Histological Evaluation of the Protective Effects of *Corchorus olitorius* on Prenatal Lead-Induced Cardiotoxicity in Wistar Rats

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Abstract

Lead toxicity remains a major environmental and public health concern due to its harmful effects on developing tissues and organs, especially during pregnancy. This study investigated the possible protective effects of aqueous extract of *Corchorus olitorius* on the heart tissues of prenatal lead-exposed Wistar rats. Pregnant Wistar rats were grouped and administered lead, *Corchorus olitorius* extract, or a combination of both (lead before extract and extract before lead respectively) during different stages of gestation. After parturition, the offspring were sacrificed and the heart tissues were harvested for histological analysis using Hematoxylin and Eosin staining techniques.

Histological observations revealed structural alterations in the cardiac tissues of rats exposed to lead, including distortion of cardiac muscle fibers, cellular degeneration, and tissue disorganization. However, groups treated with *Corchorus olitorius* extract demonstrated relatively preserved cardiac architecture and reduced tissue damage. The findings suggest that *Corchorus olitorius* possesses possible cardioprotective properties against lead-induced toxicity due to its antioxidant and bioactive constituents.

This study highlights the potential therapeutic importance of medicinal plants in reducing the harmful effects of environmental toxicants during fetal development.

Keywords: *Corchorus olitorius*, Lead toxicity, Cardiotoxicity, Histology, Wistar rats, Prenatal exposure, Medicinal plants

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Introduction

Environmental exposure to heavy metals such as lead has become a significant public health concern worldwide. Lead toxicity has been associated with damage to several body organs

including the brain, kidneys, liver, and heart. During pregnancy, lead is capable of crossing the placental barrier and interfering with fetal development, thereby increasing the risk of congenital abnormalities and organ dysfunction.

Medicinal plants continue to play important roles in traditional and modern healthcare systems. *Corchorus olitorius*, commonly known as jute leaf or "ewedu," is widely consumed in many African and Asian countries and is known for its nutritional and medicinal properties. The plant contains flavonoids, phenols, vitamins, and antioxidant compounds which may help protect tissues from oxidative stress and toxic damage.

This study was designed to evaluate the histological effects of prenatal lead exposure on the heart tissues of Wistar rat offspring and to investigate the possible ameliorative effect of aqueous extract of *Corchorus olitorius*.

Aim of the Study

The aim of this study was to investigate the protective effects of aqueous extract of *Corchorus olitorius* on the heart tissues of prenatal lead-exposed Wistar rats.

Objectives of the Study

1. To evaluate the effects of prenatal lead exposure on the histology of the heart.
2. To assess the possible protective effects of *Corchorus olitorius* extract on cardiac tissues.
3. To observe changes in maternal and fetal morphology following administration of lead and plant extract.
4. To determine the potential cardioprotective properties of *Corchorus olitorius* during gestation.

Materials and Methods

A total of 104 adult Wistar rats consisting of males and females (90 females with an average weight of 178 grams and 14 adult males with average weight of 142 grams) were used for this experimental study. The animals were housed under standard laboratory conditions and allowed access to feed and water throughout the study period. After approximately two weeks of care, vaginal smear was carried out on all the female rats to determine their reproduction cycle. The proestrus phase is the ideal phase for mating, so all females in this phase were mixed with the males for mating. This procedure was repeated for all the female rats.

After mating, another vaginal smear was carried out to determine the presence of spermatozoa in the vagina to confirm pregnancy. Pregnant female rats were then divided into experimental groups (4 groups with a total of 3 rats in each group with the exception of control) receiving:

- Lead only
- *Corchorus olitorius* extract only
- Lead before extract
- Extract before lead
- Control group receiving clean water

Administration was carried out orally during different stages of gestation. Following delivery, the offspring were sacrificed and heart tissues were harvested for histological examination.

The tissues were fixed in formalin, processed through dehydration, clearing, infiltration, embedding, sectioning, and staining using Hematoxylin and Eosin techniques. Microscopic examination was then carried out to assess structural changes in cardiac tissues.

Results

The lead-treated groups showed varying degrees of histological alterations in the cardiac tissues, including distortion of myocardial fibers, vascular congestion, and mild cellular degeneration. In some groups, fetal growth retardation and reduced litter size were also observed.

In contrast, groups treated with aqueous extract of *Corchorus olitorius* demonstrated relatively improved tissue organization and reduced histological damage. The extract-treated groups showed better preservation of cardiac muscle architecture when compared with the lead-only groups.

These findings indicate that *Corchorus olitorius* may possess protective effects against lead-induced cardiotoxicity during prenatal development.

Discussion

Lead toxicity has long been associated with oxidative stress and tissue injury in experimental animals and humans. The structural distortions observed in the heart tissues of lead-exposed offspring in this study support previous findings on the toxic effects of lead on developing organs.

The improved histological appearance observed in the groups treated with *Corchorus olitorius* may be linked to the antioxidant and anti-inflammatory properties of the plant.

Phytochemicals such as flavonoids and phenolic compounds present in the extract may help reduce oxidative damage and improve tissue preservation.

The study therefore suggests that *Corchorus olitorius* may serve as a potential natural protective agent against prenatal toxic exposure.

Conclusion

Prenatal exposure to lead may adversely affect the histological structure of the developing heart. However, administration of aqueous extract of *Corchorus olitorius* appeared to reduce some of the toxic effects and improve cardiac tissue architecture in Wistar rats.

The study highlights the importance of reducing exposure to environmental lead during pregnancy and supports the possible therapeutic role of medicinal plants in protecting body tissues against toxic substances.

Further studies are recommended to investigate the exact mechanisms responsible for these protective effects and their possible applications in human health.

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