



Does Oral Administration of Fresh and Dry Ginger (*Zingiber officinale*) Juice have Effect on the Lipid Profile of Albino Rats

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Authors' contributions

This work was carried out in collaboration among all authors. Author HAW wrote the first draft, designed the protocol and performed the statistical analysis. Author ECA searched the literature, revised the first draft. Author AOO performed the investigations in the study. All authors read and approved the final manuscript.

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ABSTRACT

Aim: This study compares the effect of fresh and dry ginger juice on the lipid profile of albino rats.
Methodology: Fifteen(15) albino rats with average weight of 150g divided into three groups of five (5) rats each were used for the study.5ml of the ginger juice was administered orally for 21 days using the gavage oral tube to the experimental animals. Blood samples were collected via cardiac

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puncture after a chloroform anesthesia was given to the animals to a heparinized sample bottle. Plasma samples were analyzed for total cholesterol, triglyceride, high density lipoprotein using the colorimeter while and low-density lipoprotein level was calculated.

Results: There was no significant difference in cholesterol, triglyceride, high density lipoprotein and low-density lipoprotein levels ($P>0.05$) when the group 1(control group) was compared with group 2 (dry ginger group) and group 3 (fresh ginger group).

Conclusion: Ginger juice in different preparation forms does not alter the lipid profiling in the experimental animals over a period of 21 days.

Keywords: Dry ginger; Fresh ginger; ginger juice; lipid profile; albino rats.

1. INTRODUCTION

Hyperlipidemias reveals the onset of abnormalities of lipid metabolism and it is secondary to the manifestation and progression of arteriosclerotic state in humans [1, 2]. One of the most important risk factors associated with coronary artery disease (CAD) is dyslipidemia. Low HDL-cholesterol (HDL-C), high triglycerides (TG) and high LDL-cholesterol (LDL-C) levels have been associated with increased incidence of CAD [3]. In addition to diet, herbal medicine has been explored as a pharmacologic modality in preventing alterations in lipid metabolism [4,5].

Ginger (*Zingiber officinale*) a well-known spice plant with a pungent appetizing taste has been in use in traditional oriental medicine [6] to treat a number of medical conditions including headache, cold, arthritis etc.[7]. It is included in the family of Zingiberaceae .This family covers up to 24 genus and around 300 species with the genus Zingiber having about 20 species. It possesses a perennial tuberous or rhizomatous root with an upright annual stalk (pseudo stem about 60-90cm tall) covered with flat sheaths that may be taken off as stalk with about 8-12 distichous dark green leaves present on the stem [8, 9].Ginger (*Zingiber officinale*) has been used in folk medicine for a long time. Its extract and juice have been shown to exhibit a variety of biological activities.

Ginger is found almost in Asian subcontinent and plays a major role as a spice for food as well as a herbal and dietary supplement with lesser toxic effects but of more therapeutic effect [10]. As a means to achieving certain health goals, individuals resort to taking ginger due to its numerous health benefits including its role in lipid metabolism and as a hypolipidemic agent [11,12]. Many varieties of ginger are found such as processed,like candles,flavoured drinks etc, coated or unscrapped, unbleached (natural) and

bleached ginger. Aqueous and organic extracts of ginger have illustrated a high number of active components including gingerols, shogaols, alkaloids, tannin, saponin, phenolic and ketone derivatives [13-16].

High plasma levels of lipoproteins are strongly associated with coronary artery disease and an independent risk factor for atherosclerosis [17]. Hence investigation of the comparative effect of fresh and dried ginger juice on lipid profile of albino rats in this study.

2. MATERIALS AND METHODS

2.1 Experimental Animals

Fifteen (15) albino rats weighing averagely 150g were used for this study. They were purchased from the Animal house of the Department of Human Physiology, University of Port Harcourt. . They were housed in wired cages, acclimatized for two weeks with temperature controlled at 25°C before commencement of treatments They were fed with rat feed (finisher) commercially prepared from the Top feed Company, Eastern Premier Feed Mill Ltd, Aba, Abia State, Nigeria and had access to water (ad libitum) throughout the period. The conditions of the animals were in conformity with standards as outlined by the National Academy of Science [18,19].

2.2 Ginger Juice

The ginger was purchase from the mile 3 market in Port Harcourt. 600g of fresh rhizome of ginger after cleaning and scrapping the superficial skin was cut into smaller pieces. Using a grinder, the pieces were made into a paste like form which was taken unto a white clean sieve cloth and the liquid squeezed out from it into a clean airtight sterile container yielding about 300ml.The stocked juice as obtained was refrigerated in the refrigerator at 4°C and used for the experiment.

Another set of fresh ginger rhizome were also dried using a hot air oven at a temperature of 60°C for 3 days at about six hours daily [20], the dried ginger was weighed to a 600g weight, then ground to powder using a grinder. This was dissolved in 300ml of distilled water, sieved out from a white clean cloth into a clean container and stored in the refrigerator for administration each week as the experiment lasted.

2.3 Experimental Design

The 15 albino rats were divided into 3 groups namely Group 1 with 5 rats serving as Control fed only with food and water. Group 2 (Dry Ginger Juice) with rats that were fed with food and water and administered orally 5ml of dry ginger juice while the last is group 3 (fresh ginger juice). This group was fed with food and water then administered 5ml of fresh ginger juice during the experiment which lasted for 21 days. The administration of the juice was done once per day.

2.4 Collection of Blood Samples

After the treatment period of 21days, the rats were left 24hours in a fasting state, then on the 22nd day, they were anaesthetized using

chloroform, sacrificed and blood collected via cardiac puncture into lithium heparinized sample bottles. This was spun using a centrifuge after which the plasma was separated and used for the estimation of total cholesterol, triglycerides, high density lipoprotein using colorimetric methods with the Randox kit UK. The Low-density lipoprotein concentration was calculated using the formula as described by Fried Wald formula [21].

$$\text{LDL-C} = (\text{TC}) - (\text{HDL-C}) - (\text{TGs}/5)$$

2.5 Statistical Analysis

Results were presented as mean ± standard deviation while the data obtained were analyzed statistically using Graph pad prism version 8.2.0. Values were considered significant at 95% confidence interval.

3. RESULTS

The effect of fresh and dried ginger juice on plasma total cholesterol (TC), triglyceride (TG). High density lipoprotein (HDL) and low-density lipoprotein (LDL)) levels of albino rats were compared and reflected in the Tables 1-3.

Table 1. Mean ±SD of Lipid Profile of Control (Group 1) and Dried Ginger Juice (Group 2)

Groups/Parameters	TC mmol/L	TG (mmol/L)	HDL (mmol/L)	LDL (mmol/L)
Group 1 (Control)	2.70 ± 0.74	0.94 ± 0.25	0.66 ± 0.21	1.61 ± 0.63
Group 2 Dried Ginger juice)	2.68 ± 1.59	0.92 ± 0.90	0.64 ± 0.98	1.62 ± 0.39
T valve	0.1377	2.154	0.6730	0.3372
P value	0.893	0.052	0.514	0.745
Remark	NS	NS	NS	NS

Key: NS-Non significant

Table 2. Mean ±SD of Lipid Profile of Control (Group 1) and Fresh Ginger Juice (Group 3)

Groups/Parameters	TC mmol/L	TG (mmol/L)	HDL (mmol/L)	LDL (mmol/L)
Group 1 (Control)	2.70 ± 0.74	0.94 ± 0.25	0.66 ± 0.21	1.61 ± 0.63
Group 3 Fresh Ginger juice)	2.69 ± 1.20	0.93 ± 0.36	0.67 ± 0.30	1.60 ± 0.46
T valve	0.4416	0.0849	0.2414	0.8470
P value	0.667	0.934	0.813	0.102
Remark	NS	NS	NS	NS

Key: NS-Non significant

Table 3. Mean ±SD of Lipid Profile parameters in Albino rats administered fresh and Dried ginger juice

Groups/Parameters	TC mmol/L	TG (mmol/L)	HDL (mmol/L)	LDL (mmol/L)
Group 2 (Dried Ginger)	2.68 ± 1.59	0.92 ± 0.90	0.64 ± 0.98	1.62 ± 0.39
Group 3(Fresh Ginger)	2.69 ± 1.20	0.93 ± 0.36	0.67 ± 0.30	1.60 ± 0.46
T valve	0.1595	1.879	0.1589	3.297
P value	0.854	0.185	0.854	0.072
Remark	NS	NS	NS	NS

Key: NS-Non significant

4. DISCUSSION

The non-significant levels seen when the control was compared with the fresh ginger treated groups is in variance with study carried out by Prasad et al. [22] who reported a decrease in cholesterol level and increase in HDL level which could be adduced to modulatory influence on cholesterol metabolism and turnover. This observation is also in contrast with the work done by [23] who administered ginger orally to the rats resulting in a reduction in cholesterol and a lesser effect on LDL level though the nature of the ginger preparations are not the same.

The nature of preparing the ginger might have an effect on the results observed in this study as compared to the study of Li et al.[24] where activities of ginger prepared in different modes were compared and significant differences were observed, However, in this study the effect from the dried ginger juice and the fresh ginger juice on the lipid profile of the rats were not significantly different. The differences in preparation of ginger may be the contributory factors for this variation. Also, Cheng et al.[25] in their study showed that steamed ginger had the potentials to change chemical profile of ginger thereby enhancing some of its beneficial activities however this kind of observation was not seen in this study considering dried and fresh ginger prepared juice. This study is also in contrast with the report from [26] where animals fed with ginger had a significantly increased HDL and reduced cholesterol which might be adduced to the activity of hepatic cholesterol-7-hydroxylase, a rate limiting enzyme in bile acids biosynthesis which stimulates cholesterol conversion to bile acids thereby removing cholesterol from the body [27]. However in a meta analysis carried out by Pourmasoumi et al. [28]. Ginger was considered a lipid lowering agent as reflected in the reduced levels of Triglycerides (TG) and low density lipoproteins (LDL) with no significant effect on Cholesterol and high density lipoprotein (HDL) in the plasma. A study by Murad et al. [29] revealed that powdered ginger administration was able to significantly reduced LDL and Cholesterol levels though this was carried out in humans. In the report of Fakhri et al [30], ginger supplementation was able to reduce cholesterol, triglycerides and LDL significantly but no significant effect on HDL which is also in variance with our present observation in this study. Reviews of the more recent trials, suggest that ginger shows considerable hypolipidemic effect in vitro and in

some animal studies [31]. Hence it will be worth studying and comparing the effects and potency of the different forms of ginger preparation; fresh, dry, steamed, powdered, juice or extract considering their doses and mode of administration.

5. CONCLUSION

Ginger juice in their different prepared forms had no significant effects on the lipid profile of the albino rats suggesting that preparation mode, doses, route of administration might contribute highly to the expected efficacy of ginger in the body.

CONSENT

It is not applicable.

ETHICAL APPROVAL

All the procedures were approved by the Ethics Committee of the Faculty of Science, Rivers State University.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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