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Research Paper

Effects of Yaji on the Liver Enzymes of Adult Wistar Rats

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ABSTRACT:- *Yaji is a mixture of spices and additives that is used as sauce for meat delicacy in Nigeria called suya. Its effects on the liver enzymes, aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphate (ALP) were the main focus of this study. Twenty wistar rats of an average weight of 215g were used for the study and were divided into 4 groups designated as A, B, C and D, of five rats in each group. Group A served as the control and received 71g of normal feed (growers mash), while the experimental groups B, C, D received 71g of normal feed with 5g, 10g and 15g of yaji respectively. The administration of yaji lasted for 60 days. Twenty four hours after the last administration, the animals were anaesthetized under chloroform vapour and dissected. About 5ml of blood was collected from animals in all the groups by cardiac puncture. Serum samples from the blood were analyzed for liver enzymes activities using randox kit method. The results showed that there was a significant increase ($P<0.05$) in the activity levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphate (ALP) in group C and D relative to group A. Alkaline phosphate (ALP) activity level of group B also increased significantly. Group B also recorded a little increase in activity levels of AST and ALT but it is not statistically significant. Chronic consumption of yaji is therefore harmful to the liver.*

Keywords:- *Yaji, Liver Enzymes, Body Weight, Suya.*

I. INTRODUCTION

The liver is a large, complex organ that is well designed for its central role in metabolism different food products. The position of the liver in the circulatory system is optimal for gathering, transforming, and accumulating metabolites and for neutralizing and eliminating toxic substances [2]. It is involved with almost all the biochemical pathways related to growth, fight against disease, nutrient supply, energy production and reproduction. Because of its unique metabolism and relationship to the gastrointestinal tract, the liver is an important target for toxicity produced by drugs, xenobiotics, and oxidative stress [1].

Researchers have shown that herbal extracts including spices, have the potential to produce adverse effects, especially when used in concentrated forms. Further, these products may interact with other herbal products as well as drugs [5] and more than 900 drugs, toxins and herbs have been reported to cause liver injury and drugs account for 20–40% of all instances of fulminant liver failure [3]. Several common spices have also been implicated to be harmful to the body when consumed in excess [12]. With regard to this, yaji, a Nigerian meat sauce of complex mixture of spices and additives has raised a lot of attentions and has provoked several scientific investigations in determining the effects of yaji on the different organs of the body [7]. Yaji is used especially to serve a meat delicacy called suya [9]. Suya is a popular traditionally processed, ready to eat meat product that can be served or sold along streets, in club houses, at picnics, parties, restaurants and within institutions [6]. The spice constituents of yaji include ginger, cloves, red pepper and black pepper. The other three constituents are white magi (or Ajinomoto), salt and groundnut cake powder [8].

With the exception of ginger, other yaji-spices has been reported to caused acute hepatitis [7] [4] and is often reflected by biochemical abnormalities of 1 of 2 different hepatic systems or of liver function. Since abnormal liver enzyme levels may signal liver damage [10], this study is therefore aimed at evaluating the effects of yaji on the liver enzymes (AST, ALP, and ALT) of adult wistar rats.

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II. MATERIALS AND METHODS

2.1 Animals

Twenty (20) Wistar rats of an average weight of (215g) were used in this study and were obtained from the animal farm house, Department of Anatomy, Nnamdi Azikiwe University, Nnewi Campus. They were maintained under standard housing conditions and fed with standard rat chow (Growers mash) and provided with water ad libitum during the experiment. They were acclimatized for two weeks before the experiment.

2.2 Preparation of Experimental Substance

This study adopted the method used by [11]. The quantities were ginger (78g), clove (39g), Ajinomoto (white magi containing MSG) (150g), red pepper (22g), black pepper (30g), salt (100g), groundnut cake powder (230g). They were mixed appropriately together to produce yaji.

2.3 Experimental Designs

They animals were divided into four (4) groups (A-D) with five (5) in each group. Group A served as the control group while the other groups (B-D) served as the test groups. The animals were fed with growers mash, a product of Premier Feed Mills Co. Limited (A subsidiary of Flour Mills Nigeria Plc) in Sapele, Delta State, Nigeria.

The experiment lasted for 8 weeks and throughout the duration of the experiment, Group A was fed with 71g of normal feed (grower mash without yaji) while test groups B, C and D were fed with 71g grower mash plus 5g, 10g and 15g of yaji respectively for each day.

Twenty four hours after the last administration, the animals were weighed and recorded. The animals were sacrificed after anaesthetizing with chloroform; about 5ml of blood was collected from animals in all the groups by cardiac puncture using sterile syringes with needles. The blood is transfer into a dry sterile container without an anti-coagulant and allowed to clot to separate the cells from the serum. Serum samples are store in the refrigerator until the analysis of liver enzymes (AST, ALP and ALT) activities. Liver tissues were also removed and weighed.

2.4 Biochemical determinations

Biochemical parameters were assayed according to standard methods. Activity of the following serum enzymes was measured: Alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP) using randox kit method.

III. RESULTS

3.1 Morph metric Analysis of Body Weights

The result obtained from calculation of initial, final and weight change of the various groups are presented in Table 1 below

Table 1: Comparison of mean initial and final body weights in all groups.

Group	Group A	Group B	Group C	Group D
Initial body weight(g)	105.80±2.44	221.00±9.40	241.40±5.11	293.00±8.41
Final body weight(g)	198.00±5.83*	220.00±10.95≠	232.00±9.17≠	275.00±6.71*

(Values are expressed as Mean SEM, significant level, P is taken as 0.05).

Table 1 showed the weight changes as observed in the various groups of the experimental animals. Initial body weights were compared with the final body weights of each group. The result showed that group A (with initial weight of 105.80±2.44) showed a significant ($p<0.05$) increase in weight (198.00±5.83) and group D (with initial weight of 293.00±8.41) showed significant ($p<0.05$) decrease in weight (275.00±6.71). Group B (with initial weight of 221.00±9.40) and Group C (with initial weight of 241.40±5.11) showed a little decrease in weight (220.00±10.95 and 232.00±9.17 respectively). However, it is statistically non-significant (Table 1 and Figure 1).

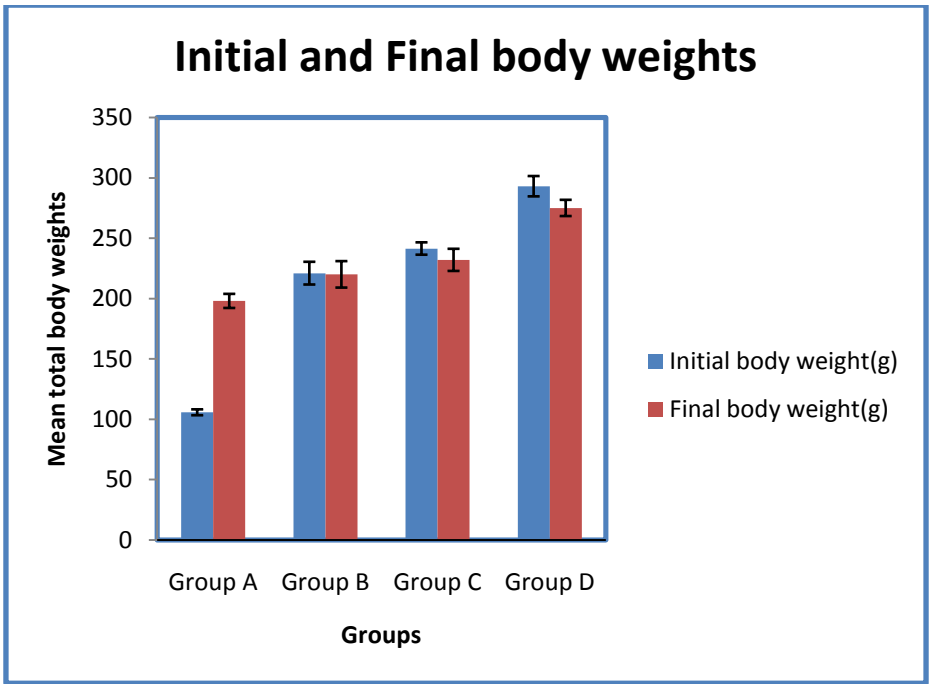

Figure 1: Bar chart showing the mean initial and final body weight

3.2 Morph metric Analysis of Liver Weights

Table 2: showing the mean liver weights and the comparison of relative liver weights of all the groups.

Group	Group A	Group B	Group C	Group D
Liver weight(mg)	6012.00±391.00	6454.00±389.00	7404.00±183.53	8444.00±398.36
Relative liver weight(mg/g)	30.47±2.25	29.38±1.30≠	32.12±1.48≠	30.65±0.82≠

(Values are expressed as Mean SEM, significant level, P is taken as 0.05.)

The liver weights and results obtained from the calculations of relative liver weights were presented in table 2. There was also a non significant difference ($p<0.05$) as comparing the relative liver weight (mg/g) in Group A (control) to those of test groups (Group B – D).

3.3 Analysis Biochemical Parameters

Table 3: Showing the Effects of Yaji on the Biochemical Parameters

Biochemical Parameters	Group A (Control)	Group B (5g of Yaji)	Group C (10g of Yaji)	Group D (15g of Yaji)	F-Ratio	Prob. of Signifance
Aspartate Aminotransferase (AST)	90.80±5.10	99.30±5.68	202.26±12.42	273.76±11.54	95.57	<0.0001
Alanine Aminotransferase (ALT)	48.86±2.32	53.84±4.10	123.80±15.33	213.38±13.59	53.58	<0.0001
Alkaline Phosphatase (ALP)	283.59±5.86	339.41±11.56	413.57±7.15	468.24±18.55	46.86	<0.0001

(Values are expressed as Mean SEM, significant level, P is taken as 0.05.)

Table 3 shows the result obtained from the calculations of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphate (ALP). There were a significant increase in the activity levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphate (ALP) in group C and group D relative to group A. Alkaline phosphate (ALP) activity level of group B also increased significantly. Group B also recorded a little increase in activity levels of AST and ALT but it is not statistically significant.

IV. DISCUSSION

Injury to the liver, whether acute or chronic, eventually results in an increase in serum concentrations of aminotransferases. AST and ALT are enzymes that catalyze the transfer of α-amino groups from aspartate and alanine to the α-keto group of ketoglutaric acid to generate oxalacetic and pyruvic acids respectively, which are important contributors to the citric acid cycle [10][13].

AST is usually found in a diversity of tissues, including mainly liver, heart, muscle, kidney and brain. ALT is, by contrast, generally found mainly in the liver. ALP is mainly concentrated in liver, bile duct, kidney, bone [14]. Although these enzymes are present in tissues throughout the body, they are most often elevated in patients with liver disease and may reflect liver injury [10].

This study observed an increase in these enzymes level. The increase is seen in dose depended manner. It shows that consumption of excessive yaji constitute a potential hazard to the liver. This observations support the report of [15] that yaji-spices are capable of causing necrosis of the hepatocytes and therefore acute hepatitis and it is on such condition that AST, ALT and ALP get abnormally elevated. In the liver, ALT is localized solely in the cellular cytoplasm, whereas AST is both cytosolic (20% of total activity) and mitochondrial (80% of total activity) [16]. These enzymes leak into the circulatory system due to altered permeability of membranes caused by injury to the liver cells [18]. Hepatic ALP is present on the surface of bile duct epithelia. Cholestasis enhances the synthesis and release of ALP, and accumulating bile salts increase its release from the cell surface [17]. The increase in enzymes activity levels may be as the result of harmful effects of excessive consumption of yaji on the liver cells and subsequent inability to excrete bile salts. Damage to other organs such as kidney and brain by yaji [20][19] may also contribute little to the elevated enzymes levels as seen in this study since this enzymes are found in them.

Apart from the observed effects on the liver enzymes, AST, ALT and ALP, this study also recorded a weight loss which is in line the research carried out by a group of Nigerian researchers [21]. Their findings stated a statistically non-significant ($P<0.05$) weight loss in the groups of experimental animals fed with 9g each of yaji constituents combined together. They suggested that the weight loss maybe due to combine effects of yaji-spices and additive since some spices have a number of established properties that make them effective in prevention and management of obesity.

V. CONCLUSION

This study showed that the consumption of yaji in large amount could cause liver failure/damage. This is seen from the elevated liver enzymes levels and it is one of biochemical indicator of liver injury. It follows that the consumption of yaji in excess caused injury to liver cells with subsequent release of these enzymes into the blood stream. If the consumption of large amount of yaji should be prolonged acute hepatitis may likely sets in.

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