



**Title :** Blood Biochemical and Histopathological Investigation of Novel Herbal Formulas in High Fat Diet/Streptozotocin-Induced Hyperlipidemia and Hyperglycemia in Rats

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## ABSTRACT

Polyherbal medicines are widely used as alternative treatment for various diseases including obesity and diabetes, as they are recognized as being less toxic compared to modern synthetic medicines. Nevertheless, the safety of herbal formulations has been widely debated. Therefore, this research aimed to investigate the effects of two novel herbal formulas on blood biochemistry and histopathology of liver and kidney of high-fat diet (HFD)/streptozotocin (STZ)-induced hyperglycemia/hyperlipidemia (HPG/HPL) in rats. Formula 1 (F1) consisted of *Dracaena cochinchinensis*, *Milium velutinum*, *Embelia officinalis*, *Piper interruptum*, and *Albizia procera*, whereas Formula 2 (F2) consisted of *Cinnamomum bejolghota*, *Milium velutinum*, *Acacia concinna*, *Ocimum gratissimum*, and *Albizia procera*. Rats in groups 1-3 were normal and fed a normal diet and orally received distilled water, F1 and F2, respectively. Rats in groups 4-9 were HPG/HPL induced rats and fed a high-fat diet for two months to induce hyperlipidemia and subsequently injected with 30 mg/kg of STZ to induce hyperglycemia. HPG/HPL-induced rats were then orally administered F1 and F2 at doses of 200 mg/kg daily for 30 days. These treatments were compared to the treatments of synthetic drugs, orlistat, metformin, and atorvastatin. After the treatment period, relative liver and kidney weights were assessed. Biochemical indices for liver function-including aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, total bilirubin and direct bilirubin-and kidney function-including blood urea nitrogen and creatinine-were evaluated. Additionally, hepatorenal histopathological alterations were examined. The results revealed that both F1 and F2, as well as the synthetic drugs, did not significantly alter relative liver weights compared to normal rats and HPG/HPL-induced rats. Moreover, the novel herbal formulas were able to attenuate all the biochemical parameters and structural changes in the liver and kidney of HPG/HPL-induced rat, except for F1, which caused an increase in aspartate aminotransferase level compared to normal and HPG/HPL-induced rats. Nevertheless, the novel herbal formulas had mild negative effects on liver functions in normal rats. In conclusion, the novel herbal formulas could restore liver and kidney function and structural integrity in HPG/HPL-induced rats but not in normal rats.

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