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Traditional application of Èfó Wòròwó (*Solanecio biafrae*) to reduce weight and fats in pre-obesity

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ABSTRACT

Background & Aim: Èfó Wòròwó (*Solanecio biafrae*) an important vegetable in Nigeria has many health benefits non-scientific claims in herbal practice. This work was designed to evaluate the traditional application of Èfó Wòròwó (*Solanecio biafrae*) to reduce weight and fats in pre-obesity.
Experimental:31 pre-obese individuals (35-70 years; females – 20; Males - 11) with BMI of 27 ± 4.0 kg/m^2 who were not on any fat or weight reduction medication and 45 age-matched non-obese volunteers with BMI of 19 ± 2.0 kg/m^2 were investigated as control test and control subjects respectively. Plasma cholesterol and triglycerides were measured by spectrophotometry method while BMI was determined by standard method.
Results: There was a significantly lower BMI, plasma Total cholesterol and triglycerides in pre-obese subjects after treatment than before treatment ($p<0.05$). There was a significantly higher total cholesterol, BMI and plasma total triglycerides in pre-obese subjects before treatment than the results obtained in the control subjects ($p<0.05$). However, there was no significant difference in plasma total cholesterol, BMI and plasma total triglycerides in pre-obese subjects after treatment compared with the results obtained in the control subjects ($p>0.05$).
Recommended applications/industries: This work confirms the traditional health benefit claim of Èfó Wòròwó (*Solaneciobiafrae*) at reducing plasma total cholesterol, BMI and plasma total triglycerides in pre-obese subjects.

1. Introduction

Pre-obesity/ overweight is characterized by excess body fat and a body mass index (BMI) of between 25 and 30 kg/m^2 (Gray and Fujioka, 1991; WHO, 2003; WHO, 2009; Ng *et al.*, 2014). Overweight and obesity may lead to diabetes, heart disease, and cancers. It may also cause health problems in foetus during pregnancy (Gray and Fujioka, 1991; WHO, 2003, 2009; Ng *et al.*, 2014).

The body mass index (BMI) is determined as a person's weight (mass) in kilograms divided by the square of the person's height in meters and the units is kg/m^2 (Gray and Fujioka, 1991; WHO, 2003; WHO, 2009; Ng *et al.*, 2014).

Human body needs a minimum amount of fat for normal physiological functions involving hormones, reproduction, and immune systems, thermal insulation, shock absorption, and as a source of energy. The accumulation of too much storage fat can impair

movement, flexibility, and change the body appearance(Gray and Fujioka, 1991; WHO, 2003, 2009; Ng *et al.*, 2014). Risk of oligospermia and azoospermia is associated with pre-obese men (Flegal *et al.*, 2002; Peeters *et al.*, 2003; Sermondade *et al.*, 2012).

Causes of pre-obesity include intake of more calories (by eating) than are expended by the body, alcoholism, eating disorders, genetic predisposition, hormonal imbalances (e.g. hypothyroidism), insufficient or poor-quality sleep, limited physical exercise and a sedentary lifestyle, poor nutrition, metabolic disorders, which could be caused by repeated, attempts to lose weight by weight cycling, overeating, psychotropic medication (e.g. olanzapine), smoking cessation and other stimulant withdrawal and stress(Flegal *et al.*, 2002; Peeters *et al*.,2003; Sermondade *et al.*, 2012). The most common treatments of pre-obesity is through diet and physical exercise (Flegal *et al.*, 2002; Peeters *et al.*, 2003; Sermondade *et al*.,2012).

Excess cholesterol and triglycerides in human body are associated with weight gain. Cholesterol is an essential requirement by the body (John *et al.*, 2007; Lecerf and Lorgeril, 2011). Cholesterol is ingested as esterified cholesterol in addition to endogenous synthesis. Liver synthesizes and excretes cholesterol in non-esterified form (via bile) into the digestive tract. Plants produce phytosterols (which is chemically similar to cholesterol), that it can compete with cholesterol for intestinal absorption thereby reducing cholesterol absorption (John *et al.*, 2007; Lecerf and Lorgeril, 2011).The dietary sources of cholesterol include cheese, egg yolks, beef, pork, poultry, fish, shrimp and breast milk. Cholesterol is not found in plant meals because plant cells do not manufacture cholesterol (Jensen *et al.*, 1978 ; William, 2003)

The major constituents of human body fats are triglycerides, including vegetable fat. High blood level of triglycerides (hypertriglyceridemia) can be treated change in lifestyle, weight loss, moderate exercise and dietary modification (Nelson and Cox, 2000; Gill *et al.*, 2002; Crawford, 2009). High levels of triglycerides in human body and blood can cause atherosclerosis which may bring about the risk of heart disease and stroke (Drummond and Brefere, 2014)

Solanecio biafrae (Èfó Wòròwó) contains phytochemicals and phytonutrients such as, potassium, iron, flavonoids, phenolics, ascorbic acid, vitamin A, folic acid, niacin, thiamine, riboflavin, vitamins E, C, K, and B, crude protein, linoleic, linolenic, and arachidonic acids, threonine, valine, isoleucine, leucne, tyrosine, phenylalanine, tryptophan and histidine, crude fiber, sodium, iron, potassium, phosphorous, aluminum, calcium, zinc, selenium, magnesium, cobalt. and terpenoids, mainly sesquiterpene D (Burkill , 1985; Stevels, 1990; Adebooye, 1996; Adebooye, 2000; Schippers, 2000; Adebooye, 2001; Ajiboye *et al.*, 2013). There is no scientific claims in the treatment of cough, rheumatic pains, heart troubles, wound, insect stings and to stop bleeding from cuts (Adebooye,1996; Adebooye, 2000; Schippers,2000; Adebooye,2001; Ajiboye *et al.*, 2013)

This work was designed to evaluate the traditional application of Èfó Wòròwó (*Solanecio biafrae*) to reduce weight and fats in pre-obese subjects.

2. Materials and Methods

2.1. Study area

The study area was Saki-West local government in Nigeria. It has its headquarters in Saki located at the Northern part of Oyo state. It shares border with Burkina Faso, Kwara State, Saki-East and ATISBO local government areas in Nigeria. There are 17 herbal homes. The major businesses in this area are Farming and Trading. There are 3 major hospitals and 5 tertiary educational institutions.

2.2. Study population

This includes 31 pre-obese individuals (35 - 70 years; females – 20; Males - 11) with BMI of 27 ± 4.0 kg/m^2 who were not on any weight reduction medication and volunteered to be treated by 9 herbal homes and agreed to be investigated. Forty five age-matched non-obese volunteers with BMI of 19 ± 2.0 kg/m^2 were investigated as control subjects.

2.3. Preparation and Administration of raw liquid extract of Èfó Wòròwó (Solanecio biafrae)

Fresh Èfó Wòròwó (*Solanecio biafrae*) was plucked on daily basis. The leaves were confirmed by the Department of Agricultural Technology, The Oke-Ogun Polytechnic, Saki – Oyo state. The vegetable was squeezed for the extraction of the liquid content. 100 milliliters of the undiluted liquid extract was administered per oral to each of the pre-obese volunteers on daily basis for 14 days under the supervision of the Researchers.

2.4. Biological sample

Five milliliters of venous blood was obtained from each of the subjects into lithium heparinized bottle for the evaluation of total cholesterol and triglycerides.

2.5. Measurement of Body Mass Index (BMI)

This was carried out at Baptist Medical Centre, Saki–Nigeria by the help of physicians and nurses. The weight and the height were measured using standard techniques to evaluate BMI.

2.6. Plasma cholesterol estimated using RANDOX kit

The cholesterol is determined after enzymatic hydrolysis and oxidation. The indicator quinoneimine is formed from hydrogen peroxide and 4-aminoantipyrine in the presence of phenol and peroxidase.

2.7. Plasma triglycerides estimated using RANDOX kit

The triglycerides are determined after enzymatic hydrolysis with lipases. The indicator is a quinoneimine formed from hydrogen-peroxide, 4-aminophenazone and 4-chlorophenol under the catalytic influence of peroxidase.

3. Results and discussion

There was a significantly lower BMI, plasma total cholesterol and triglycerides in pre-obese subjects after treatment than before treatment ($p<0.05$) (Table 1, 2).

Table 1. Mean and standard deviation of BMI (kg/m^2), Plasma Total Cholesterol (mg/dL), and Total Triglycerides (mg/dL) obtained in pre-obese and control subjects.

Indices of pre-obesity	**Subject groups**		
	Pre-obese subjects before treatment *(n=31)*	Pre-obese subjects after treatment *(n -=31)*	Non pre-obese subjects control *(n =45)*
BMI (Kg/m^2)	30 ± 2.0	19 ± 2.0	18 ± 2.0
Plasma total cholesterol (mg/dL)	277 ± 5.0	163 ± 3.0	159 ± 4.0
Plasma total triglycerides (mg/dL)	172 ± 5.0	96 ± 3.0	90 ± 5.0

This can be linked with the report of (Ajiboye, 2013) that *Solanecio biafrae* (Èfó Wòròwó) contains dietary fiber of about 15.78%±0.13. Dietary fiber or roughage is a part of plant-derived food which cannot be completely digested by digestive enzymes. Dietary fibers have metabolic activities on fat ingestion, digestion, absorption and excretion. They act by changing the nature of the contents of the gastrointestinal tract which has a significant effect on how other nutrients are absorbed (Brown *et al.*, 1999). They cause enteric loss of bile acids which leads to increased production of bile acids from cholesterol which in turn reduces body cholesterol (Brown *et al*., 1999). Short-chain fatty acids are produced upon the fermentation of fermentable fiber is fermented which can suppress cholesterol production by the liver and reduce blood levels of LDL cholesterol and triglycerides. In addition the dietary fatty acids in the vegetable can also suppress cholesterol production by the liver and reduce blood triglycerides (Brown *et al*., 1999).

There was a significantly higher total cholesterol, BMI and plasma total triglycerides in pre-obese subjects before treatment than the results obtained in the control subjects ($p<0.05$)(Table 1, 2). However, there was no significant difference in plasma total cholesterol, BMI and plasma total triglycerides in pre-obese subjects after treatment compared with the results obtained in the control subjects ($p>0.05$)(Table 1,2). These findings could be attributed to the fact that overweight is associated with excess body fats like cholesterol and triglycerides including high body mass index (BMI)(Gray and Fujioka,1991; WHO, 2003, 2009; Ng *et al.*, 2014).

There are two sources of cholesterol in the upper intestine: dietary (from food) and biliary (from bile). Dietary cholesterol, in the form of lipid emulsions, combines with bile salts, to form bile salt micelles from which cholesterol can then be absorbed by the intestinal enterocyte (Brown *et al.*, 1999). Phytosterols which are constituents of leafy vegetables have cholesterol lowering activities by disrupting the intestinal absorption of cholesterol (Tilvis, 1986; Jones, 2007). These facts could account for the significant reduction in BMI, plasma total cholesterol and triglycerides in pre-obese subjects after treatment; however, there was no significant difference in plasma total cholesterol, BMI and plasma total triglycerides in pre-obese subjects after treatment compared with the results obtained in the control subjects.

Table 2. Comparative analysis of mean and standard deviation of BMI (kg/m^2), Plasma total cholesterol (mg/dL) and Total triglycerides (mg/dL) obtained in pre-obese and control subjects.

		Pre-obese subjects before treatment (n=31) vs. pre-obese subjects after treatment (n-=31)	Pre-obese subjects before treatment (n=31) vs. non-pre-obese subjects control (n =45)	Pre-obese subjects after treatment (n=31) vs. non pre-obese subjects control (n =45)
BMI (Kg/m^2)	*'t' value*	3.27965	4.24264	0.35355.
	'p' value	0.041*	0.03*	0.4
Plasma total cholesterol(mg/dL)	*'t' value*	19.55084.	18.4285	0.85749.
	'p' value	0.001*	0.001	0.24
Plasma total triglycerides (mg/dL)	*'t' value*	11.47848.	10.62706.	1.02899.
	'p' value	0.004*	0.004*	0.205826

This further confirms the potentials of Èfó Wòròwó (*Solanecio biafrae*) at reducing plasma total cholesterol, BMI and plasma total triglycerides in pre-obese subjects.

4. Conclusion

This work confirms the traditional health benefit claim of Èfó Wòròwó (*Solanecio biafrae*) at reducing plasma total cholesterol, BMI and plasma total triglycerides in pre-obese subjects.

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