Asian Journal of Biological and Life Sciences | Original Research

Histomorpholollgical effects of aqueous extract of ginger (rhizome) on the liver and kidney after paracetamol toxicity

Ebeye O.A, Ekundina V.O.* and Ugbeh I.

Department of Human Anatomy and Cell Biology, Faculty of Basic Medical Sciences Delta State University, Abraka.

E-mail : kemvic30@gmail.com Contact No : +2348038836691

Submitted : 26.01.2014 Accepted : 25.02.2014 Published : 30.04.2014

Abstract

This study accessed the Histomorphological effect of the aqueous extract of ginger (rhizome) on the liver and kidney morphologies of an adult wistar rats after paracetamol toxicity. Twenty (20) adult wistar rats weighing between 150g-200g were assigned into four groups with five rats in each group. Group 1 served as negative control; while group two were given oral administration of paracetamol (150mg/150g) to induce toxicity, the third group was also given paracetamol at the same dose level as those in group two followed by oral administration of 1ml of the final aqueous extract of ginger (24mg/ml), and the fourth group served as positive control. Result revealed a slight reduction in the body weight of rat treated with paracetamol (group 2) while the body weight of group 1, 3 and 4 were not statistically significant. Histological, the result revealed that treating animals with paracetamol induced various histological changes in the liver and kidney morphologies. These changes include portal vein congestion, moderate pereportal and intarparenchymal fibrosis and moderate sclerosis of the glomeruli. Treating animals with the aqueous extract of ginger in paracetamol toxicity led to an improvement in the histological changes.

Key words : Heteropoda, Household pest, Painfull bite, Egg sac

INTRODUCTION

Paracetamol is a widely used non prescription analgesic and antipyretic agent. It is a suitable substitute for aspirin in patients with gastric intolerance and bleeding tendencies [1]. Therefore, it is not surprising that it is often involved in episodes of accidental or deliberate self poisoning [2].However, the hepatotoxicity effects of paracetamol is exerted by the toxic metabolite N-acetyl p benzoquinoneimine formed through the cytochrome P450 drug metabolizing system [3,4]. On the other hand, extensive investigations have been conducted on the hepatotoxicity as well as general toxicity of paracetamol [5,6].

Many medicinal plants are used today in therapy of different diseases. Moreover, ginger is example of botanical which is gaining popularity amongst physicians and its underground rhizomes are the medicinal useful part [7]. However, one of the most popular uses of ginger is to relief the symptoms of nausea and vomiting associated with motion sickness, surgery and pregnancy [8]. Many studies were carried out on ginger and its pungent constituents, fresh and dried rhizome. Among the pharmacological effects demonstrated is anti-platelet, antioxidant, anti-tumor, and anti-arthritic effect [9, 10, 11]. The present work was conducted to study the histomorpholollgical effect of the aqueous extract of ginger on the liver and kidney morphologies during paracetamol toxicity.

MATERIALS AND METHOD

Chemicals

Paracetamol- the inducer

Preparation of aqueous ginger extract

The aqueous extract of ginger was made according to the method of [11] by washing of fresh rhizomes of ginger several times with water. The washed rhizomes of ginger were then chopped and air dried at room temperature for three days prior to pulverization using the electric blender. 125g of the pulverized rhizomes were then macerated in 1000ml of distilled water for 12h at room temperature and were then filtered through a 5mm filter to obtain the final aqueous extract. The concentration of the extract is 20mg/ml equal to 120mg/kg.

In this study, each rat was orally given 1ml of the final aqueous extract [11].

Animals and treatment

Twenty female albino rats weighing 150- 200g were purchased from the animal unit of the Department of Anatomy and Cell Biology, College of Basic Medical Sciences, Delta State University, Abraka. The animals were kept in cages to acclimatize with conditions of the animal housing facility with ambient temperature 26^0C 28^0C and adequate ventilation for at least one week before and throughout the experimental work.

The rats were divided into 4 groups consisting of 5 rats per group and were treated as follows:

Group 1 served as negative control

Group 2 Were given oral administration of paracetamol (150mg/150g) paracetamol toxicity [12]. once per week for three weeks.

Group 3: Were given oral administration of paracetamol as those in group 2, followed by oral administration of 1 ml of final aqueous extract of ginger (20mg/ml) 3 times weekly for three weeks.

Group 4: Were given oral administration of 1ml of final aqueous extract ginger for three weeks (Positive control).

The treatment lasted for 3 weeks, and the animal were sacrificed by chloroform inhalation method. Following sacrifice, the liver and kidneys were dissected out and fixed in 10% buffered formalin. Fixed tissues were processed to obtain paraffin sections of 5µm thickness. Section were stained with haematoxylin and eosin for histological examination and mounted with DPX and then viewed under the light microscope were digital photomicrography were obtained.

RESULTS

Table 1. Showing the Histomorphological effects of aqueous extract of ginger (rhizome) on the liver and kidney after paracetamol toxicity on the total body weight of the animals

GROUPS (grams)	INITIAL	WEEK ONE	WEEK TWO	WEEK THREE
Group 1 (Control)	156 ± 3.74	161.3 ± 3.71	166.3 ± 3.71	167.5 ± 2.24
Group 2 (PCM)	210 ± 5.48	200 ± 7.07	190 ± 7.07	177.5 ± 5.0
Group 3 (PCM + GINGER)	185 ± 6.33	187 ± 5.09	188 ± 4.0	189 ± 4.89
Group 4 (GINGER)	164 ± 3.74	165 ± 3.16	170 ± 3.16	171.3 ± 1.23

The values are expressed in mean ± S.D (standard deviation) n =5.

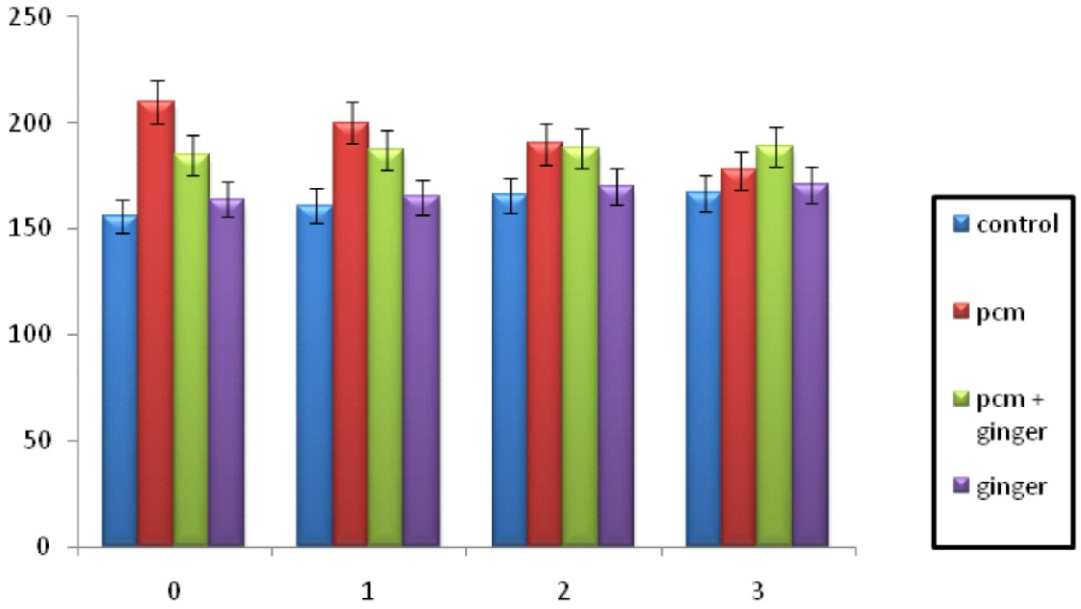

Fig 1. Showing the effect of ginger and /or paracetamol (PCM) on the total body weights of rat (mean ± S.D)

Table 2. Showing the Histomorphological effects of aqueous extract of ginger (rhizome) on the liver and kidney after paracetamol toxicity on the organs weight (liver and kidney)

ORGAN WEIGHT (grams)	LIVER	KIDNEY
Group 1 (CONTROL)	4.17 ± 0.96	0.45 ± 0.63
Group 2 (paracetamol (PCM)	6.82 ± 1.67	0.69 ± 0.16
Group 3 (PCM + GINGER)	4.58 ± 0.86	0.52 ± 0.13
Group 4 GINGER	4.28 ± 0.45	0.46 ± 0.05

The values are expressed in mean ± S.D (standard deviation) n =5.

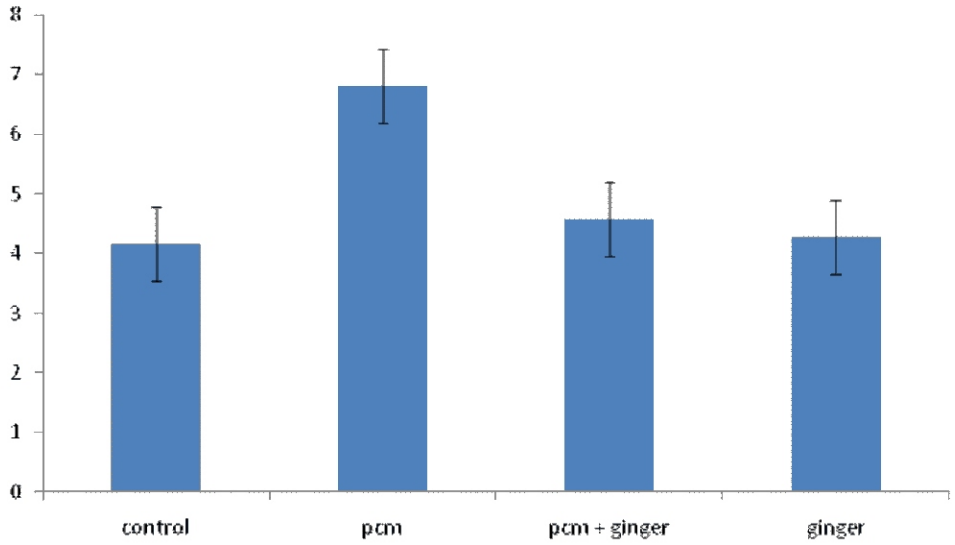

Fig 2. Showing the Histomorphological effects of aqueous extract of ginger (rhizome) on the liver

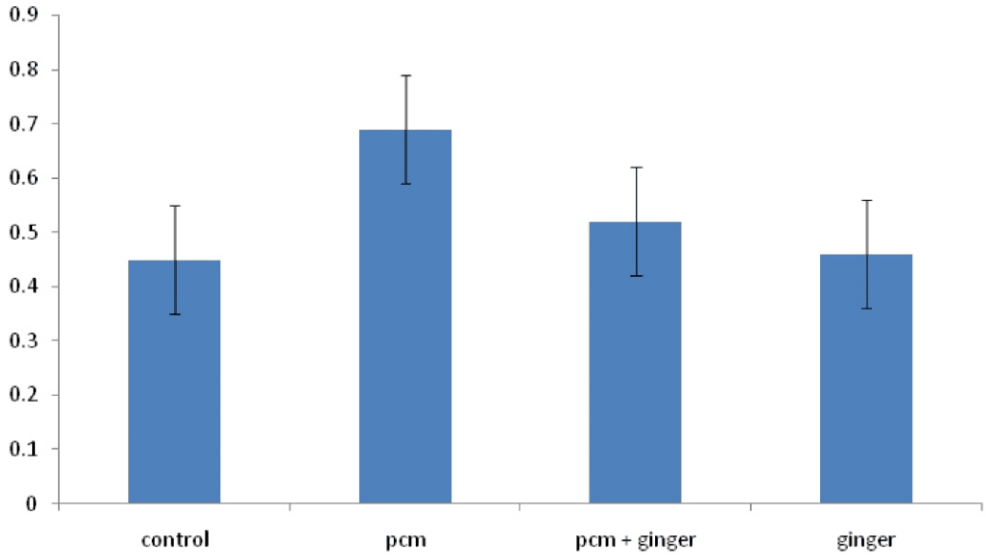

Fig 3. Showing the Histomorphological effects of aqueous extract of ginger (rhizome) on the kidney

HISTOLOGY RESULTS

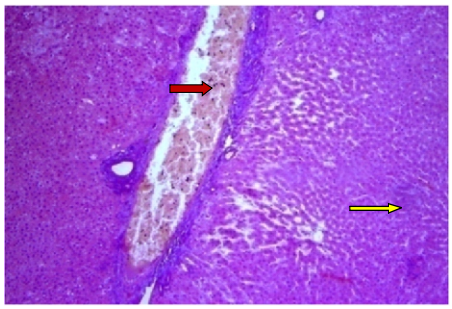

PLATE 1 Liver section (control)

Section of the liver from control group (group1) showing hepatocyte (yellow arrow) disposed in sheets. The cells are composed of eosinophilic cytoplasm with centrally placed nuclei. Portal triad (red arrow) composed of veins; bicapilary hepatic arteries are also seen. Magnification; X100

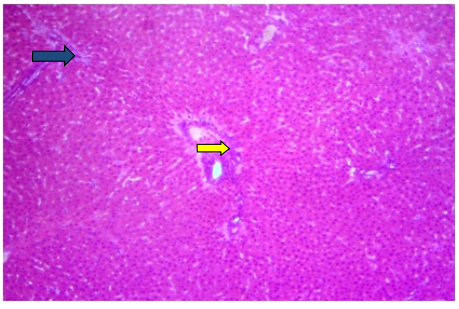

Plate 2 Liver section paracetamol

Section of the liver from paracetamol treated group (group 2) showing hepatocyte with vesicularnuclei, congested portal vein (Yellow arrow), moderate periportal and intraparenchyamal fibrosis (Blue arrow) are prominent. Magnification; X100

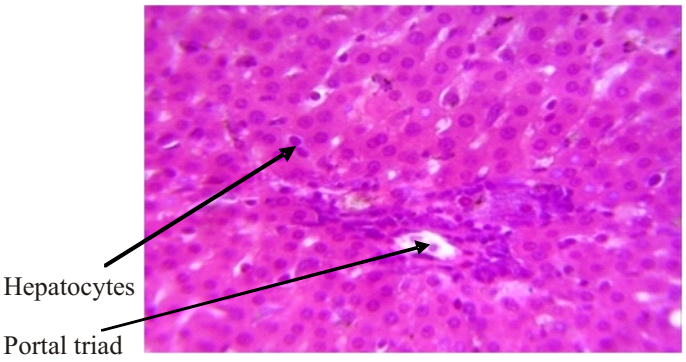

Plate 3 liver section (paracetamol + ginger)

Section of the liver from paracetamol + ginger treated rats (group 3) showing the same histological features as control group with mild periportal fibrosis. Magnification; X400

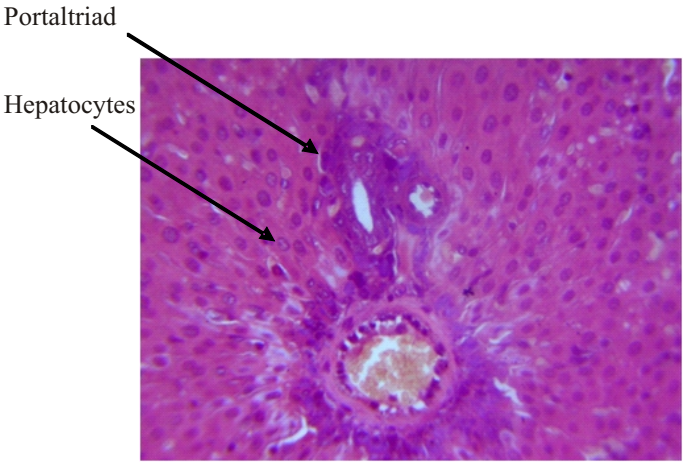

Plate 4 liver section (ginger)

Section of the liver from group 4 (positive control) showing the same histological features as control with the hepatocyte laden with a glycogen like substance in most cells. Magnification; 100X

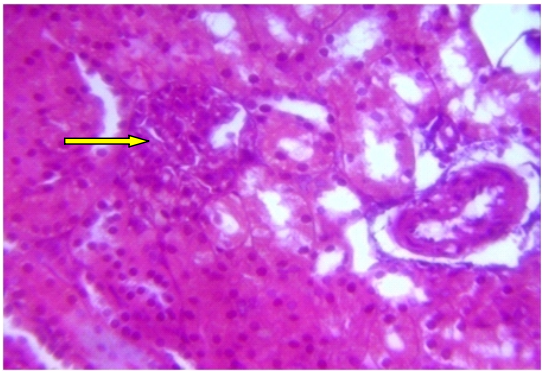

Plate 5 kidney section (control)

Section of the kidney from group 1(control) showing renal corpuscle (arrow) composed of glomeruli and bowman's capsule with renal tubules dispose within a loose connective tissue stroma.

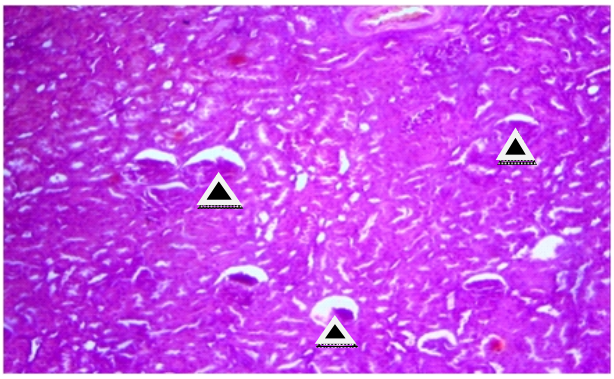

Plate 6 kidney section (Paracetamol)

Section of the kidney from paracetamol treated rats (group 2) showing moderate glomeruli sclerosis with several showing moderate collapse and several renal corpuscle and tubules within the cortex separated by a thin fibrous connective tissue stroma. Magnification; X100

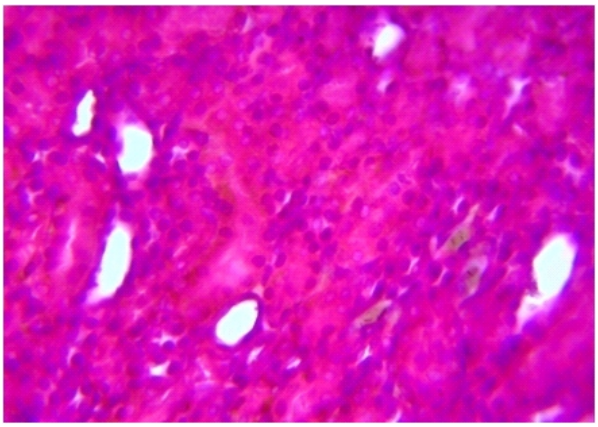

Plate 7 kidney section (paracetamol + ginger)

Section of the kidney from paracetamol + ginger treated rats showing the same histological features as control group (group 1) with few foci of congested blood vessels and fibrosis. Magnification; X400

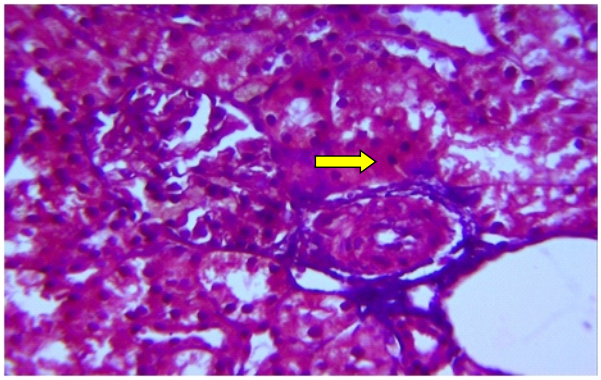

Plate 7 kidney section (paracetamol + ginger)

Section of the kidney from paracetamol + ginger treated rats showing the same histological features as control group (group 1) with few foci of congested blood vessels and fibrosis. Magnification; X400

DISCUSSION

The present study indicated the adverse effect of paracetamol on the liver and kidney morphologies. Histological result showed that paracetamol induced many alterations. These are; portal vein congestion, intarparenchymal fibrosis, periportal fibrosis, and sclerosis of the glomeruli with moderate collapses. However, similar observations were obtained by some investigators. Sangecta[5], reported that paracetamol has been shown to induce hepatic necrosis and massive haemorrhagic patches[5],[6] has also reported that paracetamol has been shown to induce sinusoidal dilation, vacuolations, cell shrinkage and less distinct nuclei and also a slight loss of glomerular architecture, slight cell shrinkage, inflammation of tubules and glomerulus and less distinct nuclei. Generally, the hepatotoxicity of paracetamol has been reported to be caused by the formation of N- acetyl-p-benzoquinoneimine (NAPQI), which is a toxic metabolite [13].

The result also showed that, treating rat with paracetamol and ginger (plate 3 and 4) improved the histopathological changes induced in the liver and kidney by paracetamol. This indicated the effectiveness of ginger in prevention of paracetamol hepatotoxicity. Also, the effect of ginger on hepatic damage was studied by some investigators. Saber [14] tested the effect of the aqueous extract of the rhizome of Z. officinale against adriamycin induced hepatotoxicity in albino rats. However, Ginger extract was found to have a protective effect on adriamycin induced hepatoxicity as confirmed by histopathological examination on the liver. Ahmed [15] also studied the effect of ginger extract against cisplatin-induced hepatotoxicity and cardiotoxicity in rats. Their results showed that, administration of ginger extract (1g/kg/day) restored the liver architecture to normal. Ajith [16]reported that ginger ameliorated cisplatin- induced nerphrotoxicity and this protection is mediated other by preventing the cispaltin-induced decline of renal antioxidant defense system or by their direct antioxidant defense system or by their direct free radical scavenging activity.[17] also reported the protective effect of ginger against the damage inflicted by reactive oxygen species. Their findings however, imply that reactive oxygen species play a causal role in ischemia / reperfussion induced renal injury, and ginger exerts renoprotective effect probably by the radical scavenging and antioxidant activities. More so (lakshmi et al., 2010[18] reported the protective effect of ginger on Gentamicin induced Nephrotoxicity in rats. It was observed that the ethyl acetate extract and fresh juice extract of zingiberofficinale significantly protect rat kidneys from gentamicin- induced histopathological changes.

CONCLUSION

Conclusively the present work indicated the effectiveness of the aqueous extract of ginger in reducing the histological changes accompanying paracetamol intoxication due to the marked reduction in congestion of the portal vein, intraparenchymal fibrosis, periportal fibrosis and sclerosis of the glomeruli. This indicates that, ginger possesses some anti-inflammatory properties which may contribute to its hepatoprotective effects since fibrosis of periportal and intraparenchymal, portal vein congestion and sclerosis of the glomeruli are prominent features of paracetamol hepatotoxicity.

RECOMMENDATION

Further research should be on the effect of the aqueous extract of ginger against paracetamol administration on the liver and kidney functioning assessments.

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