

Original research Articles

In Vivo Studies On the Possible Hypolipidemic Alterations in Rats Administered *Hibiscus Sabdariffa* Aqueous Extract

Abstract

Hibiscus sabdariffa is a popular medicinal plant that is claimed to have blood-pressure lowering effects. The present study was conducted to assess the alterations in the serum lipid concentrations in the rats administered aqueous extract of *H. sabdariffa* calyx using rat model. Twenty (20) wistar albino rats were used for this study and were assigned into 4 groups. Group 1 rats were normal control and received distilled water (10 ml/kg) while groups 2-4 rats received 200, 400 and 600 mg/kg body weight of the extract respectively. All treatments were through the oral route for 21 days. On the 21st day, blood samples for Lipid panel analyses were collected. Results indicated significant ($p < 0.05$) decreases in Low density lipoprotein (LDL), Very low density lipoprotein (VLDL) and Triacylglycerol (TAG) levels of the extract-treated groups (Groups 2-4) in a dose-dependent manner compared to that of the normal control rats. No significant change ($p > 0.05$) was observed in the total cholesterol concentration of groups 2-4 rats administered 200, 400 and 600 mg/kg b.w of the extract respectively compared to the normal control (group 1). However, there was a significant increase ($p < 0.05$) in High density lipoprotein (HDL) levels of the extract-treated group when compared to that of the normal control rats. It was concluded that administration of *H.sabdariffa* aqueous extract as used in this study demonstrated beneficial effects in the lipid profile of normal albino wistar rats.

Keywords: *Hibiscus sabdariffa* , Lipids profile, Wistar rats

Introduction

Hibiscus sabdariffa belongs to the family Malvaceae. It is a very common shrub in the tropics with a lot of uses in culinary and therapy [1]. It is usually consumed after a hot water extraction of the calyces and subsequent addition of other ingredients. In Nigeria, this preparation is called “Zobo” drink and it is cherished by most Nigerians. The shrub is found in so many tropical countries such as Indonesia, Thailand, Egypt, Mexico and Nigeria [2, 3]. Researchers have reported blood-pressure lowering effects of the extract [1, 4]. It is also on record that the calyx extract is used in the treatment of arteriosclerosis [5] and other ailments including

hyperlipidaemia and obesity [6, 7] In general, Hibiscus species is used in treating diabetes mellitus [8]

Despite all the medicinal uses of *H.sabdariffa*, there is no sufficient researched information on the lipidaemic changes associated with its subchronic administration. This present study therefore was tailored to investigate alterations in the lipid panel of albino wistar rats subchronically administered *H.sabdariffa* aqueous extract

MATERIALS AND METHODS

Materials

Plant Materials

Fresh leaves of *Hibiscus sabdariffa* were purchased from Ogige market, Nsukka, Enugu State of Nigeria and were identified by a botanist of the herbarium Botany Department., University of Nigeria, Nsukka. The leaves were air-dried separately at room temperature and then pulverized.

Animals

Adult male Wistar albino rats of 10 to 16 weeks and average weight of 160 ± 15 g were obtained from the Animal House of the Faculty of Biological Sciences, University of Nigeria, Nsukka. The animals were acclimatised for duration of 7 days under standard environmental conditions with a 12 hour light/dark cycle maintained on a regular feed (vital feed) and water *ad libitum*.

Chemicals/reagents/samples

All chemicals used in this study were of the analytical grade and products of May and Baker, England; BDH, England or Merck, Darmstadt, Germany.

Instruments/Equipment

Rotary evaporation (Model Modulyo 4K, Edward, England), Chemical Balance (Gallenkamp, England), Conical Flasks (Pyrex, England), (Gallenkamp, England), Centrifuge (PIC, England), Digital Photo Colorimeter (EI 312 Model, Japan), Adjustable Micropipette (Perfect, USA.), Refrigerator (Kelvinator, Germany),

60 **Methods**

61 **Experimental design**

62 Twenty (20) male albino Wistar rats were acclimatized at the same conditions of
63 temperature and pressure, and the same animal feeds were used for all the rats. The rats were
64 assigned into four (4) groups of five (5) rats each as shown below:

65	Group 1	Normal Control
66	Group 2	200 mg/kg b.w. of aqueous leaf extract <i>Hibiscus sabdariffa</i>
67	Group 3	400 mg/kg b.w. of aqueous leaf extract <i>Hibiscus sabdariffa</i>
68	Group 4	600 mg/kg b.w. of aqueous leaf extract <i>Hibiscus sabdariffa</i> .

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71 **Extraction of the Leaves of *Hibiscus sabdariffa***

72 The leaves of *Hibiscus sabdariffa* were air-dried separately at room temperature and then
73 pulverized. The ground samples were extracted with aqueous solvent, using cold maceration
74 techniques. The samples were filtered using Whatman filter paper. The filtrates were
75 concentrated to solid matter using rotary evaporators, which then become the stock sample of the
76 aqueous leaf extract. These extracts were stored in the refrigerator compartment till the time of
77 use.

78 **Determination of Lipid Profile**

79 **Determination of Serum Cholesterol**

80 The serum cholesterol was determined by cholesterol oxidase-peroxidase method [9].
81 High density lipoproteins (HDL)–cholesterol concentration was determined by the method of
82 [10] using QCA commercial kit;

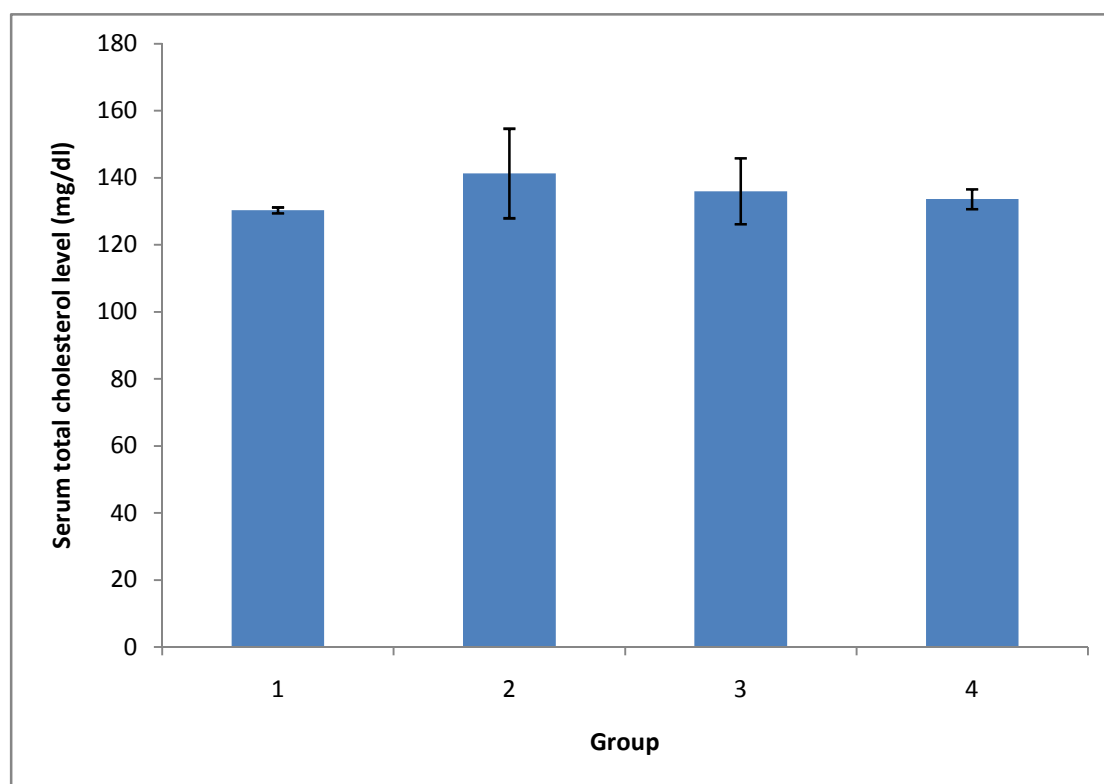
83 Estimation of Triacylglycerol concentration was done by method of [11] using QCA commercial
84 kit while Very low density lipoprotein (VLDL) and Low density lipoprotein (LDL) -cholesterol
85 concentration, were calculated using Friedwald formular [12]

86

87 Statistical Analysis

88 The results were expressed as mean $\pm$ SD and test of statistical significance was carried out using
 89 One-way Analysis of Variance (ANOVA). The means were separated using Duncan multiple
 90 Test. The statistical packaged used was the statistical package for social sciences (SPSS), version
 91 17.

92 RESULTS

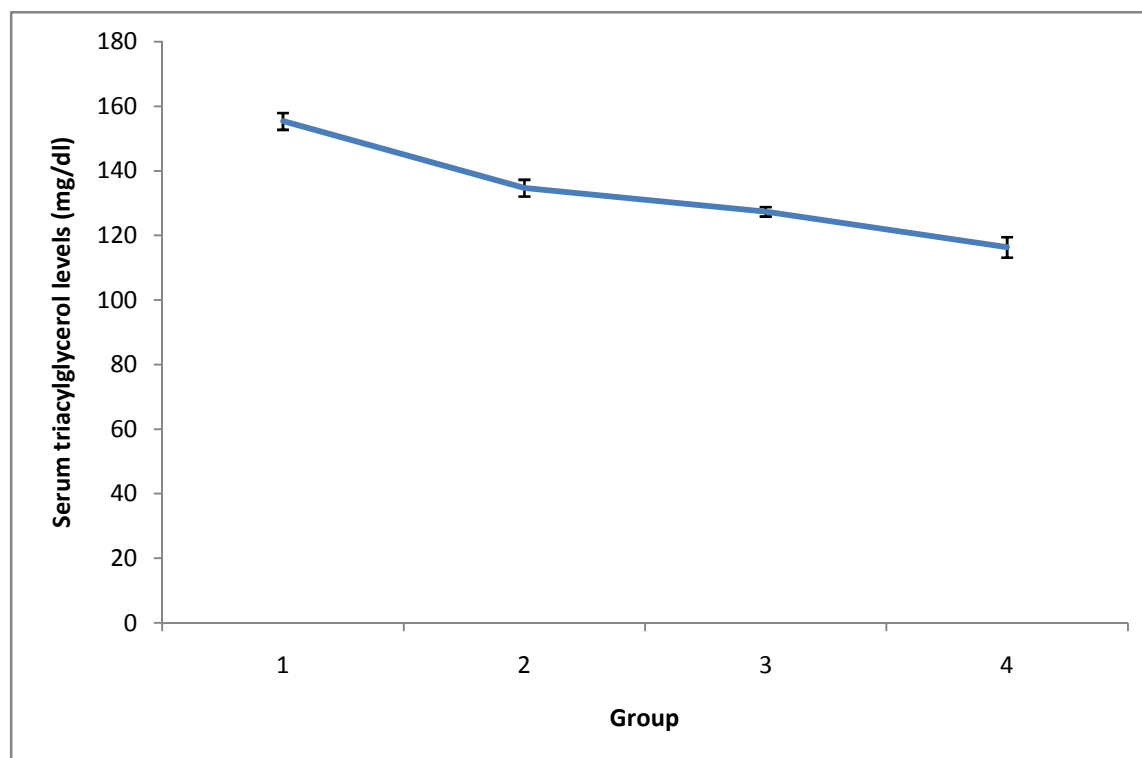


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94 **Figure 1:** The serum total cholesterol levels of rats administered with aqueous extract of
 95 *H.sabdariffa*.

96 The result shows that the serum total cholesterol levels of all the rats in all the groups (Groups 1-
97 4) did not differ significantly ($p > 0.05$) among one another. There was no significant change
98 between the total cholesterol level of the extract-treated and the distilled water-treated groups.

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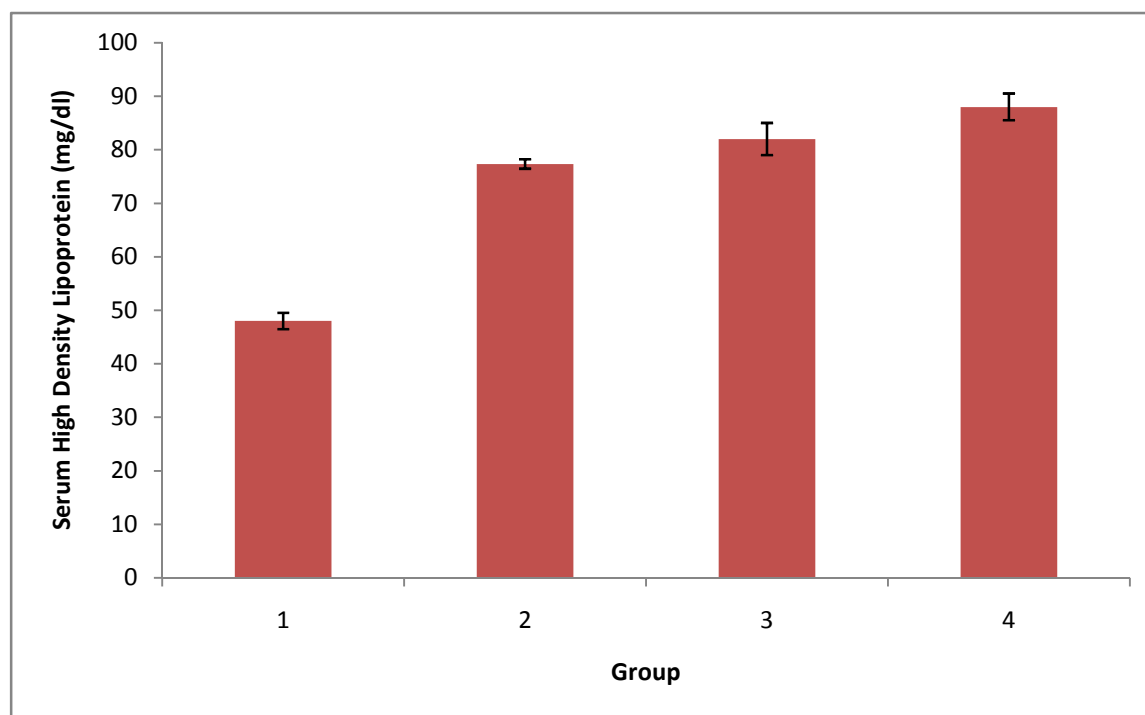


100

101 **Figure 2:** Serum Triacylglycerol levels of albino wistar rats dosed with aqueous extract of *H.*
102 *sabdariffa*

103 There was a dose-dependent significant ($p < 0.05$) reduction in the serum Triacylglycerol levels
104 of groups 2-4 rats when compared with that of the normal control rats. The serum
105 Triacylglycerol levels of groups 2 and 3 rats were comparable ($p > 0.05$) to each other but were
106 significantly ($p < 0.05$) higher than that of the group 4 rats.

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110 **Figure 3:** High density lipoprotein levels of rats administered with graded doses of aqueous
 111 extract of *H.sabdariffa*

112 There was significant ($p < 0.05$) increase in the serum HDL levels of group 4 rats compared with
 113 that of the normal group (group 1). The serum HDL levels of the rats in groups 2 and 3 were
 114 statistically comparable ($p > 0.05$) but were significantly ($p < 0.05$) higher than that of the group
 115 1 rats.

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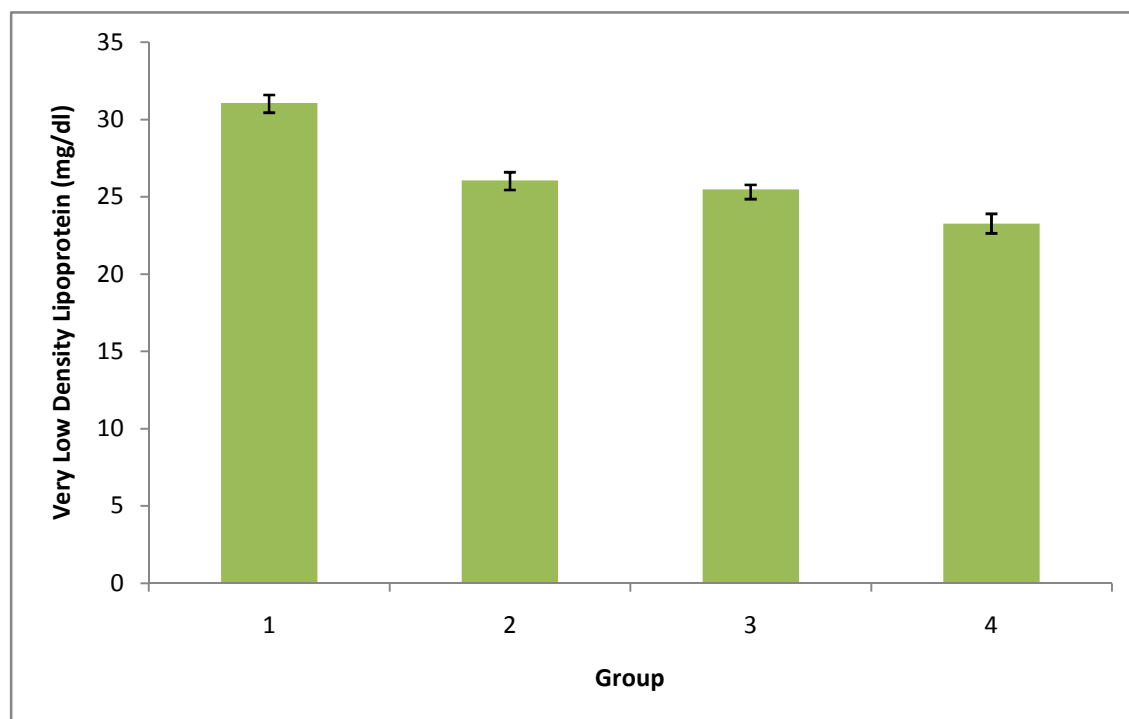


Figure 4: Effect of administration of *H.sabdariffa* aqueous extract on serum very low density lipoprotein levels of albino wistar rats

There was significant reduction in the VLDL levels of all the extract-treated rats (Groups 2-4) when compared with the normal control rats administered with distilled water. The VLDL levels of groups 2 and 3 rats were comparable ($p > 0.05$)

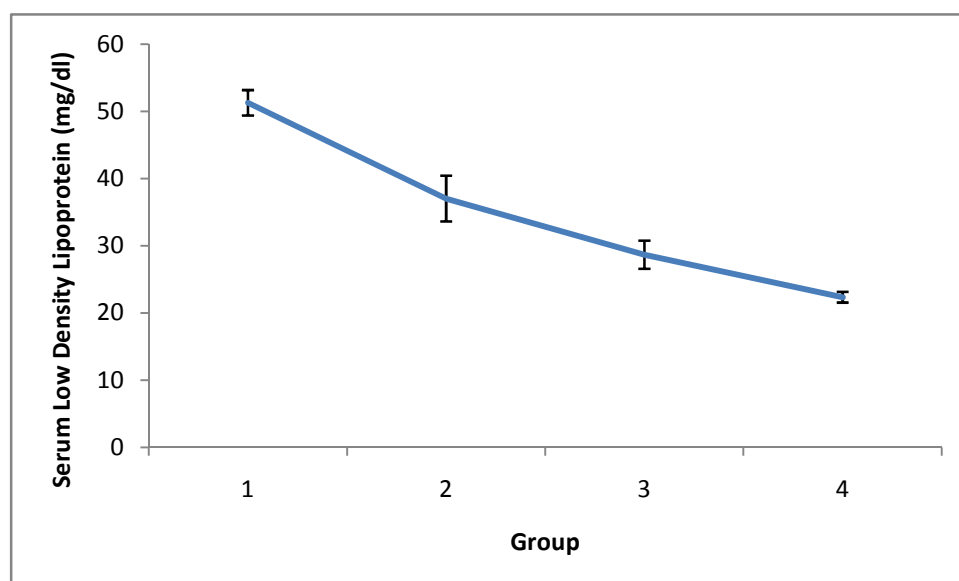


Figure 5: Effects of graded doses of *H.sabdariffa* aqueous extract administration on the serum low density lipoprotein of albino wistar rats

There was significant ($p < 0.05$) reduction in the serum LDL levels of the rats in groups 2-4 (extract-treated groups) when compared to that of the group 1 rats (normal control) in a dose-dependent manner. There was also significant ($p < 0.05$) reduction in the LDL levels of the group 3 rats when compared with that of the group 2.

Discussion

Assessment of the lipid panel following 21 days administration of *H.sabdariffa* aqueous extract at varying doses revealed significant increases in the serum level levels of TAG, LDL, VLDL and significant increases in the serum levels of HDL without any significant changes in the serum total cholesterol levels of the extract-treated rats compared to that of the normal control rats.

Reductions in the serum levels of TAG, LDL and VLDL by aqueous extract of *H.sabdariffa* may have been mediated by the antioxidant properties of the extract. Calyces of *H. sabdariffa* are one of the best sources of vitamin C and anthocyanins [8, 13, 14]. The dried calyces contain flavonoids [15] which act as antioxidants. Some researchers have also associated the lipid-lowering effects of *H.sabdariffa* with the presence of water soluble fibers contained in it [16, 17]. The result of this present study is in consonance with the findings of [18] and [19]. However, the finding of non-significant changes in the total cholesterol levels of the extract-treated rats compared to that of the normal control rats did not agree with the findings of [20] who reported reductions in the serum levels total cholesterol following treatment with *H.sabdariffa* extract. In the same vein, many researchers have reported decrease in the serum total cholesterol levels upon administration of *H.sabdariffa* [16, 17]. The finding of significant increase in the serum HDL levels of the extract-treated rats when compared with that of the normal control rats is in agreement with the submissions of [18, 19, 20]

Conclusion

It was concluded that administration of *H.sabdariffa* aqueous extract as used in this study demonstrated beneficial effects in the lipid profile of normal albino wistar rats.

ETHICAL APPROVAL

All authors hereby declare that “principles of laboratory animal care” (NIH publication No 85-23, revised 1985) were followed, as well as specific national laws. All experiments have been examined and approved by the appropriate ethics committee.

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