Biological Investigation of the Benefits and Risk of Plants Consumed by Diabetics in Ngaoundere

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Abstract: Medicinal plants have been reported as high risk of kidney failure among consumers. Around 80% in sub-Saharan population consume medicinal plants. This present study aimed to evaluate the influence of everyday life consumption of anti-diabetic plants among diabetic patients. We performed an analytical study in 54 participants. In diabetic population, we included 27 consumers of anti-diabetic plants and 27 non-consumers. We made the kidney screening with the measurement of the serum creatinine, urine creatinine, serum urea and fasting blood glucose. We estimated the GFR with the creatinine clearance of 24h. We used questionnaire to collect socio-demographic and personal history data. We identified 4 anti-diabetic plants used by our participants which are *Leptadenie hastata*, *Detarium microcarpum*, *Boswellia dalzielii* and *Moringa oleifera*. The average value of fasting blood glucose was low in patient consumers of plants (166 ± 43 mg/dl) than in non-consumers (229±53 mg/dl). We noted that consumers of *Moringa oleifera* (148.14±42 mg/dl) and *Leptadenia hastata* (148.25±46 mg/dl) presented best values of fasting blood glucose. We noted high prevalence of stage 3 and 4 of CKD in consumers of plant extracts (15%) than non-consumers (7%). Patient consumers of *Detarium microcarpum* and *Boswellia dalzielii* presented average value of eGFR in stage 2 of CKD. Though, consumers of *Moringa oleifera* and *Leptadenia hastata* presented healthy status of kidney function (116 ml/min/1.73m^2 and 115 ml/min/1.73m^2) followed by non-consumers group (102 ml/min/1.73m^2). These results showed that *Moringa oleifera* and *Leptadenia hastate* are better anti-diabetic plants for management of diabetes and they could have nephron-protection effect among diabetics.

Keywords: Diabetes, Anti-diabetics, Plant, Ngaoundere, eGFR

1. Background

Diabetes remains dangerous disease with high prevalence of death and morbidity around the world [1]. Its prevalence in Africa was 4.3% in 2012 and, in Cameroon, it was reported approaching 5.9% in 2013 [2]. The evolution of diabetes leads to others complication such as retinopathy, neuropathy, sexual disorders and chronic kidney diseases (CKD) [3]. CKD is a pathologic kidney abnormality defined as slow, progressive and irreversible damage of kidney, followed by the loss of the glomerular function for 3 months at least [4, 5]. The Kidney Diseases Improving Global Outcomes group (KDIGO) classified CKD in 5 stages according to the estimated Glomerular Filtration Rate

(eGFR), albuminuria and proteinuria. This classification goes from the stage 1 till the stage 5. The stage 1 means damage of kidney confirmed by albuminuria, proteinuria, hematuria and the eGFR up to 90 ml/min/1.73m^2. The stage 2 is the kidney damage with mild regression of the eGFR (between 60-89 ml/min/1.73m^2). The stage 3 referred to moderate regression of the eGFR (between 30-59 ml/min/1.73m^2). The stage 4 referred to sever regression of the eGFR (between 15-29 ml/min/1.73m^2). The stage 5 is the End-Stage of Renal Disease (ESRD) referred to kidney failure with the eGFR less than 15 ml/min/1.73m^2) [4]. In clinical practice, the diagnostic of CKD is done according to the KDIGO guideline without strong consideration of albuminuria and proteinuria. The negligence healthcare therapy to slowdown the evolution of CKD leads to the ESRD [6-8]. The management of diabetes remains expensive for most middle class of population in Cameroon where the monthly cost of diabetes management is 1.5 high than the living wage in 2012 [9]. This is one of the reasons why population likes use medicinal plant to manage their diseases. WHO estimated approaching 80%, the prevalence of people who uses medicinal plant in Africa [10]. This high prevalence could be explained by the ration of 1 tradi-practitioner for 500 persons while 1 medicinal doctor for 40.000 persons in Africa in 2012 [11]. Studies have reported relationship between utilization of medicinal plant and kidney failure [12-14]. Few data concerning influence of utilization of medicinal plant among diabetics are available in Cameroon. We performed this study to improve knowledge about the influence of anti-diabetic plants among diabetics who live in Ngaoundere.

2. Methods

From April to September 2014, we performed an analytical survey to analyze the renal status of diabetics, our population of study, to investigate on the benefic and risk for the consumption of plant extract among diabetics in Ngaoundere. We included 27 diabetics who consume regularly anti-diabetic plants and 27 diabetics who do not consume anti-diabetic plants. We included diabetics who sign a written consent to participate in the study, live in Ngaoundere since 3 years at least and attend the regional hospital of Ngaoundere for habitual rendezvous. We excluded pregnant women and seriously sick persons. We analyzed the kidney status with the measurement of serum creatinine, urine creatinine, serum urea and fasting blood glucose. We analyzed blood glucose, creatinine and urea with the molecular spectrometry *Semi Auto Chemistry Analyser*, modele BA-88, serial number BH7AB2710, made by the company *Mindray Biochemistry Analyser* in China. We estimated the GFR with the creatinine clearance of 24h. Urine has been collected during 24 hours to measure urine creatinine. This estimation of the GFR used standard volume of normal human of 1.73m^2. We used questionnaire to collect socio-demographic and personal history data. We typed and analyzed our data with Office Excel 2010 and SPSS version 20. We used chi-square test, Kruskal-Wallis

independent test and the accepted significance was fixed to 5%. The study protocol and the consent procedure received ethical clearance by the Institutional Review Board of the Faculty of Science of the University of Ngaoundere and the ethical committee of the Regional Hospital of Ngaoundere, Cameroon.

3. Results

3.1. Socio-demographic Parameters

We enrolled during our study 54 participants divided in 2 groups of 27 each one. Among these participants, sex-ratio female/male was 1.45 and the general average of age was 54.1±12.2 years. 87% of participants resided in urban zone. Housewife represented 42.6%. 13.0% of participants consumed alcohol while none smoked. Fulani tribe was the most represented with around 50% and, 66.7% of participants were illiterate.

3.2. Utilization of Anti-diabetics Plant

We reported 4 anti-diabetic plants consumed by diabetic patients which are *Leptadenie hastate* named locally Sobotoro, *Detarium microcarpum* named locally Konkehi, *Boswellia dalzielii* named locally Andakehi and *Moringa oleifera* named locally Giliganjajee [15].
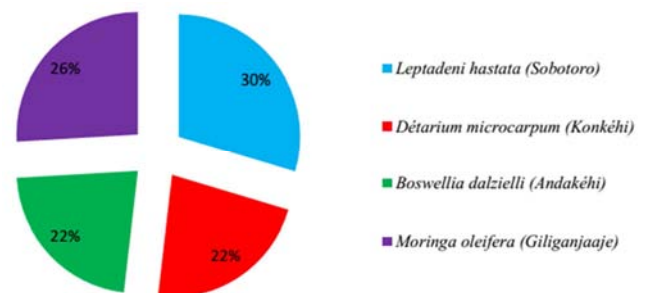

Figure 1. Representation of the utilization of anti-diabetics plant among consumers.

Among women, we noticed more than half (56.0%) of them consumed anti-diabetic plants while, less than half (40.0%) among men are consumers of plants. 85.0% of consumers mixed clinical therapy and plants and, Metformin is the most prescribed drug (64.8%). The average value of fasting blood glucose in men (196±65 mg/dL) was less than in women (199±65 mg/dL) and test for linearity had a significance value of 0.871. The average value of fasting blood glucose was low in patient consumers of plants (166±43 mg/dL) than non-consumers (229±53 mg/dL) and it was statistically meaningful with pvalues smaller than 0.001. We noted that patient consumers Moringa oleifera (148±42 mg/dl) and *Leptadenia hastata* (148±40 mg/dl) presented best values of fasting blood glucose than consumers of *Detarium microcarpum* (187±50 mg/dL) and *Boswellia dalzielii* (193±18 mg/dL) with high statistically meaningful of pvalues smaller than 0.001. We noted high prevalence of stage 3 and 4 of CKD in patient consumers (15%) than non-

consumers (7%). Patient consumers *Detarium microcarpum* and *Boswellia dalzielii* presented average value of eGFR in stage 2 of CKD. Consumers *Moringa oleifera* and

Leptadenia hastata presented healthy status of kidney function (116 ml/min/1.73m2 and 115 ml/min/1.73m2) followed by non-consumers (102 ml/min/1.73m2).
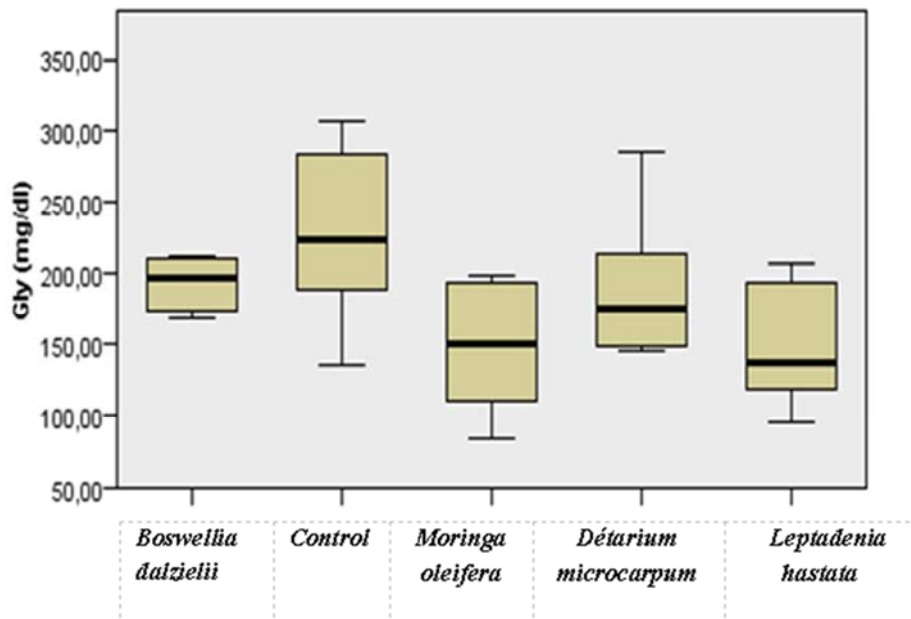

Figure 2. *Graphical representation showing the comparison of different values of the fasting blood glucose among sub-group according to the Kruskal-Wallis independent test.*

3.3. Analysis of the Urea and Creatinine

During the study, the average value of the serum urea of our participants (305.5±236 mg/L) was in the reference value prescribed by the Biolabo Laboratory (130-430 mg/L). Nevertheless, we noticed the average value of consumers 4 times elevated (423.93±247 mg/L) than non-consumers (187.11±153 mg/L). Sub-group consumers *Detarium microcarpum* showed average value of serum urea 5 times more than non-consumers. We noticed normal value of urine

creatinine of 24 hours in consumers (17.4±5.4 mg/kg/24h) and non-consumers (14.4±3.7 mg/kg/24h). Concerning serum creatinine analysis, consumers showed average value relatively high but not statistically meaningful (11.3±2. mg/L) than non-consumers (10.5±2.4 mg/L) (X2=8.96, df=1, pvalue=0.213) and, difference between men (12.1±1.8 mg/L) and women (10.15±2.3 mg/L) is statistically meaningful with pvalues=0.002.
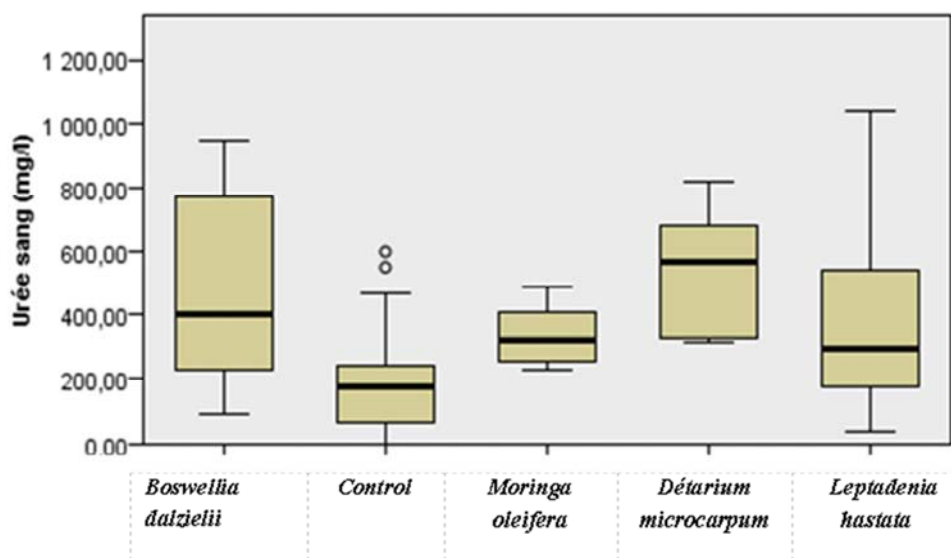

Figure 3. *Graphical representation showing the comparison of different values of the serum urea among sub-group according to the Kruskal-Wallis independent test.*

3.4. Analysis of the eGFR Among Differents Group

According to creatinine clearance of 24 hours, 15 % of consumers were in stage 3 and stage 4 of the CKD while, 7% were in those stages in non-consumers. Consumers Moringa oleifera and *Leptadenia hastata* presented better status of the

kidney function was with respectively 116 ml/min/1.73m^2 and 115 ml/min/1.73m^2 likewise, non-consumers with 102 ml/min1.73m^2. Consumers *Detarium microcarpum* (89 ml/min/1.73m^2) and *Boswellia dalzielii* (80 ml/min1.73m^2) showed average value of the eGFR in the stage 2 of the CKD.
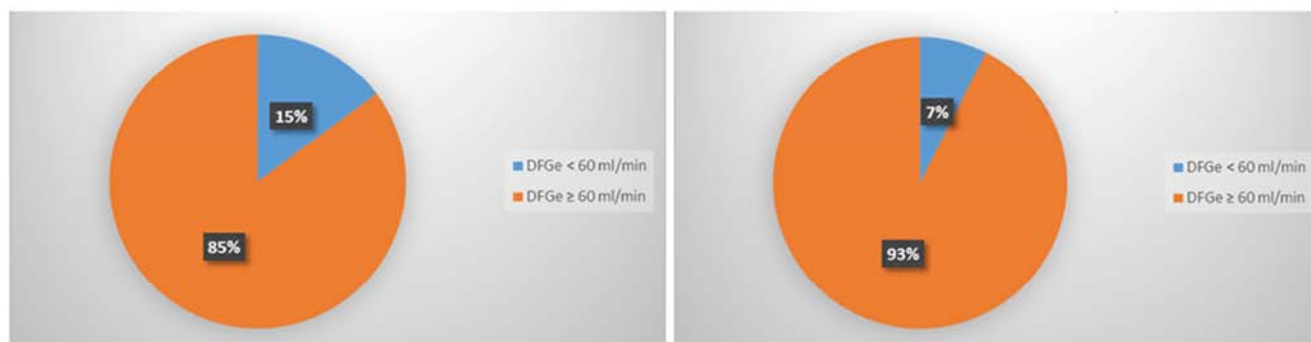

Figure 4. Graphical representation showing the eGFR distribution according to the utilization of plant.
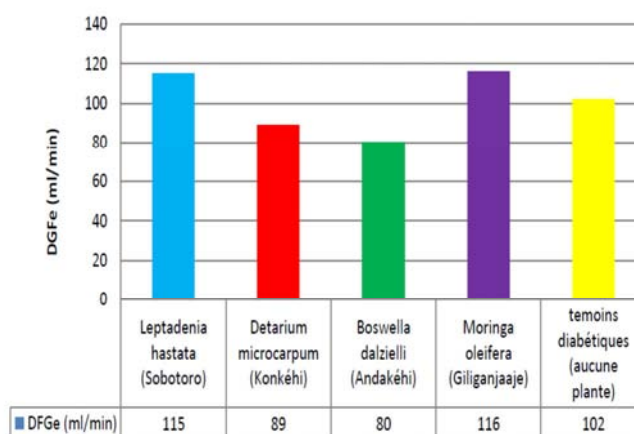

Figure 5. Graphical representation showing the comparison of the average value of the eGFR.

4. Discussion

During this study, the average age of participants was 52.1±12 years, average age approached for diabetics living in developing country (54 years) where prevalence of diabetes will double (+107%) in 2030 [16]. The proportion of women consumers of plants (56%) amid women population was more important than the proportion of men consumers of plants (40%) in men population and, it could be explained by the social habit of women to prepare plant extracts in Africa [17]. We noted high prevalence of diabetics from rural zone (13%) compared to anterior study (6%) in Cameroon [18]. More than half (65%) diabetics are illiterate and, 15% still drink alcohols [19]. Four main plants were reported in this study like anti-diabetic plants. Consumers of plants presented better value of fasting blood glucose (162.7±42 mg/dL) than non-consumers (229.5±52 mg/dL) with high statistically meaningful (pvalues <0.001). The average value of group consumers of *Moringa oleifera* (148±40) mg/dL and *Leptadenie hastate* (148.25±46 mg/dL) were better than the

two others groups with high statistically meaningful (pvalues <0.001) [20-22]. The average value of fasting blood glucose in men (196±65 mg/dL) was less than in women (199±65 mg/dL) and test for linearity had a significance value of 0.871, indicating that there is no linear relationship between blood glucose level and sex [17]. The average value of the fasting blood glucose in men (199±65 mg/dL) could be due to their sedentary habit [23]. The average value of blood urea for participants (306±22 mg/L) was in normal range (130-430 mg/L) [24]. Women presented their average value (334±27 mg/L) high than men (265±12 mg/L). This difference was closed to study done among HIV infected patients in Ghana [24]. Inversely, blood creatinine was high in men (12.1±1 mg/L) compared to women (10.1±2 mg/L) [25]. We noted 15% of consumers of plants in stage 3 and 4 of CKD while, 7% among non-consumers. This high prevalence of CKD among consumers regarding non-consumers could means that consumption of plant extract may be involved in kidney failure [12]. Therefore, consumers of *Moringa oleifera* and *Leptadéni hastata* presented average

value of the eGFR in normal range respectively 116 ml/min/1.73m^2 and 115 ml/min/1.73m^2.

5. Conclusion

Our present study in spite of its limits shows that the consumption of plant extract is benefic for the management of blood glucose. Consumers presented better value of fasting blood glucose than non-consumers. In general, consumption of plants showed high prevalence of kidney failure compared to non-consumption. *Moringa oleifera* and *Leptadenie hastate* have been reported like the best plants with high positive effects for the management of blood glucose and, low risk for kidney disease. *Detarium microcarpum* and *Boswellia dalzielii* showed low positive effect in blood glucose management and high risk for kidney diseases. Further works need to be done to improve the mechanism of *Moringa oleifera* and *Leptadenie hastate* for better management of diabetes and kidney diseases.

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