

## Can Gestational Anti-Diabetic Plants Using in Cameroon Manage Preeclampsia?

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### Abstract

Preeclampsia is a persistent hypertensive gestational disease that might happen during pregnancy (antepartum), during delivery (intrapartum) or after childbirth (postpartum). It is clinically characterized by maternal high hypertension (>140/90mmHg systolic/diastolic blood pressure) and massive proteinuria (>300mg/24h). Severe cases are manifested by the development of comorbidities such as eclampsia, liver damage, edema and scattered vascular coagulation in mother and the complications in the fetus like fetal growth restriction, premature birth and fetal death. In Africa, the prevalence of eclampsia varies from 1/100 to 1/1700 pregnancies, and Cameroon it happens in 0.92/1 100 deliveries. Our objective was to determine among antidiabetic and gestational plants used in Cameroon those that can control preeclampsia. To achieve this objective three following engines of research were used in Google, Google Scholar and PubMed: "a given antidiabetic plant treated gestational women with preeclampsia"; "a single given antidiabetic plant treated three complications of preeclampsia" and "a given antidiabetic plant may regulate hypertension in women with preeclampsia. Twelve (12) plants were recorded and belong to 10 families and 12 genera. Six plants (*Curcuma longa*, *Brassica oleracea*, *Moringa oleifera*, *Passiflora incarnata*, *Passiflora edulis* and *Passiflora foetida*) intervene in direct treatment of preeclampsia and all the twelve were used in symptomatic treatment of preeclampsia. The most important plants are *Brassica oleracea* and *Solanum melongena* with 127 and 99 repetitions respectively. Strong recommendation of further studies for finding non-toxic doses is necessary for developing anti-preeclampsia future phyto-drugs.

**Keywords:** Symptoms of Preeclampsia; Direct and symptomatic treatments; Gestational women; Gestational antidiabetic plants; Cameroon

### Definitions

- a. **Proteinuria:** is too-high concentrations of protein in the urine that can affect kidney function. Many conditions may cause this perturbation.
- b. **Anxiolytics:** are a class of medications used to prevent or treat anxiety. They're sometimes called anti-anxiety medications or minor tranquilizers.
- c. **Antidepressants:** are medications that can help relieve symptoms of depression, social anxiety disorder, anxiety disorders, seasonal affective disorder, and dysthymia, or mild chronic depression, as well as other conditions.
- d. **Depression:** is an illness characterized by great sadness, a feeling of hopelessness or a loss of motivation and decision-making faculties, a lessening in the feeling of pleasure, eating and asleep disorders and morbid thoughts.
- e. **Immunosuppressants:** are medications which stop the immune system from damaging healthy cells and tissues. People with organ transplants and stem cell transplants take these medications to prevent transplant rejections. These medicines also treat autoimmune disease symptoms. Immunosuppressants are powerful medicines that require careful monitoring to avoid complications.
- f. **PTH:** Parathyroid hormone is the foremost hormone of phospho-calcium homeostasis. It is produced and secreted by the parathyroid glands.

- g. CEA:** Carcinoembryonic antigen is a protein which is normally perceived in very small amounts in the blood of adults. The increasing in the blood level of CEA is due to the presence of certain forms of cancer and benign conditions.
- h. SHRs:** Means Spontaneously Hypertensive, BMI: Body Mass Index; GWG: Gestational Weight Gain; SPE: Severe preeclampsia

## Introduction

Preeclampsia is the most mutual and thoughtful hypertensive disease in pregnancy. It remains high in developed and even more in African countries. Preeclampsia is a disorder during pregnancy characterized by high arterial blood pressure, occasionally accompanied by fluid retention and proteinuria (proteins in urines), after 20 weeks of pregnancy. It is a principal source of maternal and fetal morbidity and mortality [1]. It remains thus, a major public health problem [2]. Universally, preeclampsia and eclampsia touch nearly 3% of pregnant women and account for nearly 15% of pregnancy correlated deaths. They are the third cause of nursery in the world. In the industrialized countries, their incidence is low in the order of 0.5 to 2% and is explained by better supervision multidisciplinary responsibility involving the gynecologist obstetrician, the anesthetist-resuscitator and the neonatology [3]. In Africa, the prevalence of this pathology in intensive care diverges between 12.3 and 29.7% [2]. It touches a people of young parturients with a wavering average age between 21 and 26.4 years [4]. The majority of parturients are not cultivated [4]. The anterior perception of preeclampsia and obesity are the backgrounds most found in industrialized countries in general and in Africa in particular [2]. Manifold obese pregnant women are often victim of preeclampsia. As overweight or obese women, they present an increased risk of preeclampsia (OR=1.81; 95%CI: 1.37–2.39), compared to those with normal pre-pregnancy Body Mass Index (BMI). Compared to women with tolerable Gestational Weight Gain (GWG), women with unwarranted GWG have an amplified risk of preeclampsia (OR=2.28; 95%CI: 1.70–3.05) [2]. Certainly, obesity is a risk factor for preeclampsia, but this sickness might be reinforced by common features associated to oxidative stress, inflammation and altered vascular function. Lately, the following indicators have been described in both preeclamptic and obese women [5]:

- a. Wide vascular infiltration of neutrophils (white blood cells) vascular inflammation.
- b. Therefore, in case of the vascular inflammation in obese women, they could be at enlarged risk of developing preeclampsia during pregnancy and are uncovered to the additional burdens of pregnancy [5].
- c. Most women with moderate preeclampsia give birth without any problems. Though, severe preeclampsia can cause foremost problems with the liver, blood coagulation, etc. and some women ultimately tremble (eclampsia). This can very infrequently lead to grave problems or even a lethal situation for the mother and her baby [2].

In Cameroon as in Africa in general, many hinterland and urban pregnant women do not consult or poorly consult obstetricians. This irregular monitoring of pregnancy, defined here by a number of prenatal consultations less than or equal to three, is one of the factors associated with the occurrence of Severe Preeclampsia (SPE) and its complications [6,7]. Undeniably, a quality prenatal consultation, characterized by the performance of at slightest four consultations and three ultrasounds, makes it possible to detect pregnancies at an early stage at potential risk of SPE and to pledge suitable care in order to avoid the incidence of complications that may will endanger the vital prognosis of the parturient [6,7].

## Causes of preeclampsia

**Unknown causes of preeclampsia:** There is no dependable enough factor to know precisely who will develop preeclampsia. We know some risk factors. For example, genetic factors (preeclampsia tends to run in the same family), as does chronic hypertension. It is seen more universally in certain socio-cultural groups that are predominantly susceptible to high blood pressure, including people of African descent. This could recommend that individuals who have an inborn predisposition to high blood pressure are more probable to get preeclampsia [8].

**Known causes for preeclampsia:** The known causes of preeclampsia are:

- i. age (over 40 or under 20);
- ii. the first pregnancy;
- iii. a history of preeclampsia;
- iv. multiple pregnancies (e.g. twins, triplets);
- v. African or Native American ancestors;
- vi. a family history of preeclampsia;
- vii. diabetes;
- viii. a history of high arterial hypertension;
- ix. kidney disease or hematological (blood cell) disorders;
- x. Overweight before pregnancy.

## Symptoms of preeclampsia

They are fragment of the definition of the disease: arterial hypertension: a blood pressure greater than 14/9 at rest confirms pregnancy-induced hypertension. The precocity and importance of this hypertension are factors of deprived prognosis, which can lead to:

- a. fetal death in utero or fetal hypotrophy; proteinuria;
- b. weight gain;
- c. edemas;
- d. headaches;
- e. ringing in the ears;

- f. drowsiness;
- g. eye disorders:
- i) decrease in visual acuity;
- ii) sometimes sudden amaurosis (blindness) which will regress without sequelae;
- iii) flying flies;
- iv) diplopia (double vision);
- v) puffiness of the eyelids [8].

### Complications of preeclampsia [8]

**Eclampsia:** is a typical uncontrollable crisis happening in the 3<sup>rd</sup> trimester of pregnancy, during labor, or after childbirth, and related with high blood pressure. The death of the fetus is a possible consequence; the life of the mother is also in peril.

**Fetal growth restriction:** Preeclampsia touches the arteries that carry blood to the placenta. If the placenta doesn't get sufficient blood, the baby could get an inadequate supply of blood and oxygen and rarer nutrients. This can cause slow growth called fetal growth restriction, low birth weight.

**Premature birth:** If a woman has preeclampsia with severe symptoms, she may need to be delivered prematurely to save her life and her baby. Premature delivery can lead to breathing and other problems for the baby.

**Ruptured placenta:** Preeclampsia increases the risk of placental abruption, a condition in which the placenta separates from the inner lining of the uterus before delivery. A large abruption can cause heavy bleeding that can be life threatening for both the woman and her baby.

**The HELLP Syndrome:** means hemolysis (destruction of red blood cells), high liver enzyme levels and low platelet count. It can appear abruptly, even before the detection of high blood pressure, or without any symptoms. HELLP syndrome is pregnancy complication that affects the blood and liver and death if not treated. HELLP syndrome occurs with the following signs and symptoms: blurred vision, chest or the upper right or middle part of the belly pain, swelling and vomiting or throwing up. Preeclampsia is an unknown condition in African medicine.

**Other organs damage:** Preeclampsia can hurt the kidneys, liver, lungs, heart, or eyes and can cause a stroke or other brain injury. The amount of injury to other organs depends on the harshness of preeclampsia. Preeclampsia can upsurge the risk of heart and cardiovascular diseases. The risk is even greater if the woman has had preeclampsia more than once or had a premature birth. To minimize this risk, after childbirth, the woman must try to maintain her ideal weight. She must eat a variety of fruits and vegetables, exercise regularly and do not smoke [8].

## Methodology

A total of 65 people were recorded during 25 years and are distributed as follow: a first group of 10 people was gestational women with severe hypertension, a second group of 55 were pregnant women presented at least three signs, symptoms and/or complications of preeclampsia and accepted to share their information on the known recorded antidiabetic plants used to treat these health problems.

### Criteria of plants inclusion

Plants include in this study must be long-established antidiabetic and used by pregnant women with preeclampsia. Or the plants could cure at least three signs, symptoms and/or complications of preeclampsia including diabetes; high arterial hypertension; kidney disease; hematological (blood cell) disorders; Overweight or obesity before pregnancy. In this condition a single antidiabetic plant used in the management of three signs, symptoms and/or complications of preeclampsia is considered as anti-preeclampsia plant. The second group of antidiabetic plants is those which are used directly in management of preeclampsia. To achieve our objective three following engines of research were used in Google, Google scholar, PubMed, etc.:

- a. "a given antidiabetic plant treated gestational women with preeclampsia".
- b. "a single given antidiabetic plant treated three complications of preeclampsia"
- c. "a given antidiabetic plant may regulate hypertension in women with preeclampsia"

All the complications of preeclampsia described overhead in the introduction were grouped 3 by 3 (Table 1). Samples of plants recorded were harvested and presented to volunteer people and a number of times an antidiabetic plant was used in the treatment of preeclampsia or three at least of its signs, symptoms and/or complications were recorded.

### Statistical analysis

The group of direct plants and the group of suggestive plants were compared using the kh-2 test. The purpose of this test is to determine whether a significant difference exists between the two groups of plants or to compare the plants of the same group. It is expressed by the mathematical formula  $\text{Khi-2} = \sum (O_i - E_i)^2 / E_i$  where Khi-2 represents the test,  $O_i$  represents the observed value and  $E_i$  the expected value.

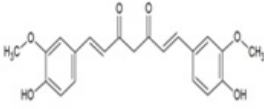
## Results

In (Table 1) Twelve (12) plants were recorded and belong to 10 families and 12 genera. Six plants intervene in direct treatment of preeclampsia and all the twelve were used in symptomatic treatment of preeclampsia. Pharmacological evaluation of the twelve

plants demonstrates that for the six plants implicated in the direct treatment of preeclampsia induced by ultra-low-dose endotoxin infusion, Lipopolysaccharide (LPS) or monitored angiogenic factors in animal model, the isolated molecules or the extracts have shown beneficial effects. Manifold traditional treatments of preeclampsia through its signs, symptoms and/or complications were confirmed in previous works (Table 1) [9-33]. Table 1 shows that the number

of symptoms treated by a plant varies from 3 to 8. Table 2 presents a total of 11 symptoms treated by 12 plant species. *Brassica oleracea* and *Ocimum gratissimum* were respectively used in the control of 8 and 7 symptoms for a total of 99 and 81 repetitions. They are the most useful species in the symptomatic treatment. High arterial hypertension with a total of 127 repetitions is the most treated symptom (Table 2).

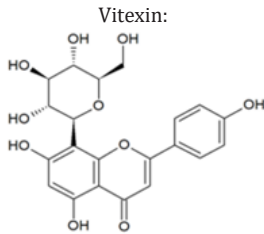
**Table 1:** Pharmacological evaluation of gestational antidiabetic plants traditional used in the direct and symptomatic treatment by indigenous pregnant women. a: Plants of direct treatment; \*: symptomatic traditional treatment confirmed in literature.

Gestational antidiabetic plants	Signs, symptoms and/or complications treated	Repetitions	Previous pharmacological studies on symptoms and preeclampsia management	Potential active principles
<i>Curcuma longa</i> <sup>a</sup> Lin. (Zingiberaceae)	Placenta abnormalities	8	Curcumin through its wide variety of actions may present helpful activities on the managing of pregnancy connected disorders counting preeclampsia but also for fetal growth syndromes (9). Advantageous effects of curcumin in the lipopolysaccharide (LPS)-induced preeclampsia-like phenotype have also been demonstrated in rat models. Curcumin was able to fall high hypertension and proteinuria (concentration of urinary protein.) in LPS-curcumin-treated rats (9).	Curcumin: lipophilic polyphenol (10) 
	Proteinuria	10		
	High arterial hypertension,	15		
	Infections (12)	21		
<i>Brassica oleracea</i> <sup>a</sup> Lin. (Brassicaceae) Cabbage	High arterial hypertension*	15	Quercetin remoted from <i>Brassica oleracea</i> displays anti-hypertensive properties and protective effects against inflammation both <i>in vitro</i> , <i>in vivo</i> , and in clinical trials. Additionally, this flavonol exerts positive actions on the growth of the embryo, fetus, and placenta without teratogenic and abortive properties [10,11]. In a preeclampsia animal model induced by ultra-low-dose endotoxin infusion and monitored angiogenic factors, quercetin treatment attenuated multi-pathophysiology changes and ameliorated the symptoms. Therefore, quercetin meaningfully improved the pathophysiology in preeclampsia and might be industrialized as entrants for preeclampsia managing [13-15].  <i>Brassica oleracea</i> for its anti-inflammatory action can relieve muscle, joint pain and hemorrhoids. <i>Brassica oleracea</i> has an analgesic and calming action. It can consequently be used to treat eye irritations, sciatica, headaches, dental pain and conjunctivitis [16,17].  Consumption of <i>Brassica oleracea</i> stimulates better blood circulation. It consequently helps avoid cardiovascular pathologies and re-establishes good blood circulation in patients with venous insufficiencies like phlebitis and varicose veins) [17].	Quercetin: a flavonol  Commonly found as glycosidic derivatives in plant-based food and beverages such as honey, tea, wine and fruit juices [10-12]  Cabbage is constituted of water, fiber, vitamins (A, B3, B5, B6, B9, C, K), minerals (potassium, magnesium, phosphorus), trace elements (selenium, iodine), flavonoids, amino acids and glucosinates [10].
	Placenta abnormalities	4		
	Premature birth	8		
	Inflammation*	7		
	Headaches	23		
	Hematological disorders	12		
	Cardiovascular diseases	23		
	Proteinuria	7		

<p><i>Crinum zeylanicum</i> Lin. (Amaryllidaceae)</p>	<p>High arterial hypertension*</p>	<p>13</p>	<p><i>Crinum zeylanicum</i> leaves methanolic extract and their ethyl acetate fractions possess potent antihypertensive properties and additionally protect the renal function in induced hypertensive rats, accordingly supporting the use of this plant in managing of arterial hypertension [18].</p>	<p>Quercetin: A flavonol widely distributed in green vegetables, fruits and medicinal plants belonging to <i>Amaryllidaceae</i>, <i>Apiaceae</i>, <i>Hypericaceae</i>, <i>Lamiaceae</i>, <i>Rosaceae</i>, and <i>Passifloraceae</i>, etc. (10)</p> <p>Polyphenols and Flavonoids</p>
	<p>Proteinuria*</p>	<p>10</p>	<p>The oral administration of leaves methanolic and aqueous extracts at the doses of 30, 60, and 120mg/kg/day progressively and significantly (<math>p &lt; 0.001</math>) decreased the systolic and diastolic blood pressure in hypertensive L-NAME treated rats as compared to the inexperienced group [18].</p>	
	<p>Overweight or obesity before pregnancy</p>	<p>10</p>	<p>The most active doses were leaves extract at 60mg/kg and leaves methanolic extract at 120mg/kg. It has been extensively demonstrated that polyphenols, particularly flavonoid compounds, possess antihypertensive activity, closely connected to their antioxidant abilities [19-21]. Quercetin shows anti-hypertensive effects [10].</p>	
<p><i>Solanum melongena</i> Lin.</p>	<p>Inflammation*</p>	<p>12</p>	<p><i>Solanum melongena</i> (Eggplant) contributes to the reduction of bad cholesterol and consequently restricts the development of atherosclerotic plaques and arterial hypertension. Eggplant is a diuretic [22]. The high ratio potassium/sodium (240mg/100g) and water (92%), help to this plant to purify the body. It is also suggested in case of inflammation of the urinary tract, and it is a source of antioxidants [23]. All these defend the body from free radicals and consequently slow the beginning of cancers, cardiovascular diseases, and premature cellular aging. Eggplant too contains beta-carotene advantageous for vision and against skin aging [24].</p>	<p>The high ratio potassium/sodium is a diuretic. Flavonoides antioxidant [23].</p>
	<p>High arterial hypertension*</p>	<p>20</p>		
	<p>Cardio-vascular diseases*</p>	<p>9</p>		
	<p>Overweight or obesity before pregnancy</p>	<p>5</p>		



<p><i>Ocimum gratissimum</i> Lin. (Lamiaceae)</p>	<p>High arterial hypertension*</p>	<p>11</p>	<p><i>Ocimum gratissimum</i> essential oil and purified extracts revealed the following activities:</p> <p>1- <i>in vitro</i> antimicrobial activity attributed to the eugenol, monoterpenoids and thymol contained in the volatile oils 2- momentous antimicrobial effects against <i>Shigella flexineri</i> [25], <i>Escherichia coli</i>, <i>Staphylococcus aureus</i>, <i>Salmonella enteritidis</i>, <i>Proteus mirabilis</i> and <i>Klebsiella</i> spp [26].</p> <p>Leaves extracts contain numerous polyphenols, iridoid glycosides and phenolic acids including rosmarinic, chlorogenic, caffeic, ferulic, chicoric and caftaric acids) and flavonoids (rutin, isoquercetin, apigenin-luteolin-glucoside) which possess strong antihypertensive properties [27]. These results proposed that <i>Ocimum gratissimum</i> extract has the Carcinoembryonic antigen (ACE) inhibition activity in vitro and also in Spontaneously Hypertensive Rats (SHRs). Rutin may be the main component of phenolic compound responsible of these effects [28].</p>	<p>Polyphenols with its main component Rutin.</p> <p>Iridoid glycosides and phenolic acids [26,27]</p>
	<p>Headaches</p>	<p>18</p>		
	<p>Proteinuria</p>	<p>11</p>		
	<p>Cardio-vascular diseases</p>	<p>15</p>		
	<p>Hematological disorders</p>	<p>4</p>		
	<p>Infection*</p>	<p>11</p>		
	<p>Inflammation</p>	<p>11</p>		
<p><i>Scoparia dulcis</i> Lin. (Scrofulariaceae)</p>	<p>Inflammation*</p>	<p>5</p>	<p><i>Scoparia dulcis</i> has the following propertie: antiulcerogenic antiviral, anti-inflammatory, antidiabetic, diuretic, antimicrobial, antioxidant, antitumoral. The leaves methanolic extract and numerous isolated compounds obtained from the plant have revealed potential anti-cancer activities [29]. Scopadulcic acid B and C in <i>in vitro</i> and <i>in vivo</i> studies have revealed the inhibition of cell proliferation, replication of Herpes simplex 1, secretion of gastric acid and resorption of Parathyroid Hormone (PTH) stimulated bone. Scopadulcic C potentiates antiviral activities, inhibits <math>\alpha</math> scoparic acid A-glucuronidase. The plant has also shown antioxidant and antifungal and antibacterial properties <i>in vitro</i> [29,30].</p>	<p>Diterpènoïdes (acide scopadulcique A, B, et C; acide scoparique A et scopaduline); triterpènoïdes (friedeline, glutinol, <math>\alpha</math>-amyrine, acide bétulinique, acide ifflaionique et acide dulcioique); scopadiol, scopadulciol; amelline; coumarines, saponines, tanins, acides aminés, flavonoïdes (hydroxytricetine-8-glucoronide-7, apigénine); alcaloïdes (6-méthoxy benzoxazolinone), oléorésines; réducteurs de sucres [29,30].</p>
	<p>Proteinuria</p>	<p>5</p>		
	<p>Infections*</p>	<p>10</p>		
	<p>Overweight or obesity before pregnancy</p>	<p>12</p>		
<p><i>Camelia sinensis</i> (L.) Kuntze (Theaceae)</p>	<p>High arterial hypertension*</p>	<p>8</p>	<p>Epigallocatechin gallate revealed the hypotensive effect, the inhibition of the angiotensin I-converting enzyme [29,30].</p>	<p>Epigallocatechin gallate: a catechin</p> 
	<p>Proteinuria</p>	<p>11</p>		
	<p>Overweight or obesity before pregnancy</p>	<p>7</p>		

<i>Passiflora incarnata</i> <sup>a</sup> Lin. (Passifloraceae)	High arterial hypertension*	17	Vitexin shows a widespread variety of pharmacological actions, such as anti-hypertensive and anti-inflammatory properties and protective effects in the cardiovascular system [31]. Vitexin ameliorates preeclampsia phenotypes by inhibiting TFPI-2 and HIF-1_/VEGF in a l-NAME induced rat model [32]. Three doses of vitexin (30,45,60mg/kg) in pregnant rats with induced preeclampsia by NG-nitro-L-arginine-methyl-ester; have shown a protective upshot against preeclampsia impairment, which reduced the high systolic blood pressure dose- and time-dependently. Vitexin also reduced placental TFPI-2, HIF-1_, and VEGF during experimental preeclampsia. This flavonoid can reduce oxidative stress in the blood and placenta. Vitexin is an antioxidant constituent that exerts protective activity against various reactive oxygen species and lipid peroxidation, which are intricated in pathophysiological pathways throughout preeclampsia [10].	 <p>Vitexin:</p>
	Inflammation*	12		
	Hematological disorders	13		
<i>Passiflora edulis</i> <sup>a</sup> Lin. (Passifloraceae)	Hematological disorders	13		
	Premature birth	11		
	Headaches	11		
<i>Passiflora foetida</i> <sup>a</sup> (Passifloraceae)	Hematological disorders	6		
	High arterial hypertension	4		
	Edemas	3		
<i>Moringa oleifera</i> <sup>a</sup> Lam. (Oleifearaceae)	High arterial hypertension*	10		
	Hematological disorders	11		
	Edemas	6		
<i>Senna occidentalis</i> Syn. <i>Cassia occidentalis</i>	High arterial hypertension*	14	<i>Senna occidentalis</i> leaves aqueous extract has diuretic and antioxidant actions and a possible potential treatment for arterial hypertension. Many other properties of this plant include antidiabetic, antimalarial, antimicrobial, hepatoprotective, larvicidal, analgesic, anti-inflammatory, anxiolytic, antidepressant, antipyretic and immunosuppressive [33].	Leaves aqueous extracts <i>Senna occidentalis</i> contains the following active compounds: Phenolic compounds, alkaloids, flavonoids, fatty acids, anthraquinones, triterpenes, volatile oils, glycosides, anthracenes, saponines, tannins, coumarins and sterols [33].
	Infections*	8		
	Inflammation*	13		
	Cardio-vascular diseases	1		

**Table 2:** Number and total repetitions for each symptom treated. CU: *Curcuma longa*; BRA: *Brassica oleracea*; CRI: *Crinum zeylanicum*; SOL: *Solanum melongena*; OC: *Ocimum gratissimum*; SC: *Scoparia dulcis*; CAM: *Camelia sinensis*; PI: *Passiflora incarnata*; PE: *Passiflora edulis*; PF: *Passiflora foetida*; SO: *Senna occidentalis*.

Symptoms	Plants												Total
	CU	BRA	CRI	SOL	OC	SC	CAM	PI	PE	PF	MO	S0	12 Plants
	Repetitions Per Symptom												Total
1-Placenta													
Abnormalities	8	4											12
2-Proteinuria	10	7	10		11	5	11						54
3-High arterial hypertension	15	15	13	20	11		8	17		4	10	14	127
4-Infections	21				11	10						8	50

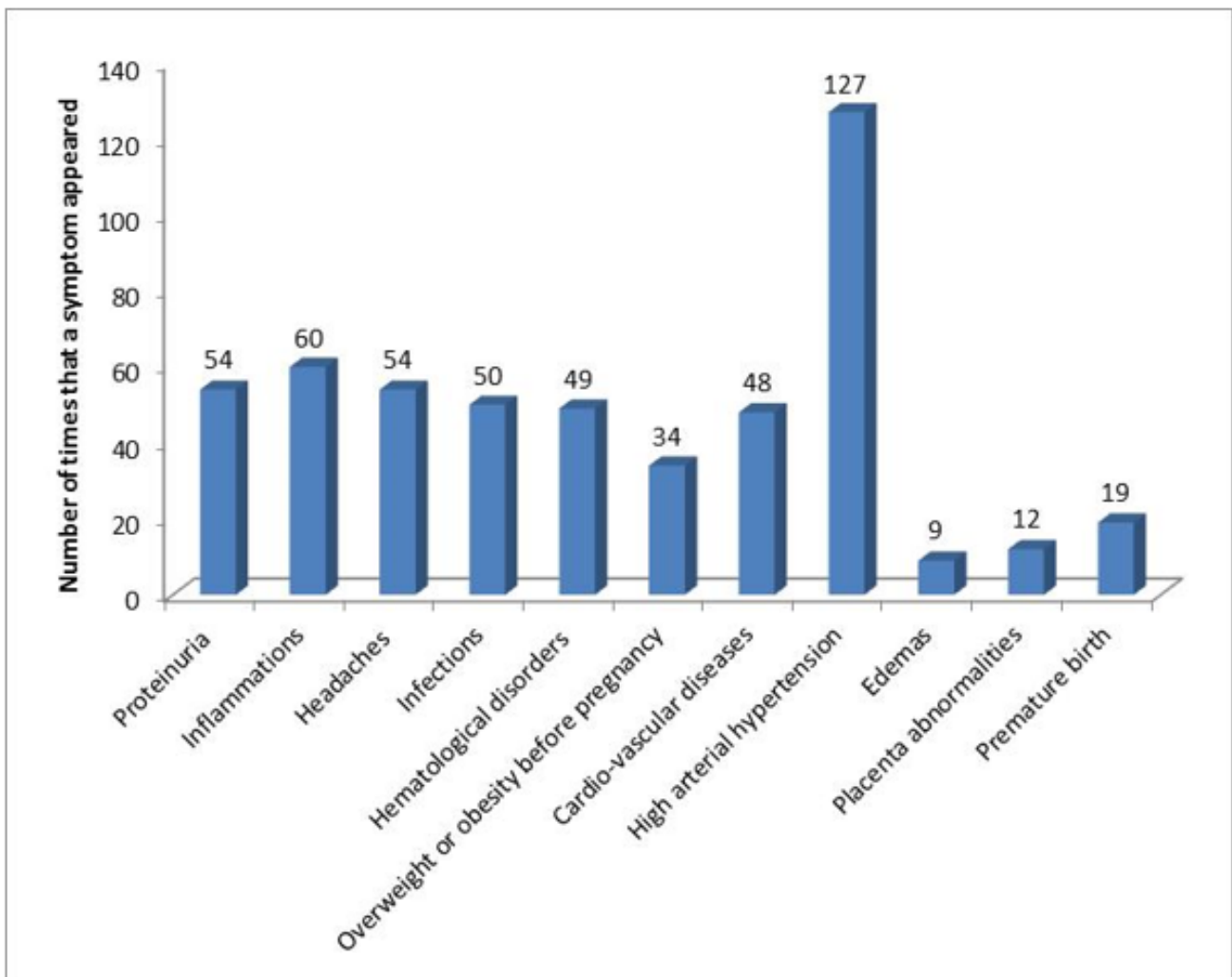
5-Premature birth		8						11				19	
6-Inflammation		7	12	11	5		12				13	60	
7-Headaches		23		18				13				54	
8-Hematological disorders		12		4			13	3	6	11		49	
9-Cardio-vascular diseases		23	9	15							1	48	
10-Overweight or obesity before pregnancy			10	5		12	7					34	
11-Edemas									3	6		9	
Total repetitions per plant	54	99	33	46	81	32	26	42	27	13	27	36	516

Figure 1 shows the following three groups of symptoms:

- a. the widely controlled symptom (high arterial hypertension);
- b. the meanly controlled symptoms (inflammations, headaches, proteinuria, infections, hematological disorders, cardio-vascular diseases and overweight or obesity before pregnancy);
- c. the lowly controlled symptoms (edemas, premature birth and placenta abnormalities)

The chi-square test shows that there is a very significant

difference between high arterial hypertension and symptoms of the meanly controlled symptoms group (chi-square=32344, Degree of freedom=7, P=0.00033263 <0.05). It exists a strong significant difference between the lowly controlled symptoms group and high arterial hypertension (chi-square=18,247, Degree of freedom=3, P=8, 3304E-05<0.001. We can therefore conclude that high arterial hypertension is a dominant symptom treated (Figure 1). Consequently, high arterial hypertension is the more frequent characteristic symptom of preeclampsia.



**Figure 1:** Distribution of symptoms in function of their repetitions.



## Ethno Pharmacological Preparation of Herbal Medicine

- a) Take an infusion of a tea spoon of *Curcuma longa* rhizome powder in a glass of water (250ml), three times a day, for a week.
- b) Boil 500g of *Brassica oleracea* (cabbage) in 3 liters of water for 10 to 15ml; drink 250ml of decoction 3 times daily, for a week.
- c) Boil 300mg of *Crinum zeylanicum* fresh leaves in 2 liters of water for 10ml; drink 250ml two times daily for a week.
- d) Boil 500kg of *Solamum melongena* fruits in 4 liters of water for 15ml; drink 250 ml of decoction three times daily per a week.
- e) Infuse in 3 liters of water 500g of *Ocimum gratissimum* leaves for 4 hours; drink 250ml of infusion three times daily for a week.
- f) Boil 300g of leaves and stems of *Scroparia dulcis*, in 3 liters of water for 10ml; drink 250ml of decoction daily per a week.
- g) Take an infusion of a tea spoon of *Camelia sinensis* leaves powder in a glass of water (250ml), three times a day, for a week.
- h) Boil 300g of leaves and leaves of *Passiflora incarnata*, in 3 liters of water for 10ml; drink 250ml of decoction daily per a week.
- i) Boil 300g of leaves and stems of *Passiflora dulcis*, in 3 liters of water for 10ml; drink 250ml of decoction daily per a week.
- j) Boil 300g of leaves of *Passiflora foetida*, in 3 liters of water for 10ml; drink 250ml of decoction daily per a week.
- k) Boil 300g of leaves of *Moringa oleifera*, in 3 liters of water for 10ml; drink 250ml of decoction daily per a week.
- l) Boil 300g of leaves of *Senna occidentalis*, in 3 liters of water for 10ml; drink 250ml of decoction daily per a week.

## Discussion

### Therapeutic importance

Medicinal plants are identified as a fruitful basis of folkloric treatment due to their secondary metabolites which have important function both *in vivo* and *in vitro* during the preeclampsia direct and symptomatic control in many animal species. It has been demonstrated that some secondary metabolites well manage several symptoms of this pregnant women disease including high blood pressure, infections and inflammations. The present work highlights 12 medicinal plants used in the treatment of woman disorders related to preeclampsia. In addition, each of these species provides an overview of active constituents with privileges for improvement of several diseases particularly their implication in hypertension (principal symptom of preeclampsia) health care [34]. Results of this study are proof that women can meaningfully decrease their risk to develop preeclampsia. It is important to point out that all the 12 plants are used as monotherapy. But their use is not safe as there are concerns about adverse incidents, such as

allergic reactions and nephropathy (kidney damage).

### Anti-aging gene sirtuin activators

The chemical review realized in this work showed that the aerial part of the recorded plant species contains considerable quantities of polyphenols, quercetins, diterpènoïdes (acide scopadulcique A, B and C; acide scoparique A and scopaduline) and quercetins, diterpènoïdes (acide scopadulcique A, B and C; acide scoparique A and scopaduline) and Epigallocatechin gallate as major constituents. Among these compounds' polyphenols, quercetins and Epigallocatechin gallate are the activators of the anti-aging gene Sirtuin 1 (Sirt 1) [35]. Sirtuin 1 is critical to the control of hypertension and preeclampsia [35,36]. Other Sirtuin 1 activators from plants or diets that do not contain Sirt 1 inhibitors promote Sirt 1 activators to accelerate hepatic caffeine metabolism to prevent T3D (Type 3 diabetes" is a term some people use to describe Alzheimer's disease) connected to various organ diseases in the developing world. These activators may be effective in treatment of hypertension and preeclampsia [37,38].

### Toxicity of some recorded plants

Although, *Ocimum gratissimum* Linn is used, under different forms in the biological fight, the preservation and the treatment of several types of affections, the use of this species is sometime awful, due to its contamination by dithizone of Plomb (3,4ppm) and dithizone of Cadmium (1,65ppm). This toxicity is respectively 12 times and more than 8 times superior to WHO norms (0,3ppm and 0,2ppm) [39]. *Senna occidentalis* leaves are also rich in laxative effect like derivatives, anthracenics with depuratives and cholagogues and oxytocics. For these reasons this plant should be avoided by pregnant women except in case of promoting delivery. It is also reported that *Senna occidentalis* aqueous treatment rats revealed no discernable behavioral changes up to 500mg/kg per os [40]. *Senna occidentalis* root extracts have strong larvicidal activities with high mortality in high concentrations. One hundred per cent mortality effect of petroleum ether and butanol of larvicidal activity of *Senna occidentalis* against mosquito *Culex puinpuefasciatus* at 0,2 and 0,3g/l was observed. In the immature aquatic larvae stage the root extracts of this plant can be a best control strategy for effective reduction of mosquito population densities [41,42].

A lot of efforts are still recommended in many domains such as:

- a. the validation of the 12 plants,
- b. the identification of the environmental contaminated agents for each of them,
- c. the roles they can play for the destruction of biological agents in the environment,
- d. the conduct of clinical trials in humans [42].

### Conclusion

As the study ended, we can conclude that folkloric African medicine helps to manage preeclampsia and to control 11 of its symptoms. High atrial hypertension with 127 repetitions for 10

plants was the most frequent and treated symptoms. The previous research indicated that the aerial parts of these species contain considerable quantities of polyphenols (curcumin), quercetins, diterpénoïdes (acide scopadulcique A, B and C; acide scoparique A and scopaduline) and Epigallocatechin gallate as major constituents. The activities of molecules isolated from plants are complemented by those of active aqueous extracts. We strongly recommend further studies to find non-toxic doses for the development of anti-preeclampsia future phytodrugs.

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