Original article

Antidiabetic fallacy of Vernonia amygdalina (bitter leaves) in human diabetes

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Abstract

Objective: Aim of present study is to scientifically, verify the antidiabetic activity/potency of Vernonia amygdalina in human diabetes. **Methods**: A search was made at Nnewi, South – East Nigeria for known diabetes who use Vernonia amygdalina either as their sole or supplementary antidiabetic. A total of ten volunteers comprising, eight females and two males were recruited. They were all of age range of 36-50 and average weight of 78 kg and suffering from non – insulin form of diabetes. The purpose of the study was explained to them and their consent obtained. They were asked not to take any other antidiabetic outside Vernonia amygdalina throughout the four weeks study period. There was however, no form of restrictions to their choice of diet or life style. They were requested to abstain from any drugs a week prior to commencement of study. Their prescriber's dosage range was followed and minimum daily dose of 210 mL (approximately 220 mg of dry extract) was administered in Week-1, followed by daily dose of 420 mL (440 mg) in Week-2. In Week-3 they received 630 mL (660 mg) daily dose and in Week-4, they received daily dose of 840 mL (880 mg). Their fasting blood sugar were estimated pre-crude drug administration and on weekly basis for the four week study period. Their weekly weights were measured to check for possible weight gain or loss. Results were subjected to statistical analysis and Students *T*-Test was used to calculate *P*-value. *P*-value $\leqslant 0.05$ were considered significant. **Results**: It was observed that all the volunteers in the study group were taking Vernonia amygdalina only as supplementary. Two volunteers dropped out of the study at the end of Week-3 leaving us with 8 in Week-4. There was no significant bodyweight change within the four week study. The starting mean fasting blood sugar which was 133.3 mg/dL(7.41 mmol/L) rose to 136.6 mg/dL(7.59 mmol/L) in Week-1, to 149.5 mg/dL(8.31 mmol/L) in Week-2 and to 166.5 mg/dL(9.30 mmol/L) in Week-3. Week-4 had us left with 8 volunteers with a mean of 190.6 mg/dL(10.59 mmol/L). There was significant differences in increase in sugar levels between the pre-crude extract administration and treatment period with Vernonia amygdalina ($P \leqslant 0.05$ for Week-1, $P \leqslant 0.02$ for Week-2, $P \leqslant 0.01$ for Week-3 and $P \leqslant 0.001$ for Week-4). **Conclusion**: Claims of antidiabetic efficacy of Vernonia amygdalina in human diabetes are scientifically non verifiable based on our work hence these claims are false. We also feel bold to state that we could not demonstrate any antidiabetic activity of Vernonia amygdalina in human subjects. We recommend that NAFDAC and all relevant agencies must sit up and control all forms advertorial on Medicinal plants until such are well studied and proven.

Keywords: Medicinal plants; Antidiabetic fallacy; Vernonia amygdalina; Bitter leaves; Fasting blood sugar

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INTRODUCTION

Medicinal plants are well documented in literature to

possess varying pharmacological activities that have proven good therapeutic value like their orthodox drugs counterpart. But, unlike their orthodox drugs counterpart, medicinal plants exhibit much less or no unwanted side/adverse effects hence their over prescription and usage round the globe[1-3].

Some medicinal plants' efficacy and therapeutic potency are not only over exaggerated, some of them are indeed toxic and human beings oblivious of these limitations, use the plants for their presumed-intended purpose. For example, over 80% of the population of Yemen chew the leaves of 'Khat' plant for social and medicinal activities. But in a recent work by WHO, this plant has been shown to posses some degree of europhoric and neurotoxic activities[4].

New drugs development is highly essential for effective Health Care Delivery and sometimes the long bureaucratic procedure along with ethical consideration make drugs research a daunting task. These considerations notwithstanding, the position of clinical phase trial before a drug is introduced to the public is imperative. Certain drugs, like Indometacin that is lethal to some animals-Rats/Mice is of good therapeutic use to man, while certain plants that have demonstrated good activity in experimental animals, do not either show those effects in man or are relatively too toxic[5].

The ultimate demonstration of therapeutic effects of any plant can only therefore, be obtained after undertaking properly designed clinical trials in man where the plants final efficacy and potency is got[5]. This standard position of research is however different in the case of Vernonia amygdalina.

Vernonia amygdalina leaves and fresh stems are edible-bitter green vegetable mostly in the Eastern part of Nigeria. The crude chloroform extract of the leaves of Vernonia amygdalina has though been shown to possess hypoglycaemic activity in both normoglycaemic and in alloxan-induced hyperglycaemic conditions in Rats[6], no work has been reported on its activity in human. Human antidiabetic efficacy/potency of Vernonia amygdalina however, has been claimed over the media and through grapevine. This non regulated over advertorial has prompt the usage of Vernonia amygdalina as an antidiabetic to so many diabetics, especially, in Eastern Nigeria.

MATERIAL AND METHODS

Fresh leaves of Vernonia amygdalina were harvested daily from the plant.

Glucose Oxidase reagent from Randox Chemical Company was purchased from reagent shop at Onitsha, Anambra State. Nigeria.

Other Materials used include Weighing Machine, Drinking glasses, Fluoride blood bottles, Spectrophotometer and Rotary evaporator.

Plant's extraction

Medicinal plants that are for studies in human should be administered in man in the same manner with their prescribers or herbalist as the active components of these plants may be lost to fractionation and extraction procedures[5]. In our present study, the fresh leaves were macerated to produce viscous-greenish liquid extract. Enough fresh leaves were used to produce the required liquid dosage in line with their prescribers' directive. This method could not however be reported for pharmacological work hence our further solid-residue-extraction. This was done by the use of the Rotary evaporator[2,7]. The solid-residue extracts were however, not administered to the volunteers but, purely for extrapolation of the dosages in mg/kg and not number of glasses per day. The amount of extracted fluid per glass was measured in mL and the solid-residue was weighed. Drinking glasses of the same capacity were used for all volunteers.

Antidiabetic study in human diabetes

A search was carried out at Nnewi, South-East Nigeria for known diabetic who use Vernonia amygdalina either as their sole or supplementary antidiabetic. A total of ten volunteers comprising, eight females and two males were recruited.

They were all of age range of 36-50 years and average weight of 78 kg and mainly suffering from non-insulin dependent form of diabetes.

The purpose of the study was explained to them and their consent obtained. They were asked not to take any other antidiabetic outside Vernonia amygdalina throughout the four weeks study period.

There was however, no form of restrictions to their choice of diet or life style.

Their prescriber's dosage range (1-4 glsses per day) was followed and minimum daily dose of 210 mL (approximately 220 mg of dry extract) was administered in Week-1, followed by daily dose of 420 mL (440 mg) in Week-2. In Week-3 they received 630 mL (660 mg) daily dose and in Week-4, they received daily dose of 840 mL (880 mg).

Their fasting blood sugar were estimated pre-crude drug administration and on weekly basis for the four

weeks study period using glucose oxidase method[8].

Their weekly weights were measured to check for possible weight gain or loss.

Results data were subjected to statistical analysis using SPSS-13.0 and *P*-value ≤0.05 were considered significant.

RESULTS

A glass contained 210 mL of macerated extract which was equivalent to 220 mg solid extract yield.

It was observed that all the volunteers in the study group were taking Vernonia amygdalina only as supplementary. Glibenclamide (Sulfonylureas) and Metformin (Biguanides) were commonly combined along with daily drinking of the macerated extract of Vernonia amygdalina. None used only the plant extract.

Two volunteers dropped out of the study at the end of Week-3 leaving us with 8 in Week-4. Their blood sugars though had risen but, were not dangerously high. They withdrew on their own accord on the ground that they were becoming uncomfortable with the rise in their sugar levels and were not really willing to carry on any further.

There was no significant bodyweight change within the four week study period.

The starting mean fasting blood sugar which was 127.3 mg/dL rose to 136.6 mg/dL in Week-1, to 149.5 mg/dL in Week-2 and to 166.5 mg/dL(9.30 mmol/L) in Week-3. Week-4 had us left with 8 volunteers with a mean of 190.6 mg/dL (Table 1).

There was significant different increases in sugar levels between the pre-crude extract administration and treatment period with Vernonia amygdalina ($P \leq 0.001$ for Week-1, $P \leq 0.001$ for Week-2, $P \leq 0.001$ for Week-3 and $P \leq 0.001$ for Week-4) (Table 2).

Table 1 Showing weekly dosage of vernonia amygdalina, fasting blood sugar and body weight (mg/dL).

SN	W/kg	Sex	Basal FBG	Wk1(220 mg) Dose-FBG	Wk2(440 mg) Dose-FBG	Wk3(660 mg) Dose-FBG	Wk4(880 mg) Dose-FBG	Mean 4Wk Sugar
1	79	F	130.0	140.0	146.0	158.8	200.2	161.2
2	80	M	100.0	120.0	135.0	155.0	190.0	150.0
3	78	F	120.0	125.0	160.0	185.0	DRP	156.6
4	74	F	134.0	138.0	145.6	160.2	182.6	156.6
5	77	F	110.0	120.0	128.0	150.0	170.0	142.0
6	78	F	105.0	115.0	120.0	145.0	DRP	126.6
7	74	F	144.0	150.0	170.0	178.0	190.0	172.0
8	84	M	150.0	160.0	180.0	190.0	199.9	182.4
9	78	F	160.0	170.0	175.0	195.0	210.0	187.5
10	78	F	120.0	128.0	145.6	148.4	182.6	148.6

Table 2 Showing statistical analysis of mean weekly blood sugars levels (mg/dL).

Treatment	Basal mean Sugar ± SD	Mean 4-Week Sugar ± SD	Mean 4-Week Sugar ± SEM	*P*-value
Wk 1	127.3 ± 19.9	136.6 ± 18.5	136.6 ± 5.85	0.001
Wk 2	127.3 ± 19.9	149.5 ± 20.7	149.5 ± 6.56	0.001
Wk 3	127.3 ± 19.9	166.5 ± 18.6	166.5 ± 5.89	0.001
Wk 4	127.3 ± 19.9	190.6 ± 12.5	190.6 ± 4.44	0.001

DISCUSSION

Our results demonstrated that Vernonia amygdalina does not possess any significant antidiabetic activity in human beings. It is possible that it may have a synergistic effect along with standard oral antidiabetic. Our target aim was however to establish its antidiabetic potency/efficacy as a single drug. As stated earlier, introducing a drug to the market only based on animal study or basically on presumptive ideas is not in the least charitable. The one week break in therapy prior to commencement of crude drug administration could

possibly have allowed their actual or close to actual sugar levels to return while the effect of earlier on administered drug abated. The continuous rise in sugar levels for all volunteers and throughout the four week study period is equally a clearer manifestation of the so-called antidiabetic effect of Vernonia amygdalina. Drug evaluation also involves chronic toxicity study to obtain its toxicity at therapeutic dosages. Paracetamol, an analgesic/antipyretic drug causes liver cirrhosis on prolonged administration even at its therapeutic dosage and worse of with acetaminophen which induces liver damage by activation and covalent binding of cytokines[9].

Acetaminophen has also been shown to block antioxidant activity of glutathione thus enhancing the cyto-damaging effect of super-oxides and other oxidants[10].

These finding were only possible through drug research which enables us to know the merits and demerits of a particular drug.

Diabetes, as we all know is a chronic ailment thus, requiring prolonged therapy. Certain medicinal plants have been shown to be neurotoxic[4]. Aristolochic acids are naturally occurring in many medicinal plants and are nephrotoxic and carcinogenic in Rodents[11].

Nitrophpenanthrene compounds that are commonly found in herbal/medicinal plants have been shown to be carcinogenic to man[12]. Today, there are several cases of infertility without known causes, poor sight/outright blindness, neoplasia just as well as serious microbial resistance to so many drugs[13]. It may not indeed be an over statement to deduce these unexplained difficult health situations to uncontrolled use of medicinal plants.

A medicinal plant should therefore not only possess a well proven pharmacological activity, it should not be toxic. It is not at all in the overall interest of the patient to use drugs or medicinal extract or whole plants that are yet to be completely evaluated and approved by the appropriate agency.

Claims of antidiabetic efficacy of Vernonia amygdalina in human diabetes are scientifically non verifiable based on our present work hence these claims are false. We also feel bold to state that we could not demonstrate any antidiabetic activity of Vernonia amygdalina in human subjects.

We recommend that NAFDAC and all relevant agencies must sit up and control all forms of advertorial on Medicinal plants until such are well studied and proven to possess a supposed activity in man and also with no devastating adverse unwanted effects.

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