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# RESEARCH ARTICLE

## HYPOTENSIVE EFFECTS OF *MORINGA OLEIFERA* LEAVES ON NORMAL WEIGHT PATIENTSAND OBESEAT THE REGIONAL HOSPITAL OF NGAOUNDERE

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**ABSTRACT**

This design study focuses on the care of hypertension among normal weight patients and obese at the Regional Hospital of Ngaoundéré by a regular dietary supplement of Moringa oleifera.The main purpose of this study was to put into evidence the hypotensive properties of Moringa oleifera.Sixty (60) hypertensive patients aged between 28 to 57 years participated to the study. Obtained results showed that obese patients draws a greater benefit of the dietary supplementation of Moringa oleifera than normal weight patients. Obese patients gain more than normal weight patients as regard to the diastolic blood pressure (we observe a reduction value of 14.63 mmHg in the obese group and 6.23 mmHg among normal weight patients). Concerning the values of the systolic blood pressure in obese and normal weight patients, we observed a reduction value of 10.53 mmHg among the normal weight patients and6.86 mmHg among obese patient. These results suggest the existence of elements in the leaves of Moringa oleifera, which may possess hypotensive properties in its composition.



## INTRODUCTION

Today, "non-transmissible" diseases constitute a serious threat for health for both men and women. Four of the main pathologies of this non-transmissible diseases, cancer, chronic respiratory affections, diabetes and cardiovascular diseases are among the first causes of mortality in the world, causing each year 60% of the whole death in the world, of which 80% comes from developing countries and handicapped ones (Ngo Lemba, 2011). As a result, the World Health Organization (WHO) elaborated a strategic plan of action in the world to fight against these diseases (WHO 2002). The fight against cardiovascular diseases occupies and important place in this plan and notably the fight against arterial hypertension. Hypertension is in fact the most important and frequent of the cardiovascular diseases (Sira Habby, 2005). In the world, hypertension occupies the third position regarding risk factors that contributes to mortality after malnutrition and nicotinism (tobacco abuse) (Sira Habby, 2005). Hypertension greatly contributes to coronary diseases; cardiac and kidney insufficiencies. The prevalence of hypertension is at an increasing rate in developing countries probably in relation to the ageing population, urbanization and change in nutritional habits in favor of obesity (Ngo Lemba, 2011).

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Hypertension is actually more frequent, but it was considered a long time ago as a rare pathology or even non existing disease in Africa. It constitute today a real public health issue, describing a non-transitory increase in blood pressure in arteries that repose on two facts: increase tension and its persistence (Arama, 1988). The treatment of hypertension always calls for hygienic and dietary measures, correction of associated metabolic abnormalities (hypercholesterolemia, diabetes) and different drug classes; but why is there still an increase in the cases of hypertension alongside this plethora of pharmaceutical products in which the efficiency has been confirmed a long time ago (Issiaka, 2006). The cost of the treatment of hypertension as well as patients follow up is still high in our milieu and in this conditions, more than 80% of our populations go in for traditional medicine since long time ago (WHO, 2002). It is in this optic that this work focuses.

### Objective

The objective of this study was to evaluate the hypotensive effect of a dietary supplementation of *Moringa oleifera* powdered formin the diet of patients enrolled in the Regional Hospital of Ngaoundéré. More specifically, our objectives were:

- To study the effect of the regular dietary supplement of *Moringa oleifera* powder on certain anthropometric parameters of hypertensive patients, normal weighted and obese;

- To study the effect of the consumption of this powder on the blood pressure;
- To study the effect of the consumption of the powder on urine frequency.

## MATERIAL AND METHODS

The study was carried out at the Regional Hospital of Ngaoundéré during the period going from March 11, 2014 to September 11, 2014. The study was realized on individuals (men and women) normal weighted an obese that attend the clinic of diabetes and hypertension of the Regional Hospital of Ngaoundéré. We worked for the cause of this study in straight collaboration with the healthcare personnel of the clinic. Before proceeding to diagnostic evaluations of our participants, our enrolled population study was sensitize verbally on the objectives of our protocol. The ethic comity was solicited for ethical considerations reliable to the progress of the study.

### Material

**Subjects:** In all, we enrolled 60 peoples aged 25 years and above, all suffering from hypertension. The population study was divided into two groups as such: 30 normal weighted (body mass index (BMI) between 18.5 and 24.9 kg/m²) and the other 30 peoples obese (BMI greater than or equal to 30 kg/m²). Just after this diagnostic evaluation, participants who fulfill our selection criteria were recruited voluntarily after signing a clear consent document. Selection criteria were as follows:

- At least 25 years old;
- Have a BMI between 18.5 and 24.9kg/m² or greater than or equal to 30kg/m²;
- Not pregnant;
- Absence of hypertensive treatment;
- Absence of hypo sodium alimentary diet;
- Have a systolic blood pressure ≥ 140 mmHg and a diastolic blood pressure ≥ 90 mmHg.

### Instruments of measure

- A height gauge;
- A mechanic weight scale of Camry marque with a capacity scale of 150 kg;
- A manometer Omron Hem 712C with an armband for the measurement of blood pressure;

### Methods

The measurement method varies from one parameter to another.

**Diagnostic evaluation:** The diagnostic aspect of this study consisted at the measurement of anthropometric parameters. This therefore permitted us to determine the weight of our subjects. Hence, subjects with normal BMI constituted the first group and the overweighed and obese constituted the second group.

### Measure of anthropometric parameters

**Weight:** To measure the weight of our subjects on the scale, they must be empty footed, bust redress, and head raised straight looking forward. The reading of the weight is taken just as the needle stabilizes on the scale.

**Height:** The subject is in a military static position, hand lying downward along the body line, foot empty and joined together and backed on the height gauge. The measurer slides the square gauge on top of the head of the subject and read the value that display at the base of the square.

**Calculation of BMI:** The measure of the height and weight of our subjects permitted us to calculate the body mass index. Defined as body weight divided by the square of your height (in kg/m²) as shown in the formula below:

$$\text{BMI}=\frac{weight\ (kg)}{height\ (m^2)}$$

**Preparation of the powder of *Moringa oleifera:*** The branches of *Moringa oleifera* gathered, the drying process undertaken in the shadow in order to preserve certain constituents of the leave from ultraviolet radiation. In order to avoid the settling and deterioration of the leaves, it was indispensable for us to turn up the leaves at least once a day. Once the leaves are dry, they were transformed to its powdered form by pounding and sifting. The obtained powder was conditioned in glass bottles with air tight covers and lined under the lee of sun.

**Constitution of homogenous groups:** Subjects aged 25 years and above and whose BMI varies between 18.5 and 24.9 kg/m² were ranged under the normal weight group named for the purpose of this study *group 1*. Subjects aged 25 years and above with a BMI greater than or equal to 30 kg/m² constituted the obese or overweighed group named for the purpose of this study *group 2*.

**Design study:** The design study consisted at the consumption of 300g of *Moringa oleifera* powdered form in patients different diets.

**Data Collection:** Data are collected on technical special slips that included all the items afferent to the different considered parameters as from the identification of the subject to the period of his evaluation.

**Statistical Analysis:** Analysis was made possible by the aid of STATGRAPHICS Plus 5.0. software. Results are presented in the forms of means/average and/or standard deviation. The analysis of the variance followed by the test of Duncan to establish differences was applied. At $p<0.05$, differences are significant.

## RESULTS AND DISCUSSION

Table 1 shows the anthropometric characteristics of the two groups of our subjects. The above table reveals that the formed groups of the population study at the beginning was homogenous in terms of participants which is for both groups (25 women and 5 men). Their heights varied between 1.67±0.07 m and 1.62±0.05 m. On the other hand their ages varied between 41.10±8.38 and 41.37±7.57. The mean value of the BMI was 21.97±2.15 kg/m² in the normal weight group and 32.33±1.10 kg/m² in the obese group.

**Table 1. Anthropometric characteristics of the study groups formed before experimentation**

| Subjects | Number | Age (year) | Height (m) | BMI (Kg/m$^2$) |
|---|---|---|---|---|
| Normal weight (group 1) | 30 | 41,10 ± 8,38 | 1,67 ± 0,07 | 21,97 ± 2,15 |
| Obese or Overweight (group 2) | 30 | 41,37 ± 7,57 | 1,62 ± 0,05 | 32,33 ±1,10 |

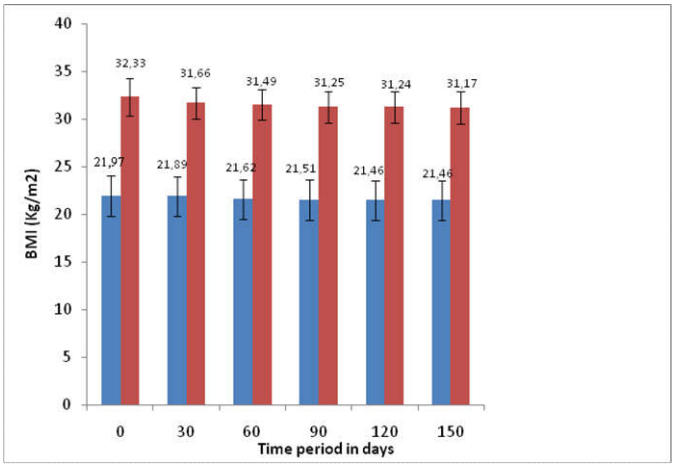


**Figure 1. Variation of BMI with time**

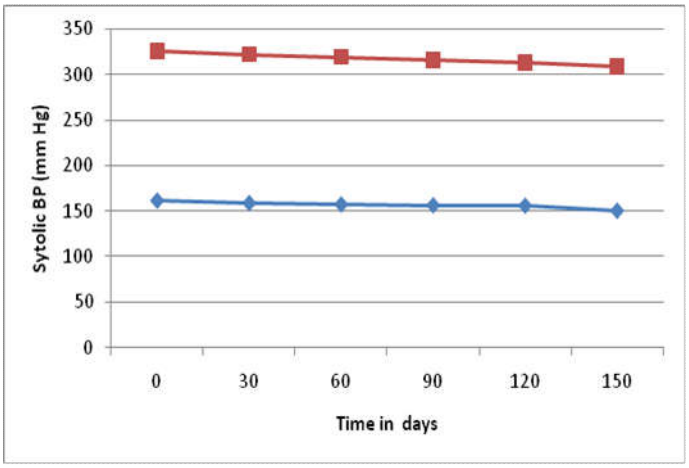


**Figure 2. Variation of systolic blood pressure with time**

**Variation of the BMI of the subjects during the study period:** Figure 1 below illustrates the variation of the BMI of the subjects during the study period. We observe from the figure above a slit decrease in BMI of all the subjects in both groups. In the normal weight group, that is group 1, the BMI is 21.97±2.15 kg/m² at the beginning of the study and decreases slightly to attain the value of 21.46±2.07 kg/m² at the end of the study. Either an average decrease of 0.51±0.08 kg/m². In the obese group, the average BMI is 32.33±1.10 kg/m² at the beginning of the test and 31.17±1.71 kg/m² at the end; either a drop of about 1.18±0.61 kg/m². However, there exist a significant difference in BMI in the obese group at the beginning of the study and then after 30 and 60 days and on the other hand after 90, 120 and 150 days with a p-value $p<0.05$. These reductions are equally more sensitive in the obese group than in the normal weight group. This may equally be explained simply by the drop in body mass in this group.

**Variations of blood pressure parameters of the subjects:** The parameters are the systolic blood pressure and the diastolic blood pressure.

**Variations of the systolic blood pressure:** Figure 2 illustrates the variation in systolic blood pressure in the two groups with time. In the normal weighed group, the systolic blood pressure varies from 161.43±22.60 mmHg at the beginning of the study and at 150.90±7.62 mmHg at the end; either an average drop of 10.53±14.98 mmHg. There exist a significant difference between the start (30, 60 days), the mean (60, 90, 120 days) and the end (150 days) with a p-value $p<0.05$. In the obese group, the systolic values of our sample blood pressure varied between 164.63±22.02 mmHg at the beginning of the study and 157.77±10.75 mmHg at the end; either a drop of 6.86±11.27 mmHg. Nevertheless, these variations are not significant.

**Variation of the diastolic blood pressure of the population:** The next figure shows the variations of the diastolic blood pressure with time in both obese and normal weighed groups.

85.60 ±8.27 mmHg was the average value of the diastolic blood pressure at the beginning of the study and 79.37 ±5.82 at the end. This represents an average decrease of 6.23 ±2.45 mmHg. There exist a significant difference with a p-value $p<0.05$ with time (30, 60, 90, 120,150 days). In the obese group the average diastolic blood pressure was 91.53 ±11.74 mmHg at the start to attain by then a value of 76.90 ±10.60 mmHg; either a drop of 14.63 ±1.14 mmHg. This difference is significant. The decrease in blood pressure in both groups was as a result of the chemical composition of powder of *Moringa oleifera* leaves. Tannin and flavonoids are found in great quantity in the powder. These substances are known for their properties to increase the capillary resistance, venous tone and collagenous stability. They have inhibitory activities on decarboxylases, elastase and angiotensin enzyme conversions. All what will be a benefit in the treatment of hypertension (Bruneton, 1993). The presence in the recipe of tannins, flavonoids and leucoanthrocyanes may explain also its antioxidant action. These antioxidants enters the therapeutic arsenal of the fight against arteriosclerosis and stress which constitute factors in favor of hypertension (Chevaly, 2000). These observations have equally been proven in the case of the utilization of the powder of *Spondias mombin* peel trunk in the treatment of Hypertension by Boullard in 2001.

These antiradicular compounds are capable of neutralizing free radicals by hindrance hence play an important role in the pathogenicsof hypertension notably in the genesis of atheroma (Sanogo and *al., 2009)*. Besides, polyphenolic substances such as benzoic acids and cinnamics present in the leaves of *Moringa oleifera* (Majambu, 2012) are known for their venotonic and vasculoprotectrice properties as they increase the capillary resistance, the venous tone and the stability of collagen; all what may be of great benefit in the treatment of hypertension. On the other hand, according to Burger and *al* in 2002, almost all the essential amino acids present in the leaves of *Moringa oleifera* favors the formation of nitric oxide which favors equally the vasodilatation of arteries with a better blood circulation. An important proportion of proteins, amino acids, mineral salts, polyphenols (powerful antioxidant), vitamins

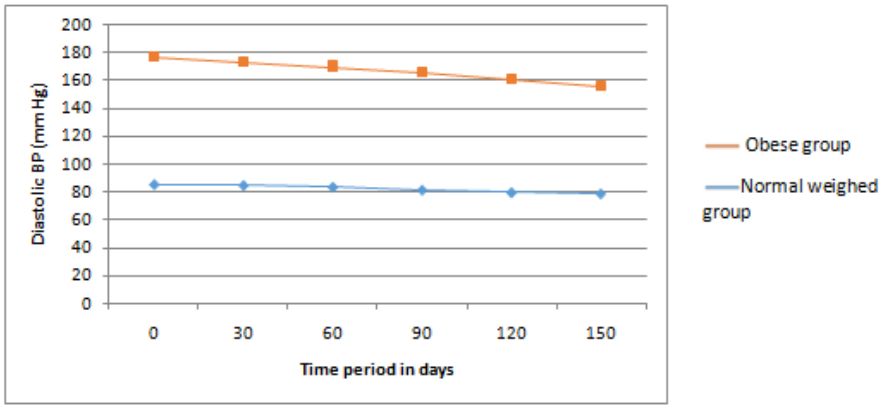


**Figure 3. Variation of diastolic blood pressure with time**

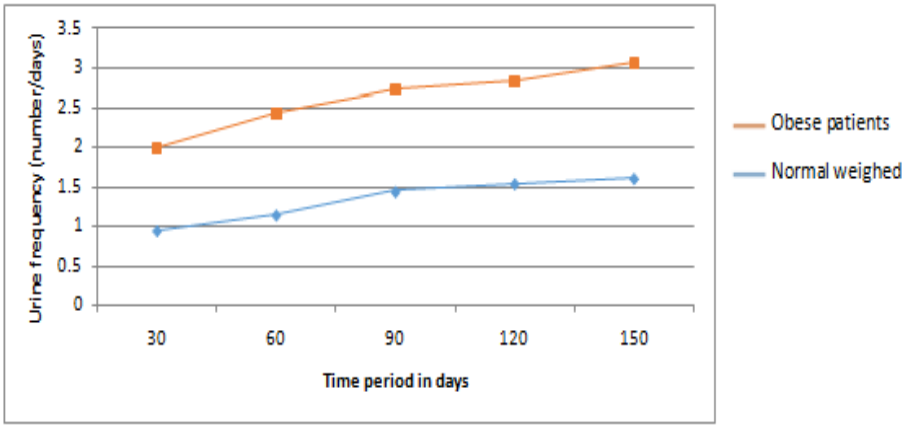


**Figure 4. Variation of the frequency of urine excretion with time**

(A, B, C) brought by the *Moringa oleifera* leaves reduces significantly the oxidative stress thus its action on hypertension. According to the works of Faizi and collaborators in 1998, on the hypotensive constituents of *Moringa oleifera,* a constituents such as niaziminine isolated from the ethanolic extract of the *Moringa oleifera* leaves showed hypotensive effects on rats.

**Variation in frequency of urine emission at the eve of the day during study:** Figure 3 illustrates the variation in urine emission with time in normal weighed an obese groups. No matter the statute of the subject, we notice an increase in the frequency of urine emission with time. In the normal weighed group, the frequency of urine increases from 0.93±0.37 times/day at the beginning to 1.60±0.50 times/day at the end of the study. This represents an average increase of 0.67±0.13 times/day. In the obese group the average is 1.07±0.37 times/day at the beginning to attend 1.47±0.57 times/day at the end; either an average increase of 0.4±0.20 times/day. It increases at day 60, remain stable at days 90 and 120, then increases as from day 120 upwards. These increases are significant with a p-value $p<0.05$ in the two groups. Obtained results corroborate with those of Tejas and collaborators in 2012, which observed equally an increase in urine excretion in rats after ingestion of some decoction of *Moringa oleifera* powder. Sighting that the chemical composition of the leaves of *Moringa oleifera*are similar to other diuretic plants, this results recalls the study carried out on the traditional treatment of hypertension by the recipe of "Nitrokoudang" based on the peel of *Sclerocarya bierrea* and *Vitex doniana* by Sonogo and collaborators in 2009.

Nevertheless we must pay attention to the content of sodium and calcium in the leaves which are hypertensive. Meanwhile, potassium is studied for its hypotensive effects. A good diuretic will then be that one which causes a greater sodium elimination holding potassium (Sonogo and al., 2009). Diuretic and salidiuretic effects of Moringa oleifera could be of great benefit in the treatment of hypertension in a way that it eliminates the sodium contained in the blood stream through urine elimination process. This will as a result reduce the volume of blood and hence reduce blood pressure.

## Conclusion

At the end of this study, results differs according to groups. Hence, concerning anthropometric parameters, obese subjects draws a greater benefit from the consumption of the *Moringa oleifera* powder leaves as a regular diet than normal weighed subjects. This is shown by the decrease in BMI (1.18 kg/m²). In normal weighed subjects, we realize just a little decrease BMI (0.51 kg/m²). Concerning blood pressure parameters, results showed that obese gain more in terms of diastolic blood pressure than normal weighed subjects; either 14.63 mmHg in the obese group and 6.23 mmHg in the normal weighed group. On the other hand, the gain in value of the systolic blood pressure is greater in the normal weighed group than the obese group; either a decrease of 10.53 mmHg in normal weighed and 6.86 mmHg in the obese. The frequency of urine excretion increases equally in the two groups. An increase of 0.67 and 0.4 times/day respectively in normal weighed and obese groups. Definitely, the regular consumption of the powder of *Moringa oleifera* leaves is of great benefit to hypertensive

obese patients as well as hypertensive normal weighed patients. The results of this study therefore suggest that *Moringa oleifera* leaves because of its diuretic properties may constitute a complementary asset for the treatment of hypertension. Confirmed diuretic properties of the leaves of *Moringa oleifera* is an argument in favor of the utilization of *Moringa oleifera*in the treatment of hypertension.

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