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THE PROTECTIVE EFFECT OF *Gongronema latifolium* ON WISTAR ALBINO RATS INDUCED WITH INDOMETHACIN

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ABSTRACT

This study was to determine the protective effects of *Gongronema latifolium* on male Wistar albino rats induced with indomethacin. Twenty-five (25) male Wistar albino rats weighing 150 g were used in this study. The rats were randomly selected and divided into five groups of five rats. Groups A, B and C were blank, negative and positive controls while Groups D and E were low (100 mg/kg) and high (400 mg/kg) dose treated groups of the extracts of *Gongronema latifolium* respectively. Rats were housed in metallic cages and allowed to acclimatize for fourteen days. The ulcerative index increased significantly in group B at ($p<0.05$) (68.00±2.83) but the low dose treated groups reduced significantly ($p<0.05$) after oral administration of 100 mg/kg of *Gongronema latifolium* extract at 12.00±4.24. The percentage ulcer inhibition increased significantly $p<0.05$ (77.68±4.61) when treated with standard anti-ulcer drug for the Group C. The percentage of ulceration reduced significantly ($p<0.05$) (38.26±6.09) when treated with low dose (100 mg/kg) of *Gongronema latifolium* for Group D. The pH value was at the lowest level at the negative control group (Group B) at ($p<0.05$) (2.92±0.63) but was significantly increased (4.60±0.18) ($p<0.05$) when treated with high dose of extracts of *Gongronema latifolium.* Indomethacin induced ulcer increased the mucosa acidity of Wistar albino rats (Group A) with the highest value ($p<0.05$) (5.29±0.12), but when treated with low dose (Group D) of *Gongronema latifolium*, it significantly reduced (2.75±1.061) ($p<0.05$). This study shows *Gongronema latifolium* is potent, effective and efficacious due to its phytochemical properties that have antioxidants potentials.

Key Words: *Gongronema latifolium,* Indomethacin, Ulcer, Omeprazole.

INTRODUCTION

Open sores or lesions on the skin or mucous membrane known as ulcers are brought on by the breakdown of surface tissue (BMA, 2002; Owu et al. 2012). Peptic ulcer is one of the most common gastro-intestinal (GI) diseases (Singh et al. 2008) attributed acid/ethanol imbalance (Goulart et al. 2005) and complicated by *Helicobacter pylori* infection (Calam and Baron, 2001), which remains one of the most common causes of peptic ulcer disease (Siddique et al. 2018). Oxidative disturbances in the digestive system have also been implicated in ulcers especially activities of Reactive Oxygen Species (ROS) (Repetto and Ilesuy, 2002).

The prevalence of *H. pylori* is higher in developing countries of Africa, Central America, Central Asia, and Eastern Europe (Hooi et al. 2017). The organism, usually acquired at childhood from unsanitary and crowded conditions, causes epithelial cell degeneration and injury (Zaki et al. 2016) with average prevalence rate between 5 to 10% of the general population over a lifetime (Mlik et al. 2022; Malfertheiner et al. 2017) and a shorter treatment course (Lara et al. 2003).

Gongronema latifolium is an edible medicinal plant found in the rain forest zones in Nigeria and other tropical African countries (Eke et al. 2014). The study objective was to determine the effect of the oral administration of *Gongronema latifolium* leave extract on Wistar albino rat induced with indomethacin.

MATERIALS AND METHODS

Animal Model and Experimental Procedure

Twenty- five (25) male Wistar albino rats

used for the study were divided into five groups with water provided *ad libitum* and animals acclimatized for 14 days before study commenced. The blank control group, designated as Group A, were not either treated or induced. Group B, which were induced with ulcers after ingestion of 40mg/kg of indomethacin served as the adverse control. Rats in Group C were the positive control. They were induced and treated with 20mg/kg of Omeprazole. Group D rats were also induced and treated with 100mg/kg of *G. latifolium* administered orally once daily. Experimental animals in Group E were induced with indomethacin and treated with 400mg/kg of *G. latifolium* water extract orally once daily.

Procurement of Animal

Twenty-five (25) male albino rats weighing between 150g were used for this study. They were procured from the Department of Veterinary Medicine at the University of Nigeria Nsukka, Enugu State, Nigeria. Experimental animals were housed in metallic cages and kept at room temperature (28-30^{o}C) under controlled light cycles (12-hr day/night cycles).

Induction of Animal

At the end of studies, experimental animals were sacrificed following their exposure to chloroform. Kidneys and colon of experimental animals were promptly removed and preserved in 10% neutral-buffered formalin for histological studies. Blood samples were taken by heart puncture into well-labelled dry plain tubes for biochemical analyses. Intestines were processed after being fixed for 24 hours. Haematoxylin and eosin staining was applied after sections were cut, mounted, and stained.

Effect of crude ethanol extract on Indomethacin-induced ulcer

The method of Urishidani and Kassanya (1979) was utilized.

Collection of Plant Materials

Fresh leaves of *Gongronema latifolium* were purchased at Ogbette Main Market, Enugu State. Leaves were washed and air-dried for one week and later ground to fine powder.

Plant Extraction

Pulverized leaves (1.0kg) were macerated in 1.0 ml/kg of 97% ethanol in a Soxhlet extractor according to the method described by Wei *et al*. (2013).

Formulation and Administration of Indomethacin

Indomethacin formulation was produced by diluting 40 mg/kg of indomethacin in 100ml of water. The formulation was administered orally.

Induction of Ulcer

Gastric ulceration was induced according to the procedure described by Sayanti *et al.* (2007).

Standard Drug

The standard drug Omeprazole was administered at a dosage of 20 mg/kg.

Statistical analysis: Statistical analyses were processed using Statistical Program of Social Science (SPSS) software for Windows version 18. The values of the measured parameters were expressed as mean±SEM. A one-way Analysis of Variance (ANOVA) was used to determine the effects of indomethacin at different doses on Wistar albino rats infected with ulcer and the test for significance was recorded as $p<0.05$ using Duncan New Multiple Range Test (DNMRT).

RESULTS

Results (Table 1) showed that the negative control group (Group B) which was induced with indomethacin and not treated had the highest ulceration index value. This inferred that indomethacin induced ulcer significantly ($p<0.05$) at 68.00±2.38. The ulceration index of the Wistar albino rats on administration of high dose of *Gongronema latifolium* extracts was significantly $p<0.05$ reduced 12.00±4.24. The result showed that there was no percentage ulcer inhibition in the blank and the negative control group (0, 0) respectively. There was a significant increase (77.68 ± 4.61) ($p<0.05$) in positive control group (Group C), where ulcer was induced and treated with 20mg/kg of the standard drug (omeprazole). However, this decreased significantly ($p<0.05$) (38.26±6.08) when compared with low dose (100 mg/kg) of extracts of *Gongronema latifolium*. This result inferred that omeprazole increased the

percentage ulcer inhibition of the Wistar albino rats more significantly compared with the oral administration of *Gongronema latifolium* extract. The result also showed that the negative control group (Group B) with the lowest pH value (2.92±0.63) was significantly ($p<0.05$) increased (4.60±0.18) when treated with high dose of *Gongronema latifolium extract. T*his inferred that indomethacin-induced ulcer initiates increased acidity in the Wistar rats' intestine. This hyperacidity is buffered following the ingestion of high dose of *G. latifolium water extract.* The blank control (Group A) had the highest value (5.29±0.12) of mucosa acidity compared with Group D, which reduced significantly $P<0.05$ (2.75±1.061) after treatment with low dose of *G, latifolium*, extract indicating that extracts of *G. latifolium* reduced mucosa acidity in the induced ulcerated rats.

Table 1: Effect of *Gongronema latifolium* on the parameters

Groups	Ulceration Index	% ulcer Inhibition	Gastric pH	Mucosa acidity
A(blank control)	0^{a}	0^{a}	5.95 ± 0.46^{b}	5.29 ± 0.18^{a}
B(negative control)	68.00 ± 2.38^{d}	0^{a}	2.93 ± 0.63^{c}	2.60 ± 0.28^{c}
C(positive control)	21.50 ± 3.54^{b}	77.68 ± 4.61^{c}	5.14 ± 0.23^{b}	4.70 ± 2.40^{b}
D(low dose)	64.50 ± 3.54^{b}	38.26 ± 6.08^{b}	3.02 ± 0.21^{a}	2.75 ± 1.06^{c}
E(high dose)	12.00 ± 4.24^{c}	57.09 ± 2.70^{d}	4.60 ± 0.18^{d}	3.60 ± 0.85^{d}

In a single column, mean values with different letter as superscript are significantly different ($p < 0.05$).

DISCUSSION AND CONCLUSION

Discussion

This result on the presence of the ulceration index showed that indomethacin-induced ulcer elevates the ulceration index of the experimental Wistar albino rats and the oral administration of low dose of extracts of *Gongronema latifolium* brought down the ulceration index. This is consistent with Morebise et al. *(2006),* who found out that alcohol induced ulcer reduces ulceration index. The work also agreed with the work of Mosango (2015), who found out that the ulceration index increased in the same fashion of aspirin-induced ulcer. This work is also consistent with the work of Ojo *et al.* (2020), who said that *Gongronema latifolium* reduces ulceration index. This result on the mucosa acidity showed that indomethacin-induced ulcer increases the mucosa acidity of Wistar albino rats but oral administration of high dose of extracts of *Gongronema latifolium* reduced the mucosa acidity. Result of this study is consistent with the work of Edim et al. (2012), who concluded that oral administration of *G. latifolium* reduces the mucosa acidity of Wistar albino rats.

Our results showed that hyper gastric acidity initiated by indomethacin-induced ulceration can be mitigated with the administration of aqueous extract of *G. latifolium*. This result is consistent with Ezekwe et al. (2014), who noted that *G. latifolium* normalises the gastric pH of Wistar albino rats in alcohol-induced ulcer.

CONCLUSION

This study revealed that oral administration of *G. latifolium* extract in the treatment of indomethacin-induced ulcer has significant effect in moderating the incidence of ulcer. The result further showed that extract of *G. latifolium* is an effective, antioxidant agent with the ability to inhibit, reverse and scavenge reactive oxygen species (ROS) generated by ulcer infection before reaching the intestine.

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