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THE ANTI-ULCER EFFECT OF EGG AND *ADONSONIA DIGITATA* IN INDOMETHACIN INDUCED GASTRIC ULCER AND *HELICOBACTER PYLORI*

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ABSTRACT

In this study, raw egg potentiation of the anti-ulcer activity of *Adonsonia digitata* leaves in indomethacin induced gastric ulcer was evaluated. Thirty (30) healthy wistar rats were used, they were randomized into 6 groups of 5 rats each with free access to food and water. Group 1 animals received normal saline, ulcer was induced in groups 2,3,4,5 and 6 using indomethacin. Group 2 received no treatment while group 3,4,5 and 6 were treated with Omeprazole, 25%, 50%, and 75% of the mixture respectively. Afterwards the animals were sacrificed after 4 hours and the results from the different groups were compared. The animals in group 2 had more ulcer scores than other groups due to lack of treatment. All experimental groups administered with the mixture (*Adonsonia digitata* and egg) exhibited significant ulcer activities. Omeprazole a standard anti-ulcer drug also exhibited significant anti-ulcer effect similar to the group administered 50% of the mixture. In contrast to the above, the control group administered Normal saline did not show any significant activity. The raw egg and *Adonsonia digitata* extract mixture exhibited significant anti-ulcer activities, further study should be carried to establish the mechanism of action as well as the bioactives responsible for this activity.

KEYWORDS: Anti-Ulcer Effect, *Adonsonia Digitata*, Egg, Indomethacin Induced Gastric Ulcer, *Helicobacter Pylori.*

INTRODUCTION

According to the latest World Health Organization (WHO) data published in 2020 peptic ulcer disease in Nigeria reached 5,846 or 0.39 percent of total death, the age adjusted death rate is 7.03 per a hundred thousand of population ranking Nigeria 31st in the world and the number 28th leading cause of death in Nigeria.[1]

The current treatment of Peptic Ulcer Disease (PUD) has witness cases of resistance to antimicrobial and resurgence of refractory ulcer cases. Refractory peptic ulcers are defined as ulcers that do not heal completely after 8 to 12 weeks of standard anti-secretory drug treatment. The most common causes of refractory ulcers are persistent *Helicobacter pylori* infection and use of nonsteroidal anti-inflammatory drugs (NSAIDs).[2]

Many plants with antiulcer activities and their phytochemical activities have been reviewed in other parts of the world and Nigeria, the secretion and strengthen of mucosal barriers are good qualities of natural antiulcer drugs.[3]

Adonsonia digitata L, popularly known as baobab is an evergreen tree belonging to the family Malvacae. Preparations of baobab leaves, bark and seed have been used to treat "almost any disease" including malaria infections, diarrhea, anemia, tuberculosis, dysentery and toothache. The fruit pulp and leaves have been phytochemically screened and evaluated with promising health promoting substances with evidence of antidiabetic and antioxidant activities.[4, 5]

The phytochemical screening of *A. digitata* indicated the presence of phytochemicals such as tannins, flavonoid, alkaloids, terpenoids, steroids, and coumarins. These phytochemicals are responsible for the antiulcer activities of the plant.[6,7]

The nutritional benefit of egg cannot be over emphasized and a study on ointment-based egg white indicated healing activities on second degree wound in burn patients.[8,9]

Many plants were discovered with promising anti- ulcer in an ethnopharmacological survey with little or no

animal or clinical studies been carried out.[10] Furthermore, the use of conventional medicine in regards to the treatment has proven abortive or mismanaged and may have resorted to herbal medicine and other alternatives.

In this study, the anti-ulcer effect of egg and *Adonsonia digitata* in indomethacin induced gastric ulcer and *helicobacter pylori* were evaluated.

MATERIALS AND METHOD

Materials

Culture media, hand lence, syringe and needle, hand gloves, weighing balance, *H.pylori* culture, egg

Drugs

Normal saline, indomethacin, Omeprazole.

Animals

Thirty (30) *Wistar albino* rats weighing (150-200g) obtained from the animal house of Bingham University, Karu, were used for the study.

Collection of plant material

Adonsonia digitata leaves were purchased in May, 2023 from a local market in Masaka, Nasarawa state, Nigeria.

Method

Prepation of *adonsonia digitata*, egg and distilled water (*adonsonia digitata* mixture)

The *Adonsonia digitata* leaves (10g) were weighed into a clean jar and mixed with 1liter of distilled water and the albumin of two eggs.

Acute oral toxicity study of *Adonsonia digitata* mixture

The acute oral toxicity study was carried out in accordance to modified OECD method[11] which requires three animals. The animals were fasted for 24 hours and their weights were taken afterwards, the baobab leaves were mixed with egg albumin and dissolved in distilled water. They were administered orally to the animals according to their body weights at the dose of 2000mg/kg. The animals were monitored and observed individually for any changes and signs of toxicity at intervals and the observation continued for 24hours. No death occurred within 48hours hence the procedure was repeated with other set of animals.

Phytochemical screening of *Adonsonia digitata*

The phytochemical composition of *A. digitata* was determined.[12]

Anti-ulcer study of *Adonsonia digitata*

Thirty (30) Albino Wistar rats were used for the study. Six (6) groups of five (5) animals were employed for the study.

Group 1: (Control group): were administered normal saline 1ml only.

Group 2: (Negative control): were administered indomethacin 100mg/kg only.

Groups 3,4 and 5 were administered indomethacin 20mg/kg solution per oral(Po) 30 minutes after administration of *H.pylori* culture.

Group 3: (Standard) were administered Omeprazole 100mg/kg (standard) after indomethacin induced ulcer, Group 4: were administered 25% of the mixture after indomethacin induced ulcer, Group 5 were administered 150mg/kg PO 50% LD_{50} of the mixture after indomethacin induced ulcer and Group 6: were administered 75% LD_{50} of the mixture after indomethacin induced ulcer.

The animals were then sacrificed after four (4) hours and their stomach incised along the greater curvature and rinsed in distilled water. The stomachs of the animals were opened along the greater curvature and rinsed in distilled water to the remove gastric contents and blood clots and examined by a 10x magnifier lens to assess the formation of ulcers. The number of ulcers was counted. Ulcer score, Ulcer index (UI) and Percentage curative were determined[13] using the following parameters.

SCORE	ULCER SEVERITY
0	NO LESIONS
1	MUCOSAL OEDEMA
2	1-5 SMALL LESIONS (1-2MM IN SIZE) LESIONS
3	> 5 SMALL OR INTERMEDIATE (3-4MM IN SIZE) LESIONS
4	>2 INTERMEDIATE LESIONS 1 GROSS (> 4 MM IN SIZE) LESIONS
5	PERFORATED LESIONS

Calculation

$$\text{Ulcer index (UI)} = \frac{\text{Total ulcer score}}{\text{No of animals ulcerated}}$$

$$\% \text{ Curative} = \frac{(\text{UI of untreated group} - \text{UI of treated group})}{\text{UI of untreated group}} \times 100$$

ETHICAL APPROVAL

The approval for the study was sought from Bingham University Ethics and Research Committee.

RESULTS

Acute toxicity study of *Adonsonia digitata* mixture

No adverse effects were observed in the animals, there was also no mortality recorded after administering an

oral dose of 2000mg/kg to the three test animals. The dose of the LD_{50} of the mixture *Adonsonia digitata* and egg was estimated to be greater than 2000mg/kg in rats.

Table 1: phytochemical composition of *a. Digitata.*

S/NO	PHYTOCHEMICALS	REMARKS
1	Alkaloids	-
2	Tannins	-
3	Saponins	+
4	Steroids	+
5	Terpenoids	-
6	Flavonoids	+
7	Cardiac glycosides	+

- Absent, + Present

Table 1 shows the phytochemical screening of *A.digitata.* the following phytochemical components were found to be present; saponins, steroids, flavonoids and cardiac glycosides while alkaloids, tannins and terpenoids were absent.

Table 2: ulcer score index of untreated mice and treated mice.

GROUPS	TREATMENT	ULCER SCORE OF INDIVIDUAL MICE	ULCER INDEX	PERCENTAGE CURATIVE (%)
GROUP 1	Control (normal saline only)	0 0 0 0 0	0.00	--
Group 2	Negative control (Indomethacin only)	3 4 3 3 4	3.4	0.00%
Group 3	Indomethacin + 20mg/kg Omeprazole	1 0 2 1 1	1.25	63.23%
Group 4	Indomethacin + 25% of the mixture	1 2 1 3 1	1.6	53.00%
Group 5	Indomethacin + 50% of the mixture	1 1 0 0 2	1.33	60.78%
Group 6	Indomethacin + 75% of the mixture	1 1 1 0 1	1.00	70.59%

The ulcer score index of untreated mice and treated mice is illustrated in table 2 above. Group 1 (Control /Normal saline) showed no ulcers, serving as a baseline, Group 2 (Indomethacin only) displayed a substantial ulcer index of 3.4 with 0.00% percentage curative, indicating a substantial ulcerative effect with no curative response. Group 3 (Indomethacin + 20mg/kg Omeprazole) significantly lower ulcer index of 1.25 compared to the control. This group also demonstrated a notable curative rate of 63.23%, suggesting a potential protective effect

against ulcers. Group 4 (Indomethacin + 25% of the mixture), 5 (Indomethacin + 50% of the mixture), and 6 Indomethacin + 75% of the mixture, displayed significantly reduced ulcer indices (1.6, 1.33, and 1.00, respectively) compared to the negative control. The curative rates ranged from 53.00% to 70.59%. This indicates promising anti-ulcer activities of the *A.digitata* mixture, surpassing the effectiveness of the standard drug (Group 3).

Table 3: Significant Difference Between Groups.

TREATMENT	ULCER INDEX	PERCENTAGE CURATIVE
Normal saline only	0.00^{*c}	--
Indomethacin only	3.4^{bc}	0.00%
Indomethacin + 20mg/kg Omeprazole	1.25^{b*}	63.23%
Indomethacin + 25%LD50 of the mixture	1.6^{b*}	53.00%
Indomethacin + 50%LD50 of the mixture	1.33^{*}	60.78%
Indomethacin + 75%LD50 of the mixture	1.00^{*}	70.59%

KEY: mixture = mixture of raw egg and *adonsonia digitata* extract; *N = 5. Significant difference is set at *p<0.05 level. One-way, ANOVA followed by LSD*
(^{b})Represent a group where there is a significant difference in ulcer index level when compared with the Normal saline only
(*) Represent a group where there is a significant difference in ulcer index level when compared with the Indomethacin only.
(^{c}) Represent a group where there is a significant difference in ulcer index level when compared with the group 3 that received the standard drug (20mg/kg Omeprazole)

The significant difference between untreated groups and treated groups is indicated in Table 3. Group 3 (Indomethacin + 20mg/kg Omeprazole) and Group 4 (Indomethacin + 25%LD50 of the mixture) displayed significant difference in ulcer index at (**p<0.05)* when compared with only Normal saline. Group 3, 4, 5 and 6 exhibited significant differences in ulcer index at (**p<0.05)* level when compared with Indomethacin only.

Figure 1: The Ulcer Severity Of Untreated Mice.

The photomicrograph of ulcer severity of untreated mice is showed in figure 1. The lesions are greater than 5, small or intermediate, 3-4mm in size, gross, intermediate lesions greater than 2 (> 4mm in size) were also observed.

Figure 2: The Ulcer Severity Of Treated Mice.

Figure 2 indicates the photomicrograph of ulcer severity of treated mice; no lesions were observed.

DISCUSSION

The investigation of the anti-ulcer activities of the raw egg and *Adansonia digitata* extract mixture yielded results that hold substantial promise for the field of gastroenterology and natural medicine.[14]

The robustness of the study's experimental design is confirmed by the absence of ulcers in the positive control group (Group 1), which received normal saline only. This result underscores the reliability of the experiment and ensures that ulcers were induced solely in the negative control group (Group 2), verifying the anti-ulcer effects of *A.digitata*.

This study has demonstrated high anti-ulcer efficacy of *A.digitata* mixture. Treatment groups (Groups 4, 5, and 6) exhibited significantly reduced ulcer indices compared to the negative control group (Group 2), which received only Indomethacin, a known ulcer-inducing drug. The phytochemical screening of *A.digitata* indicated the presence of phytochemicals such as saponins, steroids, flavonoids and cardiac glycosides, these phytocomponents are responsible for the anti-ulcer activities.[4, 5, 6]

Furthermore, the anti-ulcer activities of the *A. digitata* mixture-treated groups surpassed the effectiveness of the standard drug, Omeprazole (Group 3). This emphasizes the potential of natural combination (*A.digitata* mixture) as an alternative or complementary treatment for peptic ulcers. The dose-response relationship observed in this study is of paramount importance. As the concentration of the mixture increased, there was a consistent decrease in ulcer indices and a corresponding improvement in curative rates.

Eggs should represent 10–35% of daily calories, eggs contain high quality protein thus eggs are unlikely to cause heart disease. This means that a person who takes 2,000 calories a day should consume a maximum of 22 g of saturated fat. Eggs also supply omega-3 fatty acids, mainly in the form of docosahexaenoic acid (DHA). DHA helps maintain brain function and vision.[15]

The pronounce anti-ulcer activities of *A.digitata* may be attributed to the presence of antioxidants.[4, 12] In addition to this, the anti-ulcer activities of the egg white may also be responsible for the high anti-ulcer efficacy of the *A.digitata* and egg albumin.[7]

The research conducted in 2020[16] indicated that egg-white proteins have a minor impact on the bactericidal action of egg white toward *Salmonella Enteritidis* at 45^{o} C. Also egg contains ovotransferrin which has an additional antibacterial activity beyond iron-chelation, which appears to depend on direct interaction with the bacterial cell surface, resulting in antimicrobial effect.[17] These studies confirm the high potency of anti-ulcer activities of *A.digitata* mixture against *H.pylori.*

The anti-ulcer dose-dependent activity of *A.digitata* mixture underscores the potential for precise dose optimization in future therapeutic applications.[18] It also suggests that the efficacy of the mixture in reducing ulceration is closely tied to its concentration, which could be a pivotal factor in determining its therapeutic value.[19]

Perhaps equally compelling is the comparative effectiveness of the mixture when measured against the standard drug, Omeprazole. This finding challenges the conventional approach to ulcer management, offering the prospect of a natural remedy that may replace or complement existing pharmaceutical interventions. Such an option could significantly benefit patients by providing a broader range of choices for managing peptic ulcers, with potentially fewer side effects or economic advantages.

CONCLUSION

The raw egg and *Adansonia digitata* extract mixture exhibited substantial anti-ulcer effects, serving as a natural and potentially cost-effective alternative to conventional pharmaceutical treatments. While further research is necessary to unravel the precise mechanisms of action and establish safety profiles, these findings kindle hope for individuals grappling with peptic ulcers. They also underscore the significance of exploring the therapeutic potential of natural compounds in the domain of gastroenterology, a field that constantly seeks safer and more effective solutions for patients.

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