

International Journal of Medicine and Health Profession Research

Journal home page: www.ijmhpr.com



THE EFFECTS OF YAJI ON THE HISTOLOGY OF THE KIDNEY OF ADULT WISTAR RATS

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ABSTRACT

Twenty wistar rats of an average weight of 215g were used for the study and were divided into 4 groups of 5 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 animals were sacrificed after 60 days (2 months) of administration of yaji. The result showed that the chronic consumption of yaji is harmful to the kidney causing a very slight glomerular congestion, slight hypertrophied glomeruli, stromal edema and lymphocytic cell aggregation.

KEY WORDS

Suya, Yaji, Monosodium glutamate, Clove, Kidney and Body weight.

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INTRODUCTION¹

Suya is a very popular meat delicacy in Nigeria, spiced up with a sauce called yaji. It is a boneless lean meat of mutton; beef or goat meat staked on sticks, coated with its sauce, oiled and roasted around a burning fire². 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 institutions¹.

The suya sauce, yaji is mixture of spices and additives. The spices in yaji are are ginger, clove, red pepper, black pepper³ and the spices contain gingerol⁴, eugenol⁵, capsaicin⁶, piperine⁷ as active

principle respectively. Its additives are white magi (Ajinomoto or Monosodium Glutamate), and table salt and the other constituent is groundnut cake powder³. These spices and additives are primarily used to add flavours and to enhance the taste to foods⁸⁻¹⁰. Three decades back, it was considered that though spices themselves contain significant concentration of some vitamins¹¹, the normal levels of use in foods make their nutritional contribution negligible¹².

The United States Food and Drug Administration, said spices are generally recognized as safe (GRAS) when used in therapeutic doses¹² but researches has 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 drugs¹³. Nigerian researchers have raised an alarm on the potential hazard on the excessive consumption of yaji which is a complex mixture of spices and additives due to the wide spread use of the yaji even in dishes other than suya. They reported that yaji and its components (separately or combined) are able to induce damage or tumor in some tissues/organs¹⁴⁻²⁰.

The kidney is a paired organ located in the posterior abdominal wall, whose major functions include the removal of toxic metabolites and waste products from the blood and regulation of the amount of fluid and electrolytes balance in the body. A toxic insult to the kidney therefore could disrupt any or all of these functions and could have profound effects on total-body metabolism²¹.

Although, there is a previous work on the histological effects of yaji-spices alone, individually and combined²⁰, this research is mainly to investigate the histological effects of yaji (the whole constituents of yaji combined) on the kidney.

MATERIALS AND METHOD

Experimental 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 and libitum during the experiment. They were acclimatized for two weeks before the experiment.

Preparation of Experimental Substance

This study adopted the method used by Nwaopara AO¹⁵. 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.

Experimental Protocols

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 and the kidney tissues removed and weighed.

Tissue Processing

For easy study of sections under microscope, the tissues passed through processes of fixation, dehydration, clearing, infiltration, embedding, sectioning and staining. Fixation was carried out in 10% formal saline for 10 hours. After fixation, the tissue washed in stream tap water. Dehydration of fixed tissue was done using ascending grade of alcohol, 50%, 70%, 90% and absolute. The tissue was clear in xylene after which infiltration was done in a molten paraffin wax at 60°C for two hours each in two changes. The embedding of the tissue was done in molten paraffin wax and was sectioned afterwards. Hematoxylin and eosine method was used in staining.

Statistical Analysis

Data were analysed using student's t-test of SPSS version 16 software package and $P < 0.05$ was considered as the level of significance.

RESULTS

MORPHOMETRIC ANALYSIS OF BODY WEIGHTS

The result obtained from calculation of initial, final and weight changes of the various groups are presented in Table No.1 and Figure No.1.

Table No.1 shows the comparison of mean initial and final body weights in all the groups. Initial body weights were compared with the final body weights of each group. The result showed that group A (Figure No.2) (with initial weight of 105.80 ± 2.44) showed a significant ($p < 0.05$) increase in weight (198.00 ± 5.83) and group D (Figure No.3) (with initial weight of 293.00 ± 8.41) showed significant ($p < 0.05$) decrease in weight (275.00 ± 6.71). Group B (Figure No.4) (with initial weight of 221.00 ± 9.40) and Group C (Figure No.5) (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 No.1).

HISTOPATOLOGICAL FINDINGS

The histopathological results obtained from various groups. It showed in Figure No.1-4.

DISCUSSION

The result of this study showed that the consumption of yaji in a large amount has toxic effects on the kidney. A very slight glomerular congestion, slight hypertrophied glomeruli, stromal edema and lymphocytic cell aggregation was observed in this study. This work add more information to a related work by Nwaopara *et al*²⁰ who reported several distinct round basophilic bodies in the interstitium of the renal cortex in a group of rabbits fed with 3g each of yaji-spices (ginger, clove, red pepper and black pepper) combined together. Individual administration of clove was observed to induce kidney damage²⁰. The report also shows that individual administration of ginger, black pepper and red pepper has no significance effects on the kidney of the adult wistar rats²⁰. This maybe because unlike

clove, ginger, black pepper and red pepper has been demonstrated to have antioxidant, prophylaxis²², and anti-inflammatory²³, antitumor²⁴ activities. Also, another report has demonstrated that water extract of dried black pepper does not cause subchronic and chronic toxicity, behavioral changes, mortality, changes on gross appearance or histopathological changes of internal organs of wistar rats²⁵. Histopathological changes observed in this study differ from that reported by Nwaopara *et al*²⁰ who work on yaji-spices only. The presence of yaji-additives, especially monosodium glutamate, maybe the cause of the differences in histopathological changes observed between this study and the previous work by Nwaopara and Co. For several studies has implicated monosodium glutamate to be toxic even in small dose by induction of oxidative stress in internal organs²⁶. A study by Manal and Nawal²⁷ reported adverse effects on kidney functions of adult rats as serum urea and serum creatinine were significantly increased when MSG at doses 0.6 and 1.6 mg/g body weight was administered for 14 days. This is supported by the study of Onyema *et al*²⁶ who also noted a significant increase in Kidney Function Tests (blood urea nitrogen, serum creatinine) and urinary albumin excretion. They also observed adverse histopathological changes that include swelling in the lining endothelium of the glomeruli, hydropic degeneration of the tubules with tubular dilatation and hyaline casts, dilatation of inter-tubular spaces, congestion of the cortical blood vessels with focal haemorrhage between the tubules. With the above evidences, one might say that the histopathological changes observed in this study was cause majorly by clove and monosodium glutamate though adverse effects of other yaji-spices cannot be overruled completely since large and concentrated extract of herbs and spices have the potentials to produce adverse effects¹³.

The observed weight loss in this study is in agreement with the work of Akpamu *et al*¹⁶ who reported 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 also suggested that with proper research yaji can be used in weight management.

Table No.1: Comparison of mean initial and final body weights in all groups

S.No	Group	Group A	Group B	Group C	Group D
1	Initial body weight(g)	105.80±2.44	221.00±9.40	241.40±5.11	293.00±8.41
2	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)

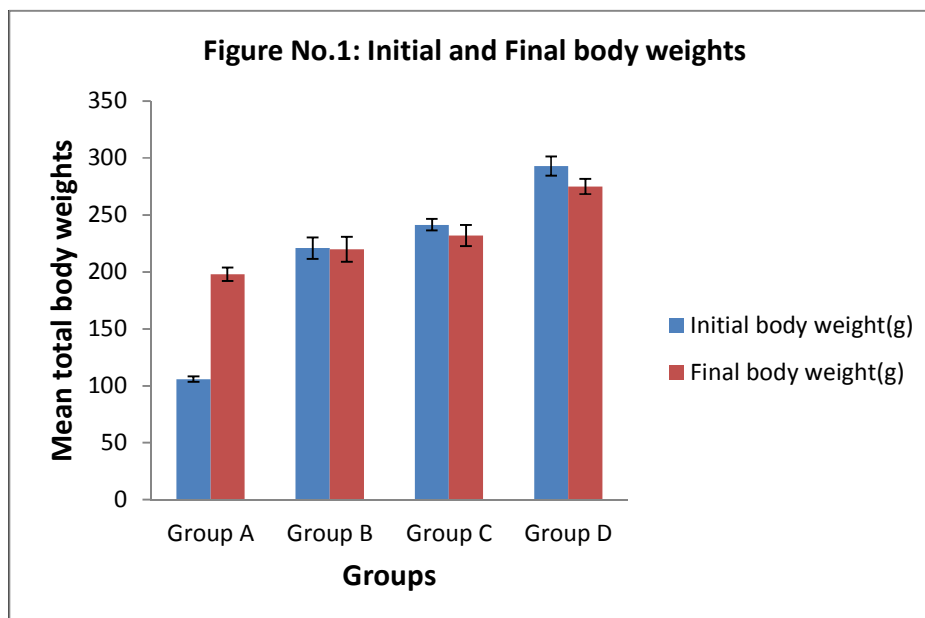


Figure No.1: Bar chart showing the mean initial and final body weight

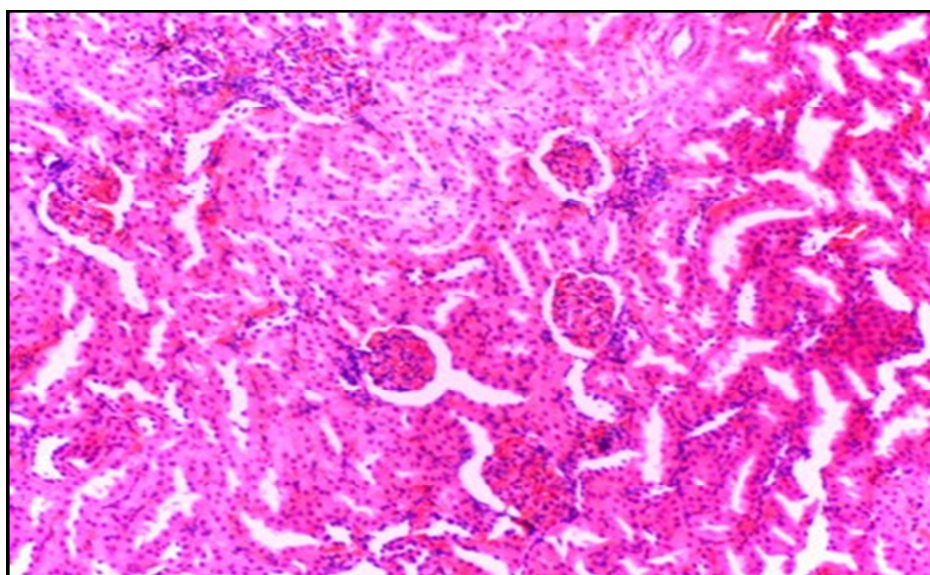


Figure No.2: Photomicrograph 1 of kidney of the Group A (Control Group). Normal architectural structure of the kidney. Magnification= x200

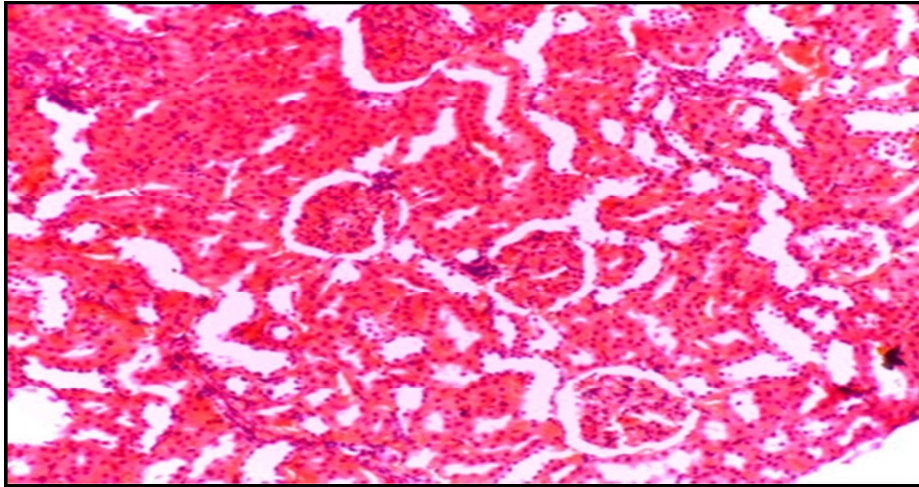


Figure No.3: Photomicrograph 4 of the Group D (Treated with 15g of Yaji). Showing very slightly hypertrophied glomeruli, stromal edema and lymphocytic cell aggregation. Magnification= x200

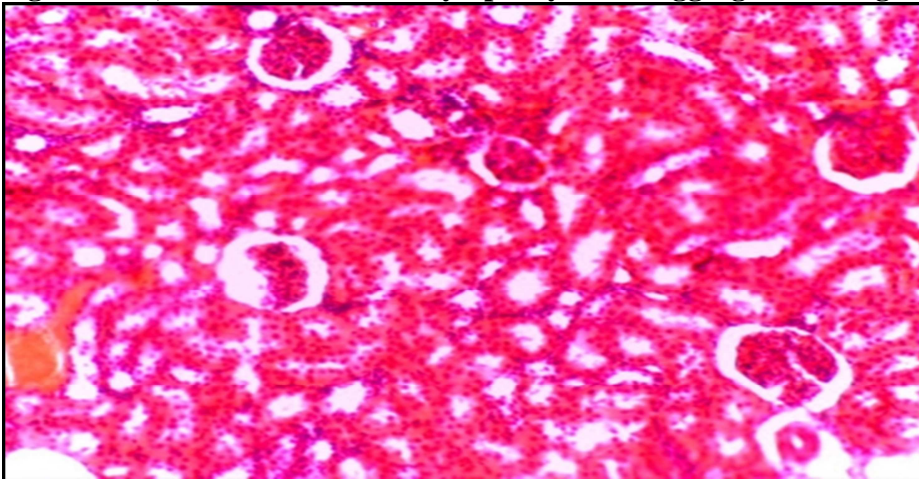


Figure No.4: Photomicrograph 2 of the Group B (Treated with 5g of Yaji). Showing no cellular changes. Magnification= x200

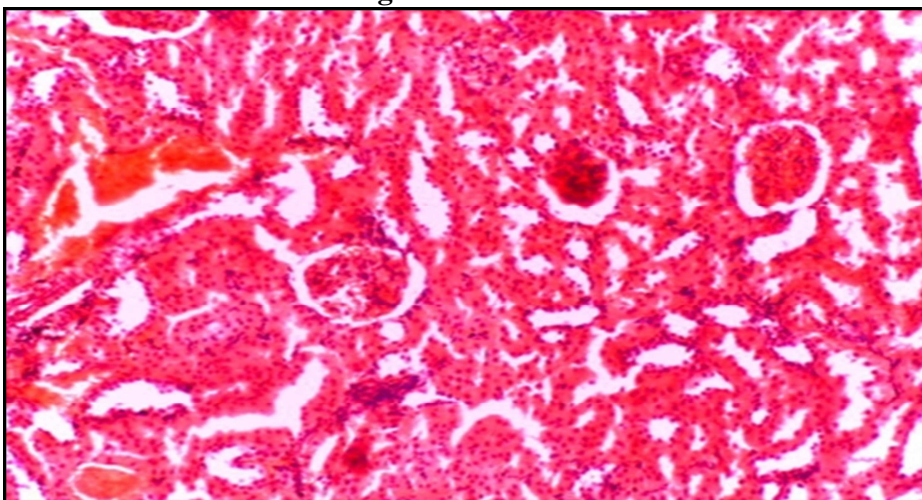


Figure No.5: Photomicrograph 3 of the Group C (Treated with 10g of Yaji). Showing very slight glomerular congestion and signs of edema. Magnification= x200

CONCLUSION

The result of this study showed that chronic consumption of yaji is harmful to the kidney as the histopathology revealed a very slight glomerular congestion, slight hypertrophied glomeruli, stromal edema and lymphocytic cell aggregation. If the administration of yaji should continue, it could lead to kidney failure.

ACKNOWLEDGEMENT

All authors would like to thank Department of Anatomy, College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria for continuous support and encouragement throughout this research work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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Please cite this article in press as: Ezejindu D N et al. The Effects of Yaji on the Histology of the Kidney of Adult Wistar Rats, *International Journal of Medicine and Health Profession Research*, 1(1), 2014, 8 - 14.