

EFFECT OF SOME NIGERIAN SNUFF BRANDS ON FASTING BLOOD GLUCOSE LEVEL AND LIPID PROFILE OF WISTER ALBINO RATS



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ABSTRACT

Snuff has been recommended as nicotine substitute of cigarette because it is devoid of tar and carbon dioxide. This study was carried out to determine the effect of snuff on blood glucose level and lipid profile of Wister albino rats. Three hundred snuff users were interviewed using a questionnaire to get hint on the consumption rate, dosage and therapeutic claims of addicts.

Fifty four Wister albino rats (110-120g) were randomly divided into five (5) groups. Group 1 was the control; received only distilled water. Group 2A and 2B (received 6mg and 3mg/kg b.w.t of TBC respectively), group 2A and 2B; received 6mg and 3mg/kg b.w.t of SMS), group 4A and 4B; received 6mg and 3mg/kg b.w.t of HAMP and group 5A and 5B; received 6mg and 3mg of AK47respectively. The established methods using kits were employed to assay for glucose level, total cholesterol, LDL, HDL, TG. The survey revealed that although some of the therapeutic claims were real, most users persist in snuffing merely due to addiction. Fasting glucose and total cholesterol level decreased while TG increased significantly in all the groups compared to the control. However, HDL and LDL did not show any significant change compared to the control. Although it is quite clear that persistent snuffling is merely addiction, all the snuff brands used in this research, decreased blood sugar and increased circulating triglyceride by stimulating lipolysis. This suggests that people on hypoglycaemic most avoid sniffing.

Key words: Snuff, glucose level, lipid profile and lipolysis

INTRODUCTION

Snuff is any product made from ground or pulverized tobacco leaves intended to be placed in the oral or nasal cavity(Phililps and Katillus, 2019). This distributes rapid nicotine sensation and long-lasting aroma and essence. Snuff could be moist, mostly placed between lips and gum, or dried ground tobacco product that is sniffed through the nose. Example of these snuff include: "Naswar" a dipping smokeless tobacco product commonly used in Pakistan, Afghanistan, Iran and South Africa (Phililps and Katillus, 2019). Snuff became widespread in England during the seventeenth century, but powdered tobacco is recognized to have been used by indigenous populations of Brazil before the arrival of the Spaniards (Khan et al., 2017). In the western world, Snuff reemerged as substitutes for tobacco and became generally acceptable among younger generations; after the ban on smoking, in many public places (MCKENNA, 2020). The traditional snuff production involves the selection of varieties of tobacco leaves, sun-dried, and then subjected to fermentation process which gives it the characteristic scent, then converted to powder known as snuff blend and mixed with calcium oxide and wood ash (MCKENNA, 2020). However, most often varieties of spice, piquant, fruit, flora and menthol are added to the pure or blend snuff (Kindvall et al., 2019). Each snuff manufacturer usually, has unique recipes and blends for different individuals or customers. Common flavoring agents include: coffee, chocolates, honey, Vanilla, alligator pepper, cherry, orange, apricot, plum, camphor, potash, clove, black pepper cinnamon, as cardamom rose and spearmint (Kindvall et al., 2019). The types of snuff include dry, wet, dipping tobacco, chewing tobacco, and creaming snuff (Muhammad-Kah et al., 2019).

Another form of snuff made from moringa is now widely accepted and sold in Nigeria. It is affectionately consumed by car drivers, motorcycle ("Okada") riders, menial laborers and even some members of the elite. They are sold under the brand name : AK-47 boss, Hajiyah Aisha man power, Sweet mother, Normal tobacco, lion brand, Hajiyah Bilkisu, Hajiyah Fatima, Special moringa sundu, Hajiyah Bilkisu Ma'a shaa Allah, Shehu Barhama, and Hajiyah Hauwa.

Although the modern snuff is a mixture of chiefly *Moringa oleifera* leaves, it is not devoid of tobacco just like the traditional tobacco. Recent studies suggested that long use of smokeless tobacco could predisposes to free radical generation and oxidative stress (Constance *et al.*, 2019).The association between tobacco use and insulin resistance / diabetes has been reported. A systematic review of studies published from Jan 1, 1990 to October 5, 2017 revealed one out of 5 diabetic patient globally used tobacco (Roderick *et al.*, 2019).

On the other hand, the major component of the modern stuff is moringa oleifera a plant considered as one of the most beneficial trees in the world, with several medicinal, nutritional and industrial applications (Bancessi et al., 2019). moringa is rich in vitamins, antioxidants, β -carotene ,amino acids ,phenolic, flavonoids(Saleem et al., 2019). These various components of moringa makes a potent free radical scavenger, enzyme inhibitors, antioxidants, antibacterial anti-tumor, cholesterol lowering, antipyretic, antiinflammatory, ant diabetics anti-ulcer among others(Atta et al., 2019). Similarly, recent investigators reported that the evidence for acute hypoglycemic effects of moringa extract on diabetic animal models appears to be robust, but more chronic and long-term studies are needed (Toma et al., 2015). In contrast, the hypoglycemic effects of moringa on humans are not clear (Vargas-Sánchez et al., 2019). Another research revealed that Moringa reversed hepatic insulin insensitivity linked to up-regulation of genes involved in insulin receptors and glucose uptake in the liver (Mohamed et al., 2019).

The rate of moringa snuff consumption has rampantly increased in Nigeria particularly the Northern region; where in the past, snuffing was considered to be filthy. The addiction to snuff is obvious, although the addicts claim that, it has various therapeutic significances against different ailment. Unlike the "traditional snuff" (i.e. a blend of purely tobacco and flavouring agent) whose effect has been studied and documented to cause disorders such as cancer (of the mouth, lips, nasal cavities, oesophagus and gut), diabetes; hypercholesterolemia, myocardial infarction and foetal morbidity and mortality (Avti et al., 2005). Modern snuffs contain high percentage of moringa beside other adjuncts and have never being studied. For this reason the current research was designed to study the effect of four brands of snuff; Hajiya Aisha man power (HAMP), AK47, Special moringa Sundus (SMS) and Smokeless tobacco (TBC) on fasting blood glucose level and lipid profile of Wister albino rats.

MATERIALS AND METHODS

The snuff samples were obtained from Keffi market, Keffi local government Council, Nasarawa State Nigeria. Glucometer, acute checker strip obtained Shenzhen Songzhijia Technology Co., Ltd. China, Kits for HDL LDL TG and Total cholesterol obtained from Solarbiose life Science China.

Experimental Design:

The study was carried out using Fifty four (54) Wister albino rats (weighing 110-120g). The rats were obtained from National veterinary research institute (NVRI) VOM, plateau state. They were housed in cleaned wooden cages, bedded with clean rice husks with 12 h Cycles of light and dark. Animals were fed with growers mesh (vital feed) and water for two (2) weeks to acclimatize to the new laboratory condition. After the acclimatization and the Experimental design was approved by the NSUK Animal Ethics Committee, animals were weighed and divided into five (5) groups; each group was sub-divided into A (high dose) and B (low dose).

Group 1: normal control received distilled water only

Group 2A: orally received 6mg / kg of smokeless tobacco solution prepared in distilled water

Group 2B: orally received 3mg / kg of smokeless tobacco solution prepared in distilled water

Group 3C: orally received 6mg / kg of special *moringa* sundu solution prepared in distilled water

Group3d: orally received 3 mg /kg of special moringa sundu solution prepared in distilled water

Group4E: orally received 6 mg /kg of special moringa sundu solution prepared in distilled water

Group4F: orally received 3 mg /kg of special moringa sundu solution prepared in distilled water

Group5G: orally received 6 mg /kg of special moringa sundu solution prepared in distilled water

Group5H: orally received 3 mg /kg of special moringa sundu solution prepared in distilled water

All animal received humane treatment, placed on water and growers mesh all through the period. Gavage method was used in the administration of the solution. At the end of the experimental period the animals where sacrificed. At the end of the experiment rats were weighed, anaesthetized using 5% isoflurane and 1.5L / min oxygen flow then, the rats' tail was pinched to obtain a spot of blood and analysed immediately for blood sugar. The blood glucose level was determined using glucometer meter

RESULTS AND DISCUSSION

The results in table1 revealed about 300 people were interviewed through a questionnaire, on the consumption rate/doses, claimed therapeutic effect and the four brands mostly consumed. The users continuously use the various products for the different motives mention in table (1); 45 % claimed Smokeless tobacco (TBC) relieves headache, improves vision, relives itching and brightens teeth, 30 % claimed Hajiya Aisha man power (HAMP) enhances sexual performance, relieves headache and improves vision, 15 % claimed Special moringa sundu relieves eye itching, fever and tooth ache and 10 % claimed that AK47 increases appetite and enhance sexual performance and relieves headache. From the table above, 75 % of users finish a container in two weeks, 15% in three weeks and 10 % in four weeks irrespective of the brand.

The result in (fig.1) showed significant decrease (P < 0.05) in fasting blood sugar especially; group 3A (administered low dose of pure tobacco solution) compared to the control. The result in (table2) revealed that, the total cholesterol in all the brands generally decreased compared to the control. However, group 2A&2B and 4A&4B decreased significantly compared to the control and other groups (3&5). The level of triglyceride increases significantly in all the groups compared to the control. HDL levels showed no significant change in all the groups compared to control except group 2B. Finally the level of LDL showed no significant decrease in all the group except groups 2B and 3B when compared to the control.

The 300 people interviewed, had different motives (sexual enhancement, better vision, fever, headache among others) for using the snuff, but it appears the addiction is the most important factor that makes the users to persistently snuffle, even when there was no any symptom of illness. Similar scenario has been reported among men in the US, Scandinavia and particularly in Sweden, where approximately 20% of men snuffle on daily basis. This addiction could be attributed to the tobacco powder and menthol usually added in all brands of snuff (Addicott, 2020). While Tobacco contains nicotine whose addiction had been documented, menthol was found to potentiate the binding of nicotine to nicotinic receptor (Henderson, 2019). Although users derive some therapeutic benefit, in most cases it has just become a habit, synonymous to smoking cigarette or eating cola nut. Finally if the users actually snuffle for the acclaimed therapeutic benefits, then it is expected that they should cease to continue when the ailment is cured, but they persist (Shehu and Yabagi, 2019). Previously, some studies have shown that heavy users of cigarette or moist snuff have an increased risk of type 2 diabetes. This could suggest that tobacco use is associated with low insulin response. The result of this revealed that all the brands of snuff except pure tobacco administered to the rats showed significant decrease in blood glucose level compared to the control. This decrease could be attributed to the moringa powder which constitutes a great percentage of the SMS snuff preparation. This is not amazing because Moringa oleifera extract has been shown to decrease blood sugar and NO in diabetic animals (Gupta et al., 2012). Thus this result clearly showed that the SMS snuff is beneficial in reducing blood sugar.

Moreover, the group administered with pure tobacco showed no significant difference in the blood glucose level compared to the control. This agrees to the report that Smokeless tobacco nicotine administration does not result in hypertension, decline in glucose tolerance or insulin resistance in juvenile rats (Swislocki, 2003).

On the other hand, the decrease in the levels of total cholesterol with concomitant increase in triglyceride could be attributed to the nicotine/tobacco content of the various brands. This agrees to the findings previously reported, that nicotine administration in rats decreases total cholesterol, increases lipolysis and increases free fatty acid concentration (Ahwal *et al.*, 2019). Increase in lipolysis or decrease lipoprotein lipase activities could have been the reason for the increase in triglycerides. Similarly nicotine induces fall in estrogen which could also lead to

hyperinsulinemia, decrease HDL and increase level of LDL (Ahwal *et al.*, 2019).

CONCLUSION

Although it is quite clear that persistent snuffling is merely addiction, all the snuff brands used in this research, decreased blood sugar and increased circulating triglyceride by stimulating lipolysis. This suggests that people on hypoglycaemic most avoid sniffing.

CONFLICT OF INTEREST

The authors declared no conflict of interest

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Table 1: Survey on four brands of snuff and users in Keffi, Nigeria

Number of individuals interviewed	Claimed therapeutic effect of snuff	Consumption rate per container	Weight of one container in grams	Percentage (%) Of individuals
141	Relieves headache, improves vision and brightens teeth	Two weeks	TBC (16g)	45%
75	Enhanced sexual performance,	Two weeks	HAMP (14.11g)	30%
45	Relieves Eye inching, fever, and decreases body temperature	Three weeks	SMS (16g)	15%
39	Headache, increases appetite and enhanced sexual performance	Four weeks	AK47 (14.11g)	10%



Fig.1. Effect of Different Brands of Snuff on Fasting Blood Glucose Levels

Results are presented as Mean \pm SD (n=6). Columns with different alphabets are statistically different at P< 0.05. Letters a. and c implies highest and lowest concentration,

respectively. Groups 2A &2B were treated with Tobacco (TBC) , group 3A&3B were treated with special moringa sundus (SMS), group 4A &4B were treated with Hajiya Aisha man power (HAMP), group 5A&5B were treated AK-47 .

Table2. Effect of Different Brands of Snuff on Lipid Profile of Wister Albino Rats

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Group	Brands	Total Cholesterol	Triglyceride	HDL	LDL		
1	Control	$2.70{\pm}0.2^{a}$	0.51 ± 0.18^{a}	0.93±0.09 ^a	1.45 ± 0.26^{a}		
2A	TBC	1.10±0.13 ^b	0.73 ± 0.04^{b}	0.97 ± 0.06^{a}	1.33±0.09 ^a		
2B	TBC	2.13 ± 0.14^{b}	0.74 ± 0.12^{b}	1.61 ± 0.15^{b}	0.53 ± 0.08^{b}		
3A	SMS	2.58 ± 0.15^{b}	0.70 ± 0.04^{b}	1.03 ± 0.05^{a}	1.25 ± 0.10^{a}		
3B	SMS	2.50 ± 0.09^{b}	0.61 ± 0.03^{b}	0.88 ± 0.06^{a}	0.7 ± 0.01^{b}		
4A	HAMP	2.67±0.12 ^a	0.72 ± 0.12^{b}	1.03±0.05 ^a	1.33±0.11 ^a		
4B	HAMP	2.58 ± 0.07^{b}	0.92 ± 0.14^{b}	$0.97{\pm}0.09^{a}$	1.43 ± 0.04^{a}		
5A	AK-47	2.20 ± 0.09^{b}	0.68 ± 0.06^{b}	$0.97{\pm}0.05^{a}$	$1.47{\pm}0.02^{a}$		
5B	AK-47	1.80 ± 0.42^{b}	0.82 ± 0.27^{b}	0.79 ± 0.16^{a}	1.20 ± 0.03^{a}		

Results are presented as Mean \pm SD (n=6). Columns with different alphabets are statistically significant at P< 0.05. Letters a and c implies highest and lowest concentration respectively. Groups 2A &2B were treated with Tobacco(TBC), group 3A&3B were treated with special moringa sundus (SMS), group 4A &4B were treated with Hajiya Aisha man power (HAMP), group 5A&5B were treated AK-47.