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EFFECT OF THREE BRANDED POLY-HERBAL MIXTURES ON THE LIPID PROFILE OF WISTAR RATS

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ABSTRACT

Poly-herbal mixtures comprises of dissimilar constituent of plants and unpurified extracts with medicinal properties for the treatment of various ailments and for sustaining good health This research investigated the effect of three branded poly-herbal mixtures on the lipid profile of Wistar rats. Seventy-six rats were used for the study, 36 for LD_{50} determination, and 40 for the administration of the mixtures. Animals were divided into four groups with ten rats per group: Group A (control) and three experimental groups treated with the mixtures at different doses per group (both low doses of the mixtures at 500 mg/kg and high doses of 1500 mg/kg per body weight for 40 days. Group B was treated with sample A, Group C and D with samples B and C respectively. Results showed a significant difference ($p<0.05$) in Total cholesterol which ranged from 1.66±0.44 mmol/L to 2.57±0.03mmol/L, with elevated cholesterol concentrations. The result showed low level of Triglyceride. High-density Lipoprotein (HDL) ranged from 0.53±0.04 mmol/L and 0.53±0.15 mmol/L to 0.78±0.11 mmol/L when compared with the control value of 0.61±0.01 mmol/L. This suggests higher levels of HDL cholesterol. The value of LDL cholesterol ranged from 0.64±0.43 mmol/L(control) to 1.82±0.08 mmol/L (group BH), all groups had elevated LDL values when compared with the control. These findings revealed that poly-herbal mixtures significantly affect lipid profile parameters by either increasing or reducing them. Total cholesterol and Low-density lipoprotein had elevated levels, which may affect cardiovascular health.

Keywords: Poly-herbal mixtures, Total cholesterol, Low-density lipoprotein, cardiovascular health.

INTRODUCTION

Herbal remedies are derived from natural sources, primarily plants. They are recognized as the utmost alternative to orthodox medicine and used by approximately 60% of the world population both in developing and developed countries where contemporary medicines are mainly used (Rickertet al., 2000). Herbal remedies are habitually consumed devoid of a prescription and there are audacious and prevalent views that they are nontoxic, and have been used for decades without any form of harm because they are natural (Markbere and Ogoun, 2022). Globally, human usage of herbal mixtures is rising daily as a supreme attention to self-medication (Mackowia*et al.*, 2001).

Plants are of inordinate worth and are unequivocally essential to life due to the fact that various compounds are not just extant but

are derivable from them. In addition to their nutritional or dietary values, they provide possible remedial weapons against numerous human, animal and even plant diseases.

A poly-herbal mixture comprises dissimilar constituents of plants and unpurified extracts with medicinal properties for the treatment of various ailments and for sustaining good health. They are composed of different Plant constituents with medicinal properties (Ogbonnia et al., 2018) such as *Vernoniaamygdalina, Cajanuscajan, Zingiberofficinale, Allium sativum, Saccharumofficinarum, Moringaoleifera, Magniferaindica, Citrus aurantifolia*, Caramel, etc.

Lipid profile is a panel of blood tests that assesses various lipids in the bloodstream, providing insight into cardiovascular health and identifying the risk of conditions like atherosclerosis, heart disease, and stroke. Common lipid profile parameters include total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides (Benjamin et al., 2019). Each parameter plays a distinct role in health assessment.

Poly-herbal mixtures are generally designed for lipid-lowering effects. Research by Oluba et al., (2008) demonstrated that poly-herbal mixtures often have a hypocholesterolemic effect by reducing total cholesterol levels in Wistar rats due to their antioxidant and bioactive compounds. However, lipid elevation can occur under certain conditions, such as improper formulation, excessive dosages, or specific herbal components that may have pro-lipidemic effects (Adedapo et al., 2009). The National Agency for Food and Drug Administration and control (NAFDAC), a food and Drug Law Enforcement Agency in Nigeria, is yet to provide a confirmed generated information publicly on the scientific and therapeutic clarification of branded Poly-herbal mixtures that are being consumed. These branded concoctions are registered and approved by NAFDAC with a disclaimer concerning the numerous therapeutic claims by manufacturers. This research aims to evaluate the effect of some branded poly-herbal mixtures on the lipid profile of Wistar rats.

MATERIALS AND METHOD

Study Area

Rivers State, Nigeria.

Sample Collection

Three samples of Poly-herbal mixtures were purchased from a vendor in Port Harcourt Metropolis.Animalswereprocuredfrom Animal house, Department of Pharmacology, UniversityofPortHarcourt, Rivers State,Nigeria.

LD_{50} Determination

A total of 36 rats were used for lethal dose (LD_{50}) determination of three samples, 12 rats for each sample at 10, 100, 1000, 2600, 3900 and 5000 mg/kg body weight. This was done with 3 rats each for the first 3 low doses (10, 100, 1000 mg/kg), and 1 rat each for the next 3 doses. The observation was made for 24 to 48 hours. There was no mortality recorded at 5000 mg/kg.

Animal Grouping

A total of 40 Animals were grouped into four (4) groups of 10 rats each and caged with standardization of the environmental conditions for the minimization of errors.

Ten (10%) and 30% of the 5000 mg/kg body weight of the samples were administered which represents low (500 mg/kg) and high doses (1,500 mg/kg) of the samples respectively for 40 days.

Group A (control) received Normal feed and water.

Group B was administered 500 mg/kg (Group BL) and 1500 mg/kg (Group BH) body weight of sample A

Group C – 500 mg/kg (Group CL) and 1500 mg/kg (Group CH) body weight of sample B

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Group D– 500 mg/kg (Group DL) and 1500 mg/kg (Group DH) body weight of sample C

Determination of Lipid Profile

Total Cholesterol and Triglyceride were estimated using Enzymatic Methods of Allain et al., (1974) and Wahlefeld, (1974) respectively. High Density Lipoprotein-Cholesterol and Low Density Lipoprotein-Cholesterol were determined by Direct methods of Sugiuchi et al., (1995) and Rifai et al., (1992) correspondingly.

Data analysis

Means ± standard deviation of triplicate determination were used to analyze data, which were compared with Analysis of Variance using the IBM Statistical Package of Biological and Social Sciences (SPSS).

RESULTS

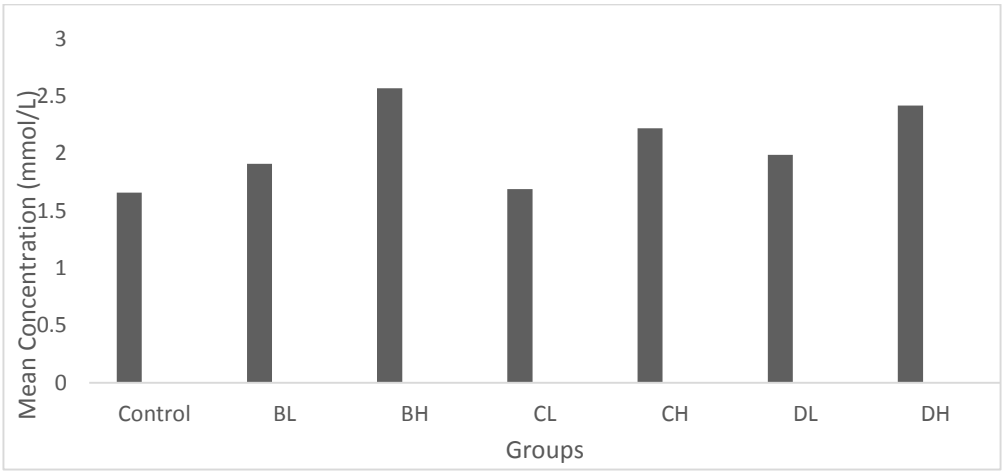

Fig 1: A graph showing the mean concentration of Total Cholesterol across different groups.

On the x- axis is the mean concentration in mmol/L

On the y-axis are the various groups, the Control Group, Group B (BL-Low dose); (BH- High dose), Group C (CL -Low dose); (CH (High dose), Group D (DL -Low dose); (DH- High dose).

It is important to note that "Figs 1-4 use the same graph layout and axis labelling conventions"

The f-value is 4.420 and the p-value is 0.045. The f-value indicated moderate differences between group means relative to within-group variability. The p-value is below 0.05 ($p<0.05$). So, the difference in Total Cholesterol across the groups is statistically significant.

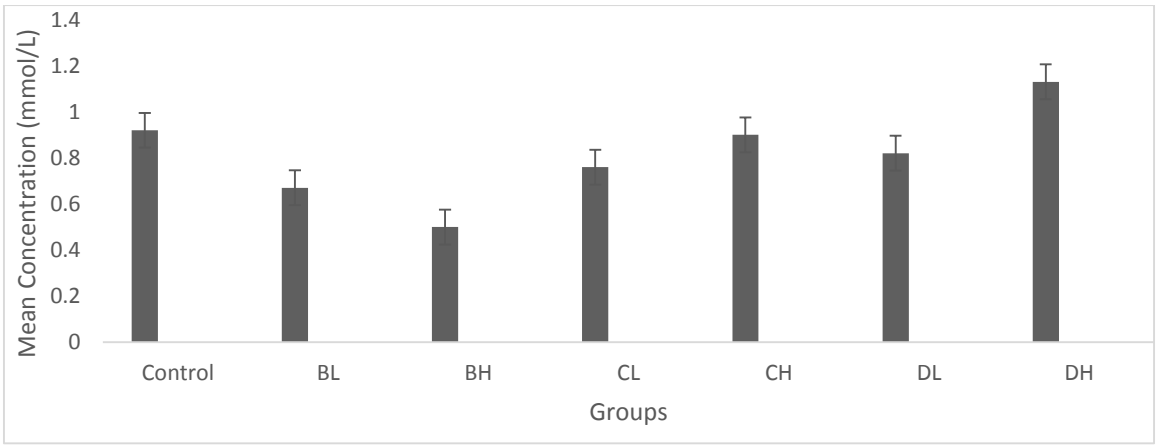

Fig 2: A graph showing the mean concentration of Triglyceride across different groups

The f-value is 1.550 and the p-value is 0.305. The p-value is above 0.05 (p>0.05). So, the difference in Triglyceride across the groups is not significantly different.

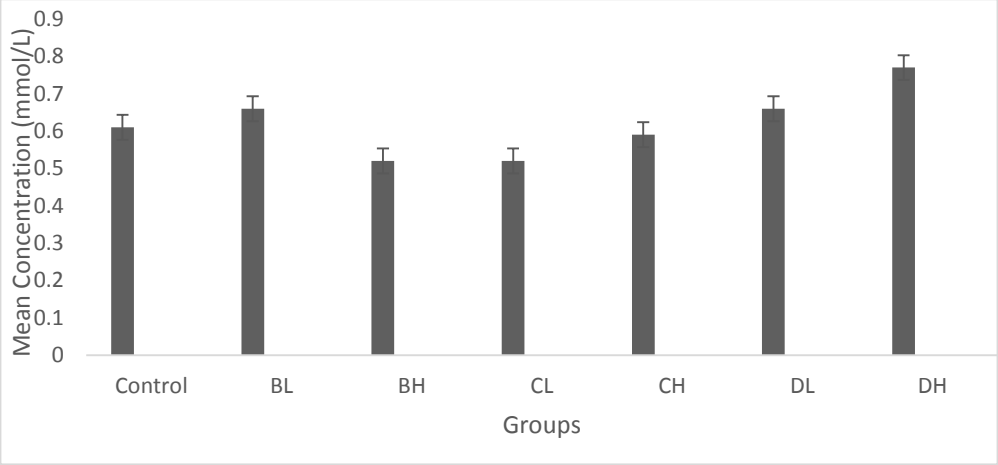

Fig 3: A graph showing the Concentration of High-density lipoprotein.

The f-value = 1.700 and the p-value = 0.267. The non-significant p-value (p>0.05) indicates no statistically significant differences in High-density lipoprotein levels across different groups.

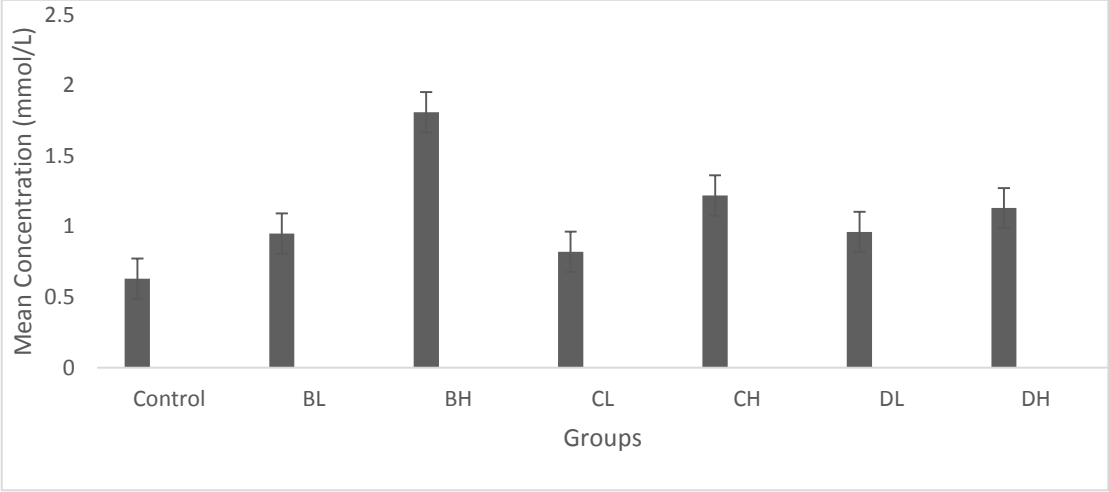

Fig 4: A graph showing the mean level of Low-density lipoprotein across groups

The f-value =2.266 and the p-value = 0.169. The non-significant p-value (p>0.05) indicates no statistically significant differences in High-density lipoprotein levels across different groups.

DISCUSSION

Total cholesterol (TCHOL) represents the sum of all cholesterol molecules in the blood. While cholesterol is necessary for cellular function and hormone synthesis, elevated (TCHOL) levels are associated with an increased risk of coronary artery disease and stroke (Benjamin et al., 2019). From Fig. 1, the value of Total Cholesterol ranged from 1.66±0.44 mmol/L (Control) to 2.57±0.03 mmol/L (Group BH). Group BH which was treated with 1,500 mg/kg of sample A, has the highest mean concentration, suggesting elevated cholesterol levels compared to other groups. A statistically significant difference was observed between groups (p<0.05). This indicates variations in total cholesterol levels across groups. Significant differences suggest some groups had notably higher or lower cholesterol levels. The values obtained in this research indicate that sample A may increase TCHOL, potentially due to differences in

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herbal composition or dosage, as also noted by Enechi et al., (2014), who observed variations in lipid-lowering effects among different herbal formulations.

There was no significant difference ($p>0.05$) between groups in Triglycerides (TAG), High-density lipoprotein (HDL) and Low-density lipoprotein (LDL) as reported in Figs 2, 3 and 4 respectively. This indicate that the groups were relatively similar in their levels.

Triglycerides are the primary form of fat storage in the body and are measured to evaluate an individual's metabolic health. From Fig. 2, TAG ranged from 0.50 ± 0.04 mmol/L (Group BH) to 1.14± 0.30 mmol/L (Group DH) as shown in Fig. 2. Group BH treated with 1,500 mg/kg of sample A, showed lower TAG, potentially reflecting the lipid-lowering effects of its herbal constituents.Adaramoye et al., (2011) reported that poly-herbal mixtures reduced TAG levels in rats due to their ability to enhance lipid metabolism and suppress lipogenesis. My findings align, as Group BH showed low level of TAG.

High-density lipoprotein,also known as "good cholesterol," removes excess cholesterol from tissues and transports it to the liver for excretion. HDL as in Fig. 3, ranged from 0.53±0.04 mmol/L in Group BH treated with 1,500 mg/kg of sample A, 0.53±0.15 mmol/L in Group CL treated with 500 mg/kg of sample B to 0.78±0.11 mmol/L in Group DH administered with 1500 mg/kg of sample C when compared with the control value (0.61±0.01 mmol/L). Studies by Ezekwesili et al., (2012) and Adebayo et al., (2017) found that poly-herbal formulations typically raise HDL levels due to their antioxidant properties, which promote reverse cholesterol transport.This result showed a similar trend as the HDL values within groups are high with Group DHhaving the highest HDL level, suggesting higher levels of good cholesterol.

Low-density lipoprotein is commonly referred to as "bad cholesterol" because it transports cholesterol from the liver to peripheral tissues, including blood vessel walls, where it can accumulate and form atherosclerotic plaques (Sniderman et al., 2019). The value of LDL in Fig. 4, ranged from 0.64±0.43 mmol/L (Control) to 1.82±0.08 mmol/L (Group BH). Enechi et al., (2014) observed that poly-herbal mixtures generally reduced LDL levels by inhibiting cholesterol absorption and enhancing bile acid excretion.Findings from this research,deviates from this report as all groups had elevated LDL values when compared with the control with Group BH treated with 1,500 mg/kg of sample A, having the highest value. This could reflect pro-lipidemic effects of certain herbs or over-dosage, as highlighted by Adedapo et al. (2009), who found that improper formulation of poly-herbals can sometimes worsen lipid profiles.

CONCLUSION

The values obtained in this research indicate that some poly-herbal mixtures may increase TCHOL and LDL levels, potentially due to differences in herbal composition or dosage. Elevated TCHOL levels are associated with an increased risk of coronary artery disease and stroke. The increase in LDL might indicate pro-lipidemic effects, and accumulation of LDL can form atherosclerotic plaques**.** There were also variations in doses especially with higher doses of the mixtures. This may require toxicity monitoring.

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