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EFFECTS OF CHRONIC ADMINISTRATION OF AQUEOUS ALCHORNEA CORDIFOLIA LEAF ON THE KIDNEY OF ADULT WISTAR RATS

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SUMMARY

Effects of chronic administration of aqueous extract of alchornea cordifolia leaf commonly used in the treatment of diarrhoea, cough, gonorrhoea, chest pain and anemia on the kidney of adult wistar rats was investigated. Rats of both sexes (n=20), with an average weight of 200g were randomly assigned into test (n=10) and control (n=10) groups. Rats in the test group were given the aqueous extract of alchornea cordifolia leaf at a single dose of 250mg/kg body weight daily for thirty days through the orogastric tube administration while the control group received equal volume of distilled water through the same route and for the same period. Rats were fed with grower's mash obtained from Edo Feeds and Flour Mill Limited, Ewu, Edo state, Nigeria. Rats were sacrificed by cervical dislocation method on the thirty-first day of the experiment and the kidney was carefully dissected out, dried, weighed, and quickly fixed in 10% formal saline for further routine histological study. Findings indicated that the kidney in the test group (group B) showed some level of distortion and disruption of the cytoarchitecture of the renal cortical structure with marked diffuse glomerulonephritis and an enlarged Bowman's space as compared to the control group. Findings also indicated that there was a significant ($P < 0.05$) decrease in weights (g) of the test kidney as compared to the control group. Chronic administration of aqueous extract of alchornea cordifolia leaf may therefore have an adverse effect on the kidney of adult wistar rats. It is recommended that further studies aimed at corroborating these observations be carried out.

Keywords: Morphology effects, Alchornea cordifolia, Kidney, Wistar rats.

INTRODUCTION

Alchornea cordifolia leaf extracts have been reportedly used in various African countries in the treatment of venereal diseases, conjunctivitis, dermatoses, stomach ulcers, bronchitis, cough and toothache (le Grand and Wondergem, 1987; le Grand, 1987). It is also used in the treatment of urinary tract infection, infected wound, diarrhoea, piles, dental caries, chest pain, yaws, rheumatic pain and anaemia (Dalziel, 1956; Gbile and Adeshina, 1986; Ogungbamila and Samuelson, 1990; Macfoy and Sama, 1990; Kambu, 1990; Muanza et al., 1994). Extracts from the leaves of alchornea cordifolia have been reported to inhibit the growth of bacteria such as staphylococcus aureus, staphylococcus albus, Eschericha coli, bacillus spp. and pseudomonas aeruginosa (Ogunlana and Ramstad, 1975; Ebi, 2001). Alchornea cordifolia plant extract has an anti-inflammatory activities (Osadebe and Okoye, 2003; Manga et al., 2004; Mavar –Manag et al., 2008) and causes regeneration of pancreatic B- cells after alloxan induced diabetic in mustan rats (Eliakim-Ikechukwu and Obri. 2009).

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Since the kidney is involved in the excretion of many toxic metabolic waste products, including the nitrogenous compounds, it would therefore be worthwhile to examine the effects of alchornea cordifolia on the kidney of adult wistar rats. The purpose of this experiment is to evaluate the possible effects of alchornea cordifolia on the morphology of the kidneys of adult wistar rats.

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MATERIALS AND METHODS

The School of Basic Medical Sciences, University of Benin granted approval before the commencement of the work. Twenty adult Wistar rats of both sexes with average weight of 200g were randomly assigned into two groups: A and B of ten rats each in a group. Group A served as control group (n=10) while group B (n=10) served as the test group. The rats were obtained and maintained in the Animal Holding of the Department of Anatomy, School of Basic Medical Sciences, University of Benin, Benin city, Edo State, Nigeria. The animals were caged in wooden cages with raised wire floors based on their sex to avoid pregnancy, fed ad libitum with grower's mash obtained from Edo Feeds and Flour Mill Limited, Ewu, Edo State, Nigeria. Alchornea cordifolia leaves where obtained within the university of Benin premises and taken to the Department of Pharmacognosy, Faculty of Pharmacy, University of Benin for proper identification. The leaves were washed free of debris and dust particles and were air dried at room temperature for two weeks. The dried leaves were blended into dry powder. 1000g of the alchornea cordifolia powder was extracted with 1.5 litres of distilled water using soxhlet apparatus and concentrated by rotary evaporator at 650C. It was then transferred into suitable container and freeze dried ready for the experiment. All the preparations were performed in the Department of Pharmacognosy, Faculty of Pharmacy, University of Benin, Edo state, Nigeria.

Animals in the test group received the aqueous extract of alchornea cordifolia leaf at a single dose of 250mg/kg body weight daily for thirty days through the orogastric tube administration while the control animals received equal volume of distilled water through the same route and for the same period. The rats in both groups were sacrificed by cervical dislocation on the thirty-one day of the experiment and the abdominal region was quickly opened and the kidneys dissected out, weighed and fixed in 10% formal saline for routine histological techniques. The tissues were dehydrated in an ascending grade of alcohol (ethanol), cleared in xylene and embedded in paraffin wax. Serial sections of 7 microns thick were obtained using a rotatory microtome. The deparaffused sections were stained routinely with haematoxyline and eosin (Drury et al., 1976). Photomicrographs of the desired results were obtained using research photographic microscope. The body weights of the rats in both groups were determined to the nearest gram. The mean weights of the kidney obtained from the control and test groups were recorded and compared statistically using the unpaired sample t-test and symmetric measured test of the Statistical Package for Social Sciences (SPSS). The results were calculated using mean and standard error of mean (SEM) respectively (Adjene and Arukwe, 2009).

RESULTS

The findings indicated that there was a significant ($p < 0.05$) decrease in weights (g) of the test kidneys as compared to the control group (Table 1). The photomicrograph of the kidney in the control group (group A) showed normal histological features with a detailed cortical parenchyma and the renal corpuscles appearing as dense rounded structure with the glomerulus surrounded by a narrow Bowman's space (figures 1 & 3) while the section of the tested kidney (group B) showed some level of distortion and disruption of the cytoarchitecture of the renal cortical structure with marked diffuse glomerulonephritis and an enlarged Bowman's space as compared to the control group (figures 2 & 4).

DISCUSSION

The finding indicated that there was a significant ($P < 0.05$) decrease in the weight (g) of the test kidney as compared to the control group. The result obtained in this experiment is probably due to the chronic administration of aqueous extract of alchornea cordifolia leaf on the kidney. It appeared that chronic administration of aqueous extract of alchornea cordifolia is not as harmless as generally believed.

TABLE 1: THE MEAN WEIGHT (g) OF THE KIDNEYS OF THE ANIMALS

Parameters	Groups of Animals	
	Group A Control (n=10)	Group B Test (n=10)
Body Weight (g)	*244 ± 9.39	Effects of chronic administration of aqueous *232 ± 7.72
Right kidney Weight (g)	*0.74± 0.03	*0.62 ± 0.02
Left kidney Weight (g)	*0.72 ± 0.04	*0.64 ± 0.03

*significant (P < 0.05) Values represent mean ± SEM

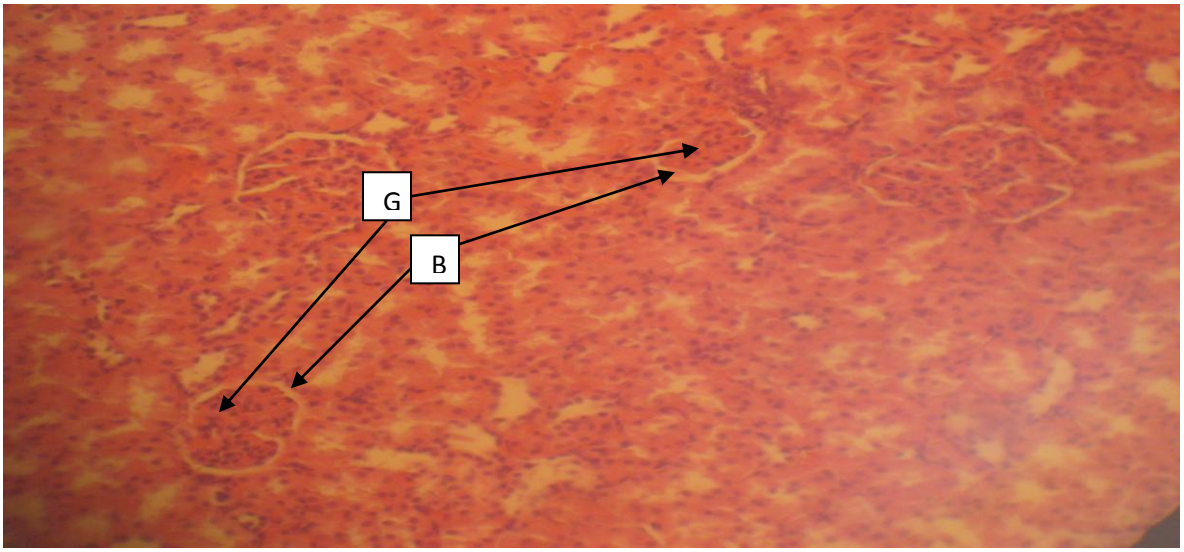

Figure 1: Control section of the Kidney showing the Glomerulus (G) and Bowman's space (B). (H & E x100)

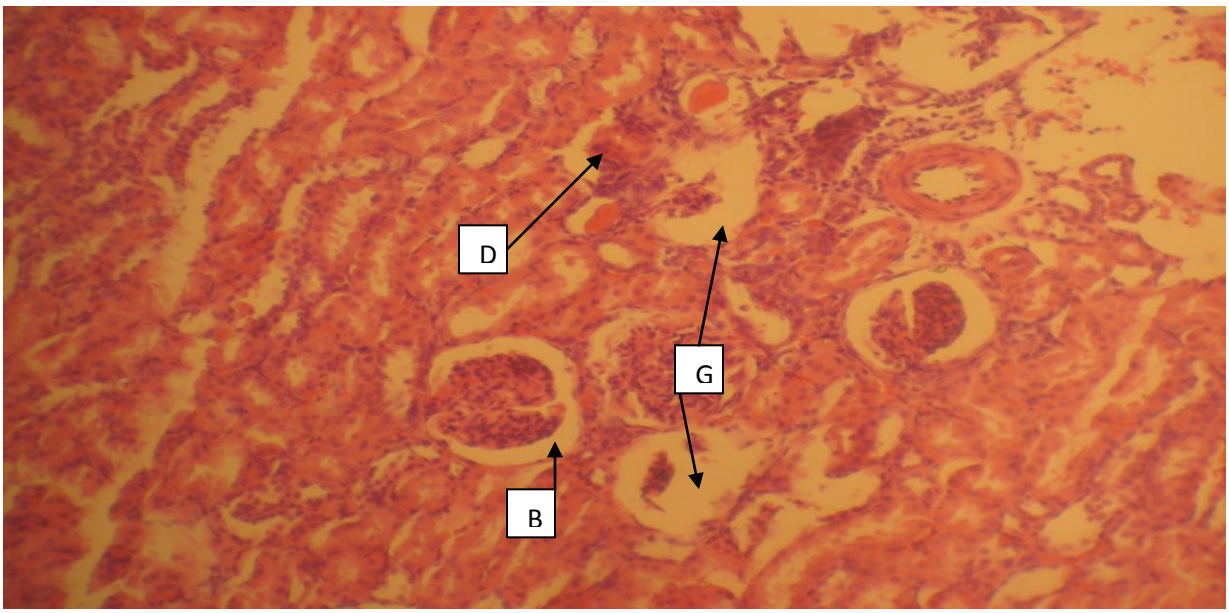

Figure 2: Tested section of kidney showing diffuse glomerulonephritis (G), dilated Bowman's space (B) and distorted glomerulus (D). (H & E Method x100)

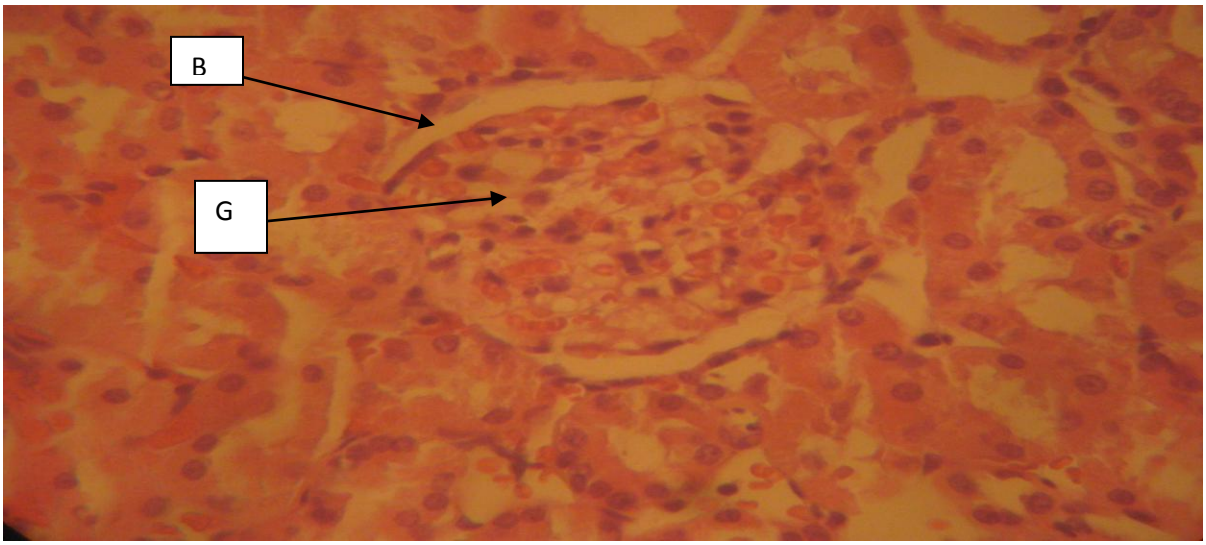

Figure 3: Control section of kidney showing the glomerulus (G) and Bowman's space (B) (H & E Method x400)

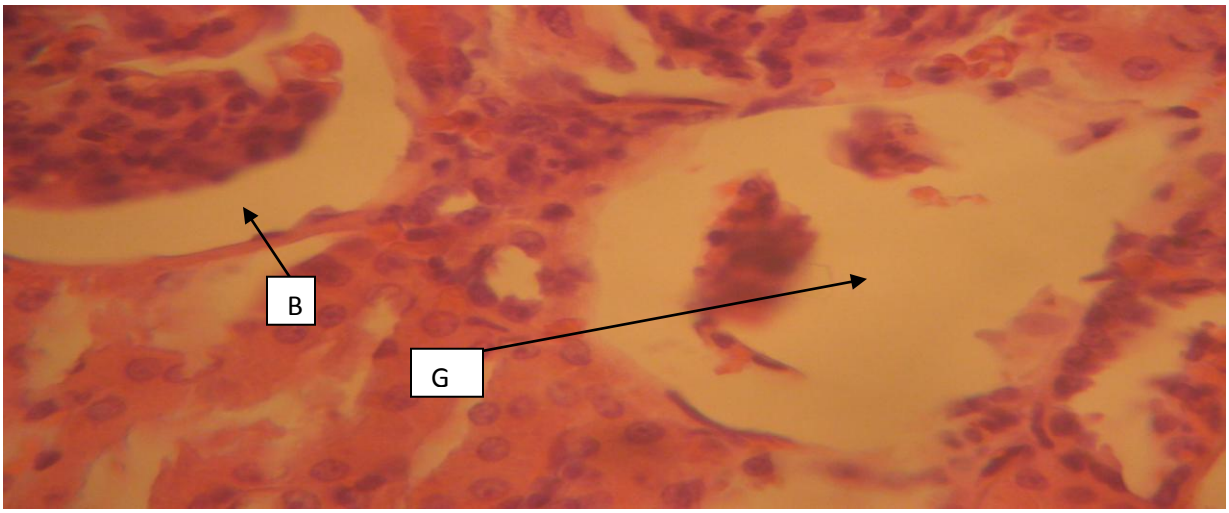

Figure 4: Tested section of kidney showing diffuse glomerulonephritis (G), dilated Bowman's space (B). (H & E Method x400)

The observed changes in weight concerning the alchornea cordifolia treated kidneys might be due to the cytotoxic effect of alchornea cordifolia on the kidney. As tissue shrinks as seen in this study, the activity of the cellular transporters is approximately modified by the up or down regulations as has been reported in the case of hyponatramia or hypernatremia (Johanson, 1995). Ischemia or pharmacologic disruption of cellular transporters can cause swelling of parenchyma of any organ. The pharmacologic disruption of the kidney weights caused by alchornea cordifolia extract is a cardinal feature of the results of this experiment. There are many different causes of cell swelling or shrinkage, including drug poisoning, water intoxication, hypoxia, and acute hyponatremia (Johanson, 1995). Under such conditions, there is a net shift of water from the extracellular space to the interior of the cells (Johanson, 1995). The significant decrease associated with the weight of the kidney in this experiment usually involves intracellular swellings or shrinkage of the endothelia (Johanson, 1995).

The photomicrograph section of the tested kidney showed some level of distortion and disruption of the cytoarchitecture of the renal cortical structure with marked diffuse glomerulonephritis and an enlarged Bowman's space as compared to the control section. The distortion and disruption of the cytoarchitecture of the kidney observed in this experiment may have been associated with the functional changes that could be detrimental to the health status of the animals. The obvious signs of the marked diffuse glomerulonephritis observed in this experiment may have been due to the cytotoxic effects of alchornea cordifolia extract on the microanatomy of the kidney. These findings implicated long term administration of alchornea cordifolia as a possible precipitant of kidney disease by causing distortion and disruption of the renal cortical structures in the microanatomy of the kidney. Pathological or accidental cell death is regarded as necrotic and could result from extrinsic insult to the cell as osmotic, thermal, toxic and traumatic effects (Farber et al., 1981). The process of cellular necrosis involves disruption of membranes, as well as structural and functional integrity. Cellular necrosis is not induced by stimuli intrinsic to the cells as in

programmed cell death, but by an abrupt environmental perturbation and departure from the normal physiological conditions (Martins et al., 1978). In cellular necrosis the rate of progression depends on the severity of the environmental insults. The greater the severity of the insults, the more rapid the progression of neuronal injury (Ito et al., 1975). The principle holds true for toxicological insult to the brain and other organs (Martins et al., 1978). It may be inferred from the present study that prolonged consumption of alchornea cordifolia may have resulted in the toxic effects on the kidney. The result obtained in this experiment is in consonance with the work carried out by Enaibe et al., (2007) where they reported that administration of camphor resulted in mild edema with glomerulonephritis, glomerular lobulation, tubular necrosis and congestion of blood cell in the kidney of rabbit. It has been reported that administration of damiana (Turnera diffusa) to a matured Wistar rats resulted in the distortion of the renal cortical structures, reduced size and number of the renal corpuscles and some degree of cellular necrosis in the histology of the kidney (Enaibe et al., 2007). In this experiment, alchornea cordifolia may have acted as toxin to the cells of the kidney thus resulting in the distortion and disruptions of the renal cortical structures with marked diffuse glomerulonephritis and an enlarged Bowman's space. The result of this experiment is also in line with the work carried out by Adjene et al., (2010) where it was reported that chronic consumption of soda pop drinks resulted in some varying degree of distortion and disruption of the cytoarchitecture of the renal cortical structures, diffuse glomerulonephritis with some congestion and tubular necrosis in the microanatomy of the treated kidney of adult wistar rats as compared to their corresponding control.

In conclusion, our findings indicated that chronic administration of aqueous extract of alchornea cordifolia leaf resulted in a significant decrease in weight, distortion and disruptions of the cytoarchitecture of the renal cortical structures with marked diffuse glomerulonephritis and an enlarged Bowman's space of the test kidney as compared to the control. With these results, it is probable that the functions of the kidney may be adversely affected. We recommend that further studies aimed at corroborating these findings be carried out.

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