfere with the natural procedure of reproduction in women. Modern research includes the use of various plant extracts having antifertility action in various ways. Numerous herbs have been tested for their contraceptive activity on different animal models. These herbal contraceptives are found to be ecofriendly, can be easily available and affordable even in rural areas. Similarly, Bhakta and Das (2018) noted that using different herbal products can control the birth in both male and female with safety and that there are some plants, flowers and seeds that can be used for this purpose. There are also many herbs that are very innocuous, which can be used by virtually anyone without any negative effects. It is necessary to establish herbal birth control extracts which have no side effects on different organs.

4. SOME FACTORS INFLUENCING CHOICE AND USE OF CONTRACEPTION

Some factors influence choice and use of contraception among women. For example, Chipeta *et al.* (2010) listed perceived benefits, concerns about how side effects may influence daily lives and personal assessment of how a particular method may affect relationships with partners as factors affecting choice and use of contraception. Ezebialu and Eke (2013) mentioned poor contraceptive knowledge and cultural or religious beliefs as factors affecting utilization of contraception. Solanke (2017) found that maternal age, parity, age at first birth, child mortality experience, fertility desire, ideal family size, maternal education, place of residence, employment status, geographic region and remarriage are some of the factors that significantly influence non-use of contraceptives; while parity, fertility desire, maternal education, household wealth and geographic region, significantly influence modern contraceptive use in Nigeria. Earlier, Odimegwu (1999) reported that people's perception of family planning affect whether they will use it. Those who think that practicing contraception provides health benefits are likely to use a method just like those who perceive that family planning will help them improve their standard of living. Ajayi *et al.* (2018) observed that low levels of education, women's and partners' disapproval of modern family planning methods, religious beliefs, fear of side effects of modern contraception, women's misconceptions of contraceptive side effects, use of unproven methods or concoctions and infrequent sex are among the reasons for non-use of contraception in sub-Saharan Africa. Sinai *et al.* (2019) stated that infrequent sexual activity or perceived infecundity, opposition to contraceptive use by the woman, her partner, or someone close to her, lack of awareness of contraceptive methods, or limited availability and / or accessibility to family planning methods and/or services, concerns about side effects or health risks of contraceptive method use are women's reasons for not using a contraceptive method.

5. THE PRACTICE OF HERBAL CONTRACEPTION IN NIGERIA

Several contraceptive methods are practiced by men and women in various parts of Nigeria, but traditional and herbal methods are mostly practiced in rural communities within the States. Examples include: Ogun State (Animasahun *et al.* 2013), Oyo State (Ndikom *et al.* 2018), Osun and Kwara States (Olugbenga-Bello *et al.* 2011; Adebisi and Bello, 2011), Ondo and Ekiti States (Ajayi *et al.* 2018), Edo state (Ogbe *et al.* 2009; Ogboghodo *et al.* 2017), Kaduna state (Sinai *et al.* 2019), Jigawa, Katsina, Yobe, and Zamfara States (Doctor *et al.* 2013; Chukwuji *et al.* 2018; Imam and Khan, 2019), Sokoto State (Adebisi and Alebiosu, 2014), Imo State (Nwachukwu and Obasi, 2008), Cross River State (Etokidem *et al.* 2017), Kano State (Ayyuba and Ahmad, 2018), Lagos State (Bablola, 2009), etc. Others include: Delta State (Eniojukan *et al.* 2015), Rivers State (Nwauzoma and Magdalene, 2013), South-South and North-Western zones of Nigeria (Ezire *et al.* 2014), etc. Hence, there is need to produce herbal contraceptives from abundance of medicinal plants in various States of Nigeria.

Traditional herbal drugs and their formulations generally involves the use of extracts of medicinal plants (Bala *et al.* 2014), a diversity of indigenous knowledge and cultural beliefs which constitute an important basis for the development of a society (Chukwuma *et al.* 2015). Moreover, man's life and survival would be impossible without 'symbiosis' with, and extensive use of plants and plant products (Chukwuma *et al.* 2015). Bala *et al.* (2014) stated that knowing the active ingredients in medicinal plants such as alkaloids, glycosides, saponins, tannins, terpenoids and isoflavonoids would be helpful in producing herbal contraceptives from the plants. They also listed thirty (30) plants having antifertility potentials, and eight (8) approved herbal antifertility combination drugs.

In addition, various Nigerian medicinal plants with contraceptive, antifertility and abortifacient potentials have also been reported and documented by some researchers. For example, different parts of 'Irosun' (*Baphia nitida),*a Nigerian medicinal plant, are used for preventing pregnancy and for restoring fertility. The bark of the root prepared in a particular way prevents pregnancy permanently (it has superior power to synthetic contraceptives such as Depo Medroxyprogesterone Acetate which is only effective for three months). To restore fertility, the leaves of the tree are also prepared in a particular way and the effect is immediate. Alade *et al.* (2018) surveyed thirty-five (35) medicinal plant species employed by traditional birth attendants and elders for contraception, labour induction and abortion in Bayelsa State. Bablola (2009) listed ten (10) herbal contraceptive and abortifacient recipes prescribed and sold in Lagos State. Adebisi and Alebiosu (2014) listed twelve (12) medicinal plants used as herbal contraceptives and fifteen (15) medicinal plants used as abortifacients in Sokoto State; six (6) medicinal plant recipes used in combination as abortifacients were also listed. Aiyeloja *et al.* (2010) identified twenty-three (23) plants species and eleven (11) herbal preparation methods used for family planning in Nigeria, while Saalu (2016) listed thirty-nine (39) Nigerian medicinal plants with anti-fertility potentials, and thirty-eight (38) Nigerian medicinal plants with male anti-fertility potentials respectively. Similarly, Adebisi and Bello (2011) surveyed and listed seven (7) plants and four (4) plant combinations used for male contraception in south-western Nigeria. They found that decoction and rings were the common methods of application, although some were applied as powder rubbed into fresh skin incisions. Rings were usually metal rings boiled in water extracts of the relevant parts of the plant and subsequently worn on the fingers during sexual acts.

In addition, Pradhan *et al*. (2012) listed one hundred and thirty-three (133) indigenous medicinal plants having antifertility activity in India, while Dali *et al.* (2019) listed eighteen (18) plant species used as abortifacients and contraceptives in Western Region of Ghana. Apart from females, high level of male awareness, involvement and utilization of family methods has also been reported by Lampiao (2011), Eremutha and Chizoba (2018) and Nmadu *et al.* (2019).

Apart from Nigeria, traditional and herbal contraceptive methods are practiced in India (Bandyopadhyay *et al.* 2006; Gediya *et al*. 2011; Pradhan *et al.* 2012; Umadevi *et al*. 2013), Morocco, Tunisia, Egypt, Ecuador, Indonesia, and Thailand (Ali and Cleland, 1995), Malawi (Chipeta *et al.* 2010; Lampiao, 2011), South Africa (Moroole *et al.* 2019), Cameroon (Adonis *et al.* 2001), Ghana (Dali *et al.* 2019), etc. Furthermore, some countries have conducted ethno-medicinal inventories of plants used for family planning, and have also successfully developed herbal contraceptives from the plants, examples include: Pakistan (Ishtiaq *et al.* 2006; Shah *et al.* 2009; Somia *et al.* 2015), Philippines (Marquez *et al.* 2017) and Bangladesh (Bhakta and Das, 2018). Nigeria is therefore expected to follow suit. A list of some common medicinal plants used for family planning in Nigeria is shown in Table 1 as reported by Aiyeloja *et al.* (2010).

ISSN 2349-7823

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Table 1. Some common medicinal plants used for family planning in Nigeria

S/n.	Botanical name	Yoruba	Hausa	Igbo	Family	Active component	Distribution	Habit	Part used
1	*Sorghum bicolor*	Poporo	Gero	Inyari	Grammeae	Taninin	Savannah region	Shrub	Leaf
2	*Curcur bitaedulis*	Egusi/Bara	Egusi	Ogili	Cucurbiaceae	Taninin & oil	Commonly distributed	Climber	Frit /leaf
3	*Citrus species*	Osanwewe	Isami	Olomankrisi	Rutaceae	Vitamin B2 & C	Widely distributed	Tree	Fruit
4	*Ficus exasperata*	Ipin	Baure	Asesa	Moraceae	Taninin & alkaloid	Tropical region	Herbs	Leaf
5	*Manihiot esculentus*	Ege	Rogo	Akpu	Euhorbiaceae	Alkaloid & starch	Commonly distributed	Tree	Tuber
6	*Saccharrum officinarum*	Ireke	Ruke	Okpete	Grammeae	Glucose & Taninin	Widely spread	Shrub	Stick /stem
7	*Lolchocainfus cyanescens*	Eru			Caesalpinaceae	Taninin	Scantly distributed	Herbs	Fruits
8	*Allium cepa*	Alubosa	Alabasa	Alliaceae	Surphur compound	Needle-like shape	Shrub	Leaf & bulb	Leaf /bulb
9	*Teminalia glaver scens*	Idi (Epo)			Cumbretaceae	Taninin	Commonly spread	Tree	Bark of tree
10	*Crinum jagus*	Ogedeodo			Longanaiaceae	Alkaloid	Scantly distributed	Herbs	Tuber
11	*Teminalia ivorensis*	Afara (Epo)			Cumbretaceae	Taninin	Scantly spread	Tree	Bark of tree
12	*Anthrocaeitadjalimesis*	Aparun			Longanaiaceae	Alkaloid	Scantly distributed	Tree	Root
13	*Chasmanthera dependens*	Isigun			Meinspermaceae	Taninin	Tropical region	Climber	Leaf
14	*Cassia alata*	Asunwon		Okpo	Caealpinaceae	Saponin, tainin	Common plant	Tree	Leaf
15	*Uvaria*	Gboonse			Annonacae	Taninin & flavoid	Widely distributed	Tree	Bark of tree
16	*Khaya grandifolii*	(Ogano)		Ogo	Meliaceae	Alkaloid	Tropical region	Shrub	Fruit
17	*Annona sengalensis*	ewe Abo tutu	Gwansar	Isapo	Annonaceae	Alkaloid	Tropical region	Shrub	Fruit /leaf
18	*Albizia odoratissiima*	Eposapo			Annonacae	Tainin	Tropical region	Shrub	Fruit
19	*Xylopa aethiopica*	Eru			Annonacae	Taninin	Temperate region	Shrub	Fruit
20	*Aframomum Melegaata*	Atare			Zingiberaceae	Alkaloid taninin	Widely distributed	Herb	Leaf
21	*Angeratum Conyzoides*	Imi	Kadanya	Osisi	Compositae	5-methoxynobiletein	Tropical region	Herb	Leaf
22	*Elaeis guineensis*	Igiope			Myrtaceae	Alkaloid	Widely spread tree	Tree	Fruit/ oil, wine
23	*Spigelin Anthelniah*	Aparun			Longaniaceae	Alkaloid, spigeline	Commonly distributed	Shrub	Root /back

Source: Aiyeloja *et al.* (2010).

Some contraceptive recipes prescribed and sold in Lagos State are given in Table 2, as reported by Bablola (2009).

Table 2: Some contraceptive recipes prescribed and sold in Lagos state.

S/n.	Recipe and administration	Function
1	Grind seeds of *Abrus precatorius* into powder. A single dose acts as a long acting contraceptive lasting up to three menstrual cycles.	Used as contraceptive
2	Peel the bark of male *Carica papaya* root downwards and add sizeable fruits *Xylopia aethiopica*, little oil of *Elaeis guineensis* and cook with cat fish. Then eat. To restore fertility, carry out the above but with female *Carica papaya*.	Used as contraceptive
3	Burn the leaves of *Macrosphyra longistyle* together with *Aframomum melegueta* and use the powder to cover incisions round the wrist. To restore fertility, mix the powder with pap daily until conception	Used as contraceptive
4	Ingest equal number of seeds of *Ricinus communis* and *Mucuna sloaeni*, depending on how long the contraception is desired. To restore fertility, regular drinking of oil of *Elaeisguineensis*for two weeks is recommended.	Used as contraceptive
5	Wash roots of *Curculigo pilosa* and *Anthocleista vogelii*, bulb of *Chysoptiyllum albolum* and peel the fruit of *Colocynthis citrullus*, add little quantities of complex salt (potash) and soak them in a bottle of gin for three days. The preparation is taken every time it is needed. To restore fertility, stop usage whenever conception is desired.	Used as contraceptive
6	Slice the fruit of *Colocynthis citrullus* add few quantity of Potash and soak in juice of *Citrus medica*. Take the preparation in small glass cup morning and night. To restore fertility, stop taking the drink.	Used as contraceptive
7	Soak fruits of *Xylopia aethiopica*, seeds of *Aframomum melegueta* and leaf *Sorghum bicolor*. In a mixture of hot drink and juice of *Citrus limon*. Take in glass cup morning and night. To restore fertility, stop taking the drink.	Used as contraceptive

8	Cut roots of *Cassia alata*, *Citrus medica*, and *Anthocleista vogelii* and boil with water obtained from fermented milled fruits of *Zea mays* for about one hour. Take the juice in small glass cup twice daily. To restore fertility, stop taking the drink.	Used as contraceptive
9	Grind fruits of *Croton penduliflorus*, make a paste and drink with pap once in three days. It may cause purging that will stop. To restore fertility, stop taking the preparation.	Used as contraceptive
10	Wash whole plant of *Abrus precatorius* and boil in water obtained from fermented milled fruits of *Zea mays*. Take in small glass cup three times daily before intercourse. To restore fertility, stop taking the preparation.	Used as contraceptive

Source: Bablola (2009).

Some plants used as single agents for male contraception in south-western Nigeria are shown in Table 3 as reported by Adebisi and Bello (2011).

Table 3: Plants used as single agents for male contraception in south-western Nigeria.

S/no.	Local (Vernacular) name	Common name	Scientific name	Parts used	Method of application
1	Etiponla	Hogweed	*Boehaavia diffusa*	Leaf	Ring
2	Iru	Locust beans	*Parkia bigglobo*	Seed	Ring
3.	Ibepe	Pawpaw	*Carica papaya*	Bark	Ring/Decoction
4	Ataare	Alligator pepper	*Aframonum melegueta*	Seed	Ring/Incision
5	Eeru alamo	Negro or Ethiopian pepper	*Xylopia aethipica*	Fruit	Decoction
6	Aidan	Aidan tree	*Tetrapleura tetraptera*	Fruit	Decoction
7	Osan wewe	Lime	*Citrus limon*	Juice	Decoction

The vernacular names are in Yoruba language. Ring form of application involves boiling a metal ring in water extract of the plant for hours. The ring is then worn on the finger during sexual activities. Incision involves making up to 7 cuts on the leg and applying the dried powder of the plant to the fresh wound.

Source: Adebisi and Bello (2011).

Again, some plants used in combinations for male contraception in south-western Nigeria are shown in Table 4 as reported by Adebisi and Bello (2011).

Table 4: Plants used in combination for male contraception in south-western Nigeria.

S/no.	Plants and combination	Method of application
1	*Boehaavia diffusa, Parkia bigglobo and Aframonium melegueta*	Ring
2	*Carica papaya and Aframonium melegueta*	Ring
3	*Carica papaya and Tetrapleura tetraptera*	Incision
4	*Citrus limon and* Potash*	Decoction

Potash is the common name of potassium carbonate. The common name is retained because it represents (only) the white residue obtained after leaching wood ashes and evaporating the solution obtained.

Source: Adebisi and Bello (2011).

6. MECHANISM OF ACTION OF HERBAL PRODUCTS IN CONTRACEPTION

According to Bhakta and Das (2018), most of the constituents contained in any herbal product normally acts on the vital organs of the body according to their site of predilection. The herbal products which are responsible for the birth control work mostly in the genitalia irrespective of sex to control the morphology and also the hormonal state in the blood stream of the body. The herbal extracts exert their effects by different processes. In case of female, they mainly act on the ovary regarding folliculogenesis and also change the level of female hormones in blood. If the administration of these herbal extracts is abruptly stopped then again the conception occur without leaving any harmful effects on the vital organs of the body. In case of male, the herbal extracts act on the testes regarding the spermatogenesis and also control the level of male hormones in blood. According to Bala *et al.* (2014), medicinal plants may induce infertility in distinct ways. They may

effect on ovary, uterus, hormone production, inhibition of hormonal action, interfere with implantation, sperm production. Some of them prevent fertilization by generating a protective layer around an egg. On the basis of these actions, the plants can be divided into different categories as shown in Table 5.

Table 5: Categories of Plants for Producing Herbal contraceptives.

S/n.	Plants	Mode of Action on Reproductive System.
1.	Antifertility plants	Prevents fertilization
2.	Antiovulatory plants	Inhibits ovulation
3.	Anti-implantation plants	Blocking implantation
4.	Abortifacient plants	Causing early abortion

Source: Bala *et al.* (2014).

7. SUGGESTED METHODOLOGY

The methods and dosages of Saalu (2016), Bhakta and Das (2018) and Bhakta *et al.* (2019) are suggested to be studied in details and adopted in order to produce and develop herbal contraceptives in Nigeria. Saalu (2016) produced comprehensive tables showing basic medical science demonstration of male antifertility potentials of Nigerian medicinal plants. Bhakta and Das (2018) formulated a new type of herbal contraceptive product, a combination of some herbal extracts which has no side effects on the body. The extract can be used for both sexes. To evaluate the efficacy, the herbal extract was applied on White Swiss albino mice (both male and female) and it was proved successful. About 82% of the female did not conceive after the treatment done by the herbal extract. Similarly, the methodology of Bhakta *et al.* (2019), who found herbal contraceptive effects of *Abrus precatorius, Ricinus communis, and Syzygium aromaticum* on anatomy of the testis of male Swiss albino mice, is also suggested.

Some herbal antifertility combination drugs have actually been produced and approved for human use. Table 6 shows a list of approved herbal antifertility combination drugs, modified from Bala *et al.* (2014).

Table 6. List of approved herbal antifertility combination drugs.

S/n.	Drug Name	Active ingredients	Activity	Side effects on longterm exposure
1	Activelle	Estradiol Norethindrone	Hormone replacement	Liver dysfunction, Genital bleeding, endometrial & breast cancer.
2	Cyclessa	Ethinyl estradiol Desogestrel	Triphasic contraceptive, antiovulatory	Venous thromboembolism, Myocardial infarction.
3	Natazia	Estradiol valerate dienogest	Antiovulatory	Breast tenderness, Irregular uterine bleeding.
4	Safyral	Ethinyl estradiol Drospirenone levomefolate calcium	Antiovulatory	Hyperkalemia, depression, nausea.
5	Ortho Tri-Cyclen	Ethinyl estradiol Norgestimate	Antifertility, antiimplantation	Decreased testosterone, obesity, hepatic neoplasia
6	Yasmin	Ethinyl estradiol drospirenone	Antiovulatory, antiimplantation	Stroke, diabetes
7	BlueCohosh	Quinolizidine, Aporphine, pepridine, norlupanine	Abortifacient, Teratogenic	Fetal toxicity, aplastic anemia.
8	German Chamomile Oil	Chamazulene, abisabolol, bisabolol oxide A, bisabolol oxides.	Abortifacient, emmenagogue	Allergy, inflammation.

Source: Modified from Bala *et al.* (2014).

8. CONCLUSION

Contraception is an integral and indispensable part of family planning. Among other benefits, the use of contraceptive drugs and methods serve as a means to regulate population explosion in Nigeria. However, modern methods of contraception which are prevalently used have adverse effects detrimental to the users. Herbal contraceptives will therefore provide a valuable and safe alternative with lesser side effects. It is necessary and possible for herbal contraceptives to be produced from the abundance of medicinal plants, knowledge and information from traditional medicine practitioners (TMPs) in Nigeria. Hopefully, this necessity could lead to the development of herbal contraceptives in future. This will indeed serve as a means to harness, utilize and further preserve the indigenous and traditional health knowledge and technology in Nigeria. Given the abundance and potency of medicinal plants in Nigeria, the Nigeria Natural Medicine Development Agency (NNMDA) that has taken the lead in production and development of natural medicines in Nigeria is therefore poised to take up the challenge of conducting further research in order to produce and develop herbal contraceptives in Nigeria.

9. RECOMMENDATIONS

The following are recommended:

1. There should be a database of traditional medicine practitioners (TMPs) and all medicinal plants that can be used to produce herbal contraceptives in Nigeria.

2. There should be a comprehensive database of traditional birth attendants (TBAs) and a compendium of formulations from medicinal plants with antifertility potentials that would be useful in production and development of herbal contraceptives in Nigeria.

3. Research agencies and institutions should form partnerships and collaborations to produce and develop herbal contraceptives in Nigeria.

4. The Federal Republic of Nigeria should empower researchers, research institutions and agencies to produce and develop herbal medicines for the benefit of all Nigerians.

5. Further research, partnership and collaborations in this regard are required in order to produce and develop herbal contraceptive drugs for the benefits of Nigerians and humanity in general.

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