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Antidyslipidemic Effect of Diherbal mixture of Pteridium Aquilinum and Caesalpinia bonducella in Albino Rats

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Abstract:
Pteridium aquilinum and Caesalpinia bonducella are plants commonly used in the management of various ailments in Nigerian folk medicine. Each of them has been found to possess antioxidant and anti-inflammatory properties that can help in maintaining cardiovascular health. In the present study, the effect of the herbal mixture on the lipid profile of albino rats was investigated. A total of twenty albino rats were used in the study. These rats were randomly distributed into 5 groups of 4 rats per group. The rats were allowed to acclimatize for ten days prior to treatment. Rats in group 1 (control) were kept on water and feed. While rats in groups 2, 3, 4 and 5 were treated with 200, 400, 600 and 800mg/kg bwt. of the di-herbal mixture respectively. The treatments lasted for 21 days. Twenty four hours after treatment, the rats were sacrificed. Blood samples collected and prepared for lipid profile. The following parameters: total cholesterol (TC), High-density Lipoprotein (HDL), Low-density lipoprotein (LDL) and triglycerides (TG) were evaluated by standard methods. Results showed that the di-herbal mixture exhibited a dose-dependent reduction in Total cholesterol, LDL cholesterol and Triglyceride. For instance, the control rats had a total cholesterol value of 91.28± 3.54mg/dl. When the herbal mixture was introduced at the dose of 200mgkg bwt, cholesterol value reduced to 90.28±3.77mg/dl. Dose-dependent increments in HDL Cholesterol levels were however, recorded. For instance, the control rats had a HDL Cholesterol value of 32.28 ± 1.81mg/dl. When the herbal sample was given at the initial dose of 200mg/kg bwt, HDL Cholesterol level increased to 34.21 ± 1.72mg/dl. When the extract dose was further increased to 400mg/kg bwt. HDL Cholesterol level was found to be 34.61± 2.10mg/dl. The conclusion was thus drawn that the sample has the potency of maintaining healthy levels of the cardiac function parameters investigated.

Keywords: Antidyslipidemic, Diherbal, mixture, Pteridium aquilinum, Caesalpinia bonducella, lipid profile, albino rats.

I. INTRODUCTION

Interests in the use of medicinal plants as alternative therapies for various kinds of ailments have been on the increase in recent years (Fowomola et al., 2010). Some of the factors responsible for this increased interest in the use of medicinal plants and their products may include the ever increasing cost of conventional drugs, high rates of incidence of fake and substandard drugs in circulation especially in the developing world, resistance to standard drugs by disease causing pathogens, higher incidence of harmful side effects associated with orthodox medications as compared with plant products which are essentially natural etc. These medicinal plants make many chemical compounds that act in humans in the same way a pharmaceutical drug would and can therefore be of benefit like conventional drugs (Onwusonye et al., 2018).

Lipids are essential components of various body functions. When their levels become high, they can contribute to the development of cardiovascular diseases like atherosclerosis. High-density lipoprotein is referred to as "Good cholesterol" for the fact that it helps to remove LDL cholesterol from the bloodstream and then transports it to the liver for detoxification; hence it is related to lowering the risk of heart and blood vessel diseases. Low-density lipoprotein formed in the blood on the other hand is called the "Bad cholesterol" because it contributes to the formation of plaques in the arteries; hence high level of LDL is related to increased risk of heart and blood vessel diseases (Cushnie et al., 2014).

Dyslipidemia is a medical condition, characterized by abnormal levels of lipids in the blood stream. These abnormal levels of lipids may include high levels of LDL cholesterol, low-levels of HDL cholesterol and high levels of triglycerides. An imbalance in any of these factors, whatever the cause, can lead to dyslipidemia (Rader et al., 1994). Excessive deposits of lipids in the arteries can cause plaque buildup, resulting to atherosclerosis, pancreatitis, fatty liver disease, metabolic syndrome, heart attack, stroke and other cardiovascular issues and diseases.

II. MATERIALS AND METHODS

The leaves of Pteridium aquilinum were collected from the road side, along FUTO- Ihiagwa road, Owerri, Imo state. While the leaves of Caesalpinia bonducella were collected from a farm land at Ihiagwa, Owerri West LGA, Imo State. Both plant parts were authenticated by a botanist and only the healthy ones were used after the examination.

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PREPARATION OF PLANT MATERIALS

The fresh and healthy leaves of each plant were dried separately under shade for two weeks, after which the samples were subsequently ground to fine powder.

FORMULATION OF HERBAL MIXTURE

One hundred and twenty-five grams (125g) of each ground plants sample was separately measured out and mixed together in a conical flask to give 250g of di-herbal powder. The herbal mixture was then soaked in 1500 ml of water. The extract was filtered and concentrated to dryness in a rotary evaporator and stored in a refrigerator for use.

ANIMAL MANAGEMENT

Twenty (20) healthy male albino rats were procured from Nano farms, Irete, in Imo State. The animals were kept for 7days prior to commencement of study for acclimatization with Laboratory conditions. The Animal housing was maintained at a temperature of 30±2°C with a 12 hours light and 12 hours darkness cycle. The animals were allowed free access to commercial feed pellets and clean drinking water.

EXPERIMENTAL DESIGN

The experimental animals were randomly selected and grouped into 5 groups of 4 albino rats each. Each group was accommodated in a separate cage. Treatments were given to all groups in the following order; Group 1 (control) received distilled water and feed pellets. . Groups 2, 3, 4 and 5 were treated with the di-herbal mixture at the dose levels of 200mg/kg 400mg/kg, 600mg/kg and 800mg/kg body weight respectively.

All treatments were given once daily for 14 consecutive days. On the 15th day, all the animals were sacrificed under the influence of chloroform vapor as anesthesia. Blood samples were collected via cardiac puncture using a 1 ml sterile syringe, allowed to clot, and later centrifuged for separation and collection of the serum. The clear serum in each case was then transferred into a clean, labeled sterile plastic sample bottle for the analysis.

EVALUATION OF LIPID PROFILE

Total cholesterol was determined by the colorimetric method described by Richmond (1973). High density lipoprotein (HDL) cholesterol was determined by the method described by Grove (1979). Triglycerides were measured by the enzymatic method of Bucolo and David (1973), while Low density lipoprotein (LDL) cholesterol values were calculated using the relationship:

$$[\text{LDL - Cholesterol}] = [\text{Total Cholesterol}] - [\text{HDL cholesterol}] - \frac{[\text{Tryglycerides}]}{5}$$

STATISTICAL ANALYSIS

Results obtained were analyzed using the SPSS Microsoft Excel package. All data were expressed as Mean ± SD (n=4). Differences between groups were considered significant at $p<0.05$

III. RESULTS

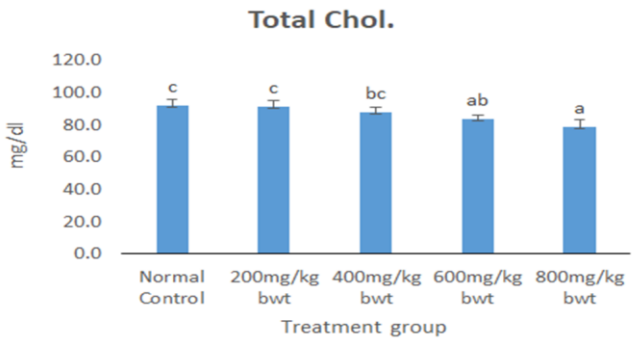

Figure 1: The serum total cholesterol levels of the rats.

. The serum total cholesterol levels of the rats reduced non-significantly ($P>0.05$) as the extract dose increased up to 400mg/kg b.w. At higher extract doses (600 and 800mg/kg b.w.), significant reductions were recorded ($p<0.05$).

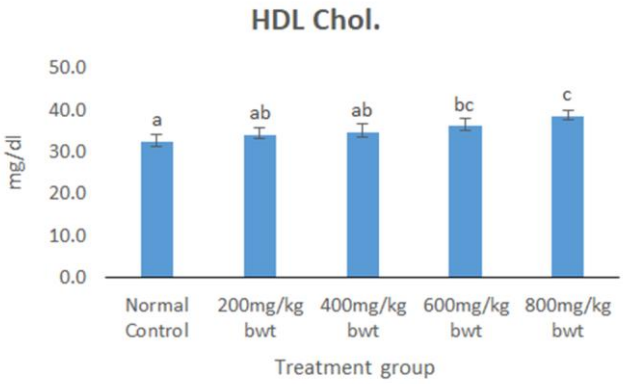

Figure 2: HDL cholesterol levels of the rats.

From figure 2 above, the HDL cholesterol levels of the rats increased gradually up to the extract dose of 400mg/kg b.w. Above this dose level, the increments became significant ($p<0.05$).

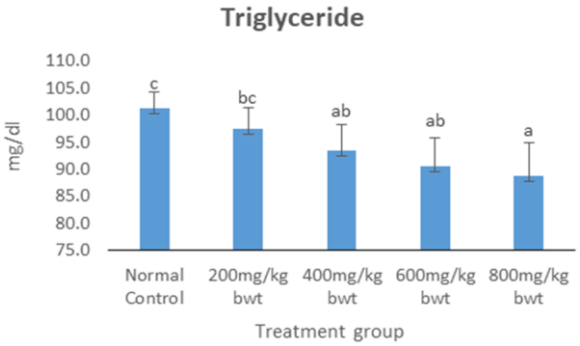

Figure 3: The triglyceride levels of the rats.

From Figure 3 above, the triglyceride levels of the rats decreased slightly when the extract was initially introduced at the dose of 200mg/kg b.w. Above this dose level, significant reductions in triglyceride levels were observed ($p<0.05$).

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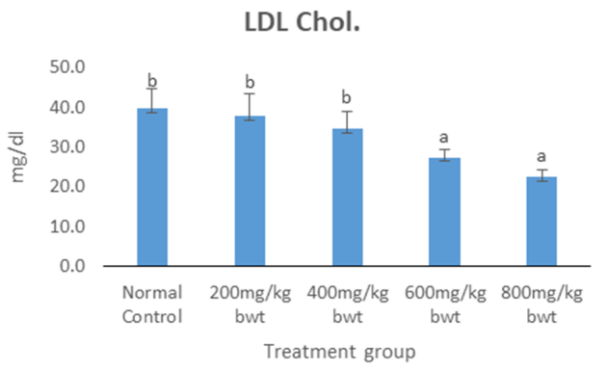

Figure 4: LDL cholesterol levels decreased slightly up to the extract dose level.

From figure 4 above, LDL cholesterol levels decreased slightly up to the extract dose level of 400mg/kg b.w. However, at increased dose levels (600mg/kg and 800mg/kg), the reductions became significant ($P<0.05$).

IV. Discussion and Conclusion

Abnormalities in serum lipids contribute significantly to the development and progression of atherosclerosis and diseases of the cardiovascular system (Ogunrinola et al., 2019). High-density lipoprotein is often referred to as the "good" cholesterol because it carries cholesterol away from the walls of the arteries and subsequently transports it to the liver. By so doing, the walls of the arteries are unclogged this ultimately leads to a reduced risk of heart attack. At all treatment doses, the herbal mixture increased the HDL levels of the test rats. The maintenance of normal /healthy levels of lipids by the herbal sample, as observed in this study, could be linked to a number of factors which may include a direct effect on Lipid metabolism: The herbal mixture may possibly contain compounds that directly inhibit intestinal cholesterol absorption, thereby reducing the amount of LDL cholesterol entering the bloodstream and also may increase HDL production. Oxidized LDL is more susceptible to modification and deposition in the arterial wall. The diherbal mixture may also possibly have the potency of protecting LDL from oxidation, thus reducing the amount that could be deposited on the walls of the artery.

Low levels of total cholesterol and LDL cholesterol implies lowered risks of atherosclerosis and coronary heart disease (Grundy et al., 2004). Result of this study showed that at increased herbal doses, the TC levels were significantly ($P<0.05$) lower when compared to the control group.Elevated TG levels are associated with an increased risk of cardiovascular disease, metabolic syndrome, and pancreatitis.

Some plant extracts like those of green tea and turmeric have been demonstrated to inhibit enzymes that mediate the synthesis of fatty acids in the hepatocytes (Bays et al., 2009). This can result to decreased production of triglycerides. Extracts from various plants like garlic and ginger have also been shown to activate enzymes involved in fatty acid oxidation (Davidson, 2000). This mechanism can thus lead to enhanced breakdown of triglycerides which ultimately leads to decreased circulating triglycerides levels. Cinnamon and fenugreek extracts have been shown to enhance the activity of lipoprotein lipase, an enzyme which breaks down circulating triglycerides. This ultimately increases the clearance of triglycerides from the blood stream (Herber et al., 2000). The diherbal mixture of Pteridium aquilinum and Caesalpinia bondicella could have reduced the triglyceride levels of the test rats by any of these mechanisms. Results of the present study have shown that diherbal mixture was able to reduce total cholesterol, LDL cholesterol and triglycerides, while increasing the HDL cholesterol levels of the test rats. These findings therefore suggest that the diherbal mixture could be very beneficial in the management of atherosclerosis and cardiovascular diseases.

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