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POTENTIALS OF *Raunvolfia vomitoria* AS A MEDICINAL PLANT IN THE TREATMENT OF DIABETES MELLITUS AMONG AGROFORESTRY FARMERS IN EDO STATE

Omoghie, E.S. [1], Simpson, V.B. [2], Ojedokun, C.A. [3], Oripelaye, O.S.[2] and Adeleye, A.S.[1]

[1]*Federal College of Forest Resources Management, Fugar, Edo State, Nigeria*
[2]*Moist Forest Research Station, Forestry Research Institute of Nigeria, Benin City, Nigeria*
[3]*Forestry Research Institute of Nigeria, Jericho Hills, Ibadan, Nigeria*
***Corresponding Author:** *eomoghie@gmail.com*; +234 803 589 9833

ABSTRACT

Diabetes mellitus (DM) is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Thus, the study was carried out to evaluate the potentials of the use of Raunvolfia vomitoria in the treatment of diabetic patients. The study involved the preparation and administration of an infusion produced with the leaves of Rauvolfia vomitoria to eight volunteers who already have been diagnosed to have diabetes. Futhermore 150 respondents were also selected from where Raunvolfia vomitoria was majorly planted to know their level of awareness about Diabetes mellitus. Findings showed that the diabetic patients responded positively to the Rauvolfia vomitoria infusion, in that their blood glucose level reduced considerably. Also, results showed that 94% had the knowledge of diabetes while only 4% have not heard about diabetes. 80.67% were between the ages of 15 and 30 years while 2% were between the ages of 61 and 75 years. The study proved that people are aware of diabetes mellitus but do not check their sugar level or take that aspect of their health serious except in severe conditions.

Keywords: Diabetes mellitus, *Raunvolfia vomitoria*, awareness, treatment.

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INTRODUCTION

Diabetes mellitus (DM) is a serious, chronic disease that occurs either when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Diabetes mellitus is a metabolic disease characterized by high blood glucose level resulting from defects in insulin secretion, insulin action or both (Khan *et al*., 2009). It is a chronic disorder that affects the metabolism of carbohydrates, fats, proteins and electrolytes in the body, leading to severe complications which are classified into acute, sub-acute and chronic (Kumar and Clark, 2002).According to International Diabetes Federation (IDF) report 2004, approximately 463 million adults (20–79 years) were living with diabetes; by 2045 this may rise to 700 million. Moreover, there were an estimated 374 million people with impaired glucose tolerance and it was projected that almost 21.3 million live births to women were affected by some form of hyperglycemia in pregnancy. According to the 2004 estimates of the Diabetes Association of Nigeria (DAN), the diabetics' population in Nigeria was about 10 million (Ogbera *et al*., 2005). Patient education, diet, and lifestyle modifications greatly improve the prognosis of diabetes mellitus, these strategies help to reduce weight, improve glycemic control and reduce the risk of cardiovascular complications, which account for 70% – 80% of deaths among those with diabetes. Herbal

medicines which is a component of traditional medicine, continues to play an important role in diabetic therapy, particularly in the developing countries where most people have limited resources and do not have access to modern treatment (Ali *et al*., 2006). World health organisation had also authenticated the use of herbal remedies for the treatment of diabetes (Bailey and Day, 1989).

Traditional medicine according to the World Health Organisation "is the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness (World Health Organization, 2005). Alternative systems of medicine based on plant extracts have thrived through the ages and are still practiced by a large population for the management of diabetes. Globally, medicinal plants have been used as a source of medicine and 80–85% of populations rely on these medicinal plants using the extracts or their active components as a traditional medicine to meet their primary health care needs. Ethno-medicinal surveys indicate that more than 1,200 plants have been used in traditional medicine systems following claims of their hypoglycemic properties. Many studies confirmed the benefits of medicinal plants with hypoglycemic effects in the management of diabetes mellitus (Gbolade, 2009). The effects of these plants may delay the development of diabetic complications and correct metabolic abnormalities. During the past few years, some of the new bioactive drugs isolated from hypoglycemic plants showed anti-diabetic activity with more efficacy than oral hypoglycemic agents used in clinical therapy (Erasmus, *et al*., 1999). Several people of different age classes suffer from one form of diabetes or the other as a result of insufficiency or inefficiency of the body insulin which can either be caused naturally or by itself. Over the past thirty years in Nigeria, the prevalence of diabetes has been increasing steadily. In a hospital survey by Osuntokun *et al* 2001, in Ibadan, there was an estimated prevalence of 0.4%. In 2015, according to the World Health Organization, at least 171 million people worldwide suffer from diabetes, or 2.8% of the global population. Its incidence is increasing rapidly, and it is estimated that by 2030, this number will almost double.

Diabetes mellitus occurs throughout the world, but is more common (especially type 2) in the developed countries. The greatest increase in prevalence is, however, expected to occur in Asia and Africa, where most patients will probably be found by 2030. The increase in incidence of diabetes in developing countries follows the trend of urbanization and lifestyles changes, perhaps most importantly a "Western-style" diet (Wild, *et al*., 2004). This has suggested an environmental (dietary) effect, but there is little understanding of the mechanism(s) at present, though there is much speculation, some of it most compellingly presented. There are organized structures to arrest the scourge of Human Immunodeficiency Virus (HIV) infections and provide free treatment for patients with HIV and Tuberculosis. Whereas, there are no known such structures for non-communicable disease such as diabetes mellitus. The average monthly cost of treatment for a person with diabetes without complication is about thirty thousand naira (₦30,000) (WHO, 2005). In this regard, there is a need to investigate the potency of traditional medicinal plants which could be used in the treatment of diabetes. The objectives of this study to extract and test the potentials of isolated anti-diabetic ingredient present in *Rauvolfia vomitoria*.

MATERIALS AND METHODS

Study Area

This study was carried out in Sakpoba Forest Reserve Area in Orhionmwon Local Government Area (LGA) of Edo State. It is located in Orhionmwon LGA about 30 kilometers South-East of Benin City. The people of the area are farmers and traders. Crops grown in the area include: yam, cassava, maize, plantain, and cocoyam planted with some tress like *Tectona grandis* (teak), *Gmelina arborea*, *Terminalia ivorenisis*, *Khaya ivorensis* and so on.

Experimental design

The primary data were obtained using well-structured questionnaire. A total of 10 villages where *Raunvolfia vomitoria Afzel* is being

planted were purposively selected from the study area, after which 15 farmers were randomly selected from each of the 10 villages to give a total of 150 respondents.

Based on these objective highlighted, leaves of *Rauvolfia vomitoria* were collected from Sakponba Forest Reserve area in Edo State. The freshly collected leaves were first rinsed to remove dirt and air-dried. Leaves were dried by spreading them on a clean sheet in an open and well aerated space for about ten days; these leaves were sun-dried to make crushing and grinding easier. Dried leaves are crushed immediately and grinded into fine powder with the aid of a grinding machine and the powder stored in a covered container. The tea was administered to eight volunteers, who have already been diagnosed to have diabetes by putting the required dosage (one teaspoon full) in a teacup containing hot water, and left for about two to three minutes, then stirred at intervals about two to three times. The tea was taken by the volunteers twice daily (in the morning after breakfast and at night after dinner). The resultant effects were monitored through an administered questionnaire and data collected were analyzed using the descriptive analysis.

RESULTS

Results from table 1 revealed that 54.7% were females while 45.3% were male; 80.7% fell between the ages of 15 – 30 years while 2% were between the ages of 61 to 75 years. Also, 27.3% had a robust body while 48% were slim.

Table 1: Socio-economic characteristics of respondents

	Frequency	Percentage (%)
Sex		
Male	68	45.3
Female	82	54.7
Age		
15 – 30	121	80.7
31 – 45	14	9.3
46 – 60	12	8.0
61 – 75	3	2.0
Body-size		
Macho	7	4.7
Obese	2	1.3
Athletic	28	18.7
Robust	41	27.3
Slim	72	48.0

The Results in Table 2 shows the reduction trend in the blood sugar level of volunteers that used *Rauvolfia vomitoria* infusion. The results revealed that volunteer B had the highest initial blood sugar level 184 mg/dl which reduces to 98 mg/dl after 4 weeks of using *Rauvolfia vomitoria* infusion, while volunteer H had the lowest initial sugar level 139 mg/dl which also reduces to 93 mg/dl.

Results from table 3 indicated that 72.7% of the respondents mostly consumed carbohydrate class of food, while only 6% consumed protein and 21.3% consume both carbohydrates and protein. Result from table 4 revealed that 51% of the respondents consume starchy foods twice per day while 11.3% consumed starchy foods three times a day. Results from table 5 shows that 70% of the respondents did not consume beer (alcohol), while 30% consumed beer (alcohol). Also 86.7% of those that consumed beer (alcohol) took between 2 – 4 bottles daily and 13.3% took more than 4 bottles a day. Table 6 results showed that ninety-four percent had the knowledge of diabetes while only 4% have not heard about diabetes.

Table 2: Reduction trend in the blood sugar level of volunteers that used *Rauvolfia vomitoria* infusion

Volunteer	Gender	Initial (mg/dl)	Weeks of treatment			
			1 (mg/dl)	2 (mg/dl)	3 (mg/dl)	4 (mg/dl)
A	Male	162	158	143	127	102
B	Male	184	172	159	121	98
C	Male	152	150	139	130	113
D	Female	168	161	151	134	111
E	Male	142	137	128	105	89
F	Female	173	169	154	128	104
G	Male	159	154	143	122	100
H	Female	139	137	131	109	93

Table 3: Classes of food consumed by respondents

Class of food	Frequency	Percentage (%)
Protein	9	6.0
Carbohydrate	109	72.7
Both	32	21.3
Total	**150**	**100**

Table 4: Respondents' pattern of starchy foods consumption per day

Rate	Frequency	Percentage (%)
Once	55	36.7
Twice	78	51.0
Thrice	17	11.3
Total	**150**	**100**

Table 5: Consumption of alcohol by Respondents

Response	Frequency	Percentage (%)
Yes	45	30
No	105	70
Total	**150**	**100**
Consumption pattern for those that drink beer (alcohol)		
2 – 4 bottles	39	86.7
More than 4 bottles	6	13.3
Total	**45**	**100**

Table 6: Respondents' awareness knowledge of diabetes

Knowledge	Frequency	Percentage (%)
Yes	144	96
No	6	4
Total	**150**	**100**

Results from Table 7 revealed that television/radio was the source of awareness for 27.8% of the respondents, 19.5% of the respondents heard from family and friends and 13.2% from the hospital. Also 14.6% of the respondents got the awareness of diabetes from the combination of the 2 of the sources listed and 2.8% from the combination of 4.

Result obtained from table 8 revealed that 61.3% never went for checkup while 38.7% always went for checkup. 75.9% of the respondents that always go for checkup were last checked more

than 5 years ago and 24.1% were check 5 years ago. Result of the respondent that have been checked before showed that only 3.4% were susceptible while 96.6% were negative.

Table 7: Respondents sources of awareness of diabetes

Source(s)	Frequency	Percentage (%)
Family and friends	28	19.5
Hospital	19	13.2
Television/Radio	40	27.8
Literature	17	11.8
Seminar/Conference	3	2.1
Combination of 2	21	14.6
Combination of 3	12	8.3
Combination of 4	4	2.8
Total	**150**	**100**

Table 8: Respondents response to whether they have been checked for diabetes before

Checked	Frequency	Percentage (%)
Yes	58	38.7
No	92	61.3
Total	**150**	**100**
Time frame for those who have been checked before		
5 years ago,	14	24.1
Above 5 years	44	75.9
Total	**58**	**100**
Results for those that have been checked before		
Susceptible	2	3.4
Negative	56	96.6
Total	**58**	**100**

DISCUSSION

Respondents in the study area responded that taking of *Rauvolfia vomitoria* infusion, had reduced their blood glucose level considerably. There was an exceptional reduction with volunteer B whose glucose level read 184 mg/dl initially and reduced after 4 weeks to 98 mg/dl which fell within the normal range for any healthy human. Unlike volunteer C and D volunteers who though responded positively too but still had their blood sugar levels outside the range of normalcy, which is between 80-100 mg/dl. The study shows that female respondents were more than the males; and majority of the respondents were between the ages of 15 – 30 years. Furthermore, the study revealed that 30% of the sampled population consumed beer; this can be ascertained to be as a result of gender distribution. In addition, majority of the respondents had the knowledge of diabetes while only 4% have not heard about diabetes. This shows that the awareness level of diabetes is high in the study area. It could be deduced that majority of the respondents never went for checkup and most of those that went for checkup do not do that regularly. This supports the ascertain by Wagner, (2005) that people between ages twenty to eighty years have their blood glucose level checkup at most once in their lives.

CONCLUSION

In conclusion, this study involved the preparation and administration of infusion produced with the leaves of *Rauvolfia vomitoria* to eight volunteers who already have been checked and diagnosed to have diabetes, that is, their blood sugar level was higher than normal. Findings from the study show that majority (72.9%) of the respondents

consumed more of carbohydrate class of food twice or even or three times a day. Also, about 30% of the respondents consume at least 2 – 4 bottles of bear daily. It was observed that 94% of the respondents are aware of diabetes through family & friends, Hospital, Media e.t.c., however only about 38.7% of the respondents have went for check-up, out of which 75.9% have not been checked in the last 5 years. From the study, respondents who were administered *Rauvolfia vomitoria* infusion responded positively to it, thus taking *Rauvolfia vomitoria* infusion significantly reduced blood sugar level.

Recommendations

Based on the results from this study, the following recommendations were made:

i. There is a need to educate and sensitize the people on the damages that diabetes causes to the human body system, so as to encourage a healthy style of living.
ii. The people should be encouraged to check their blood sugar level regularly.
iii. Infrastructures should also be put in place for easy access to treatment of diabetes such infrastructures could include free blood sugar level check-ups, subsidy on blood sugar meters etc.
iv. Also, education of the general populace about conservation strategies is important for effective approach to sustainable utilization of medicinal plants.

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