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A comparative histopathological remedial study of polyherbal formulation Diabcure and Glibenclamide on Streptozotocin induced diabetic rats

Devdatta Gopal Lad

Department of Zoology, Wilson College, Chowpatty, Mumbai - 400 007

E-mail: devdatta.lad@gmail.com

ABSTRACT

Diabetes mellitus is one of the most important health problems worldwide, showing high indices of prevalence and mortality. It is also rapidly emerging as a major health-care problem in India, especially in urban areas where the prevalence of Type 2 diabetes has been reported as 12% of the adult population. A histopathological study was carried out on wistar rat in which comparative remedial effectiveness was studied of 2 different medicines Diabcure and Glibenclamide. The rats were divided into 4 groups with 6 rats in each group and were treated accordingly Group 1: Control rats given physiological saline solution 10mL/Kg body wt, Group 2: Rats injected Streptozotocin (45mg/kg ip body wt.) intraperitonially, Group 3: Rats injected Streptozotocin (45 mg/kg ip body wt.) intraperitonially + Polyherbal Formulation Diabcure (PHFD) (125 mg/kg body wt.) administered orally using an intragastric tube. Group 4: Rats injected (45 mg/kg ip body wt.) intraperitonially + Glibenclamide (125mg/kg body wt.) administered orally using an intragastric tube. After 30 days of the treatment the rats were sacrificed and blood glucose level was determined along with the histopathological study of the liver, pancreas and kidney was carried out. Histopathological changes were observed in Streptozotocin treated rats showed fatty changes, necrosis, vacuolization, space formation and loss of cell boundaries in liver, proximal tubular necrosis, tubular degeneration and glomerular swelling in kidney and reduced islet cells and necrosis of pancreas. Oral administration of aqueous extract of Polyherbal Formulation Diabcure (PHFD) (125 mg/kg body weight) and Glibenclamide to Streptozotocin treated rats brought back the above-mentioned changes to near normal. But the histopathological study revealed that Diabcure was more effective then Glibenclamide.

Keywords: Glibenclamide, Diabetes mellitus, Histopathology, Diabcure.

INTRODUCTION

Diabetes mellitus is one of the most important health problems worldwide, showing high indices of prevalence and mortality. It is also rapidly emerging as a major health-care problem in India, especially in urban areas where the prevalence of Type 2 diabetes has been reported as 12% of the adult population. (ADA, 1997) (Committee Report, 1997).

Diabetes mellitus is a major health problem in developed and developing countries. Management options for the disease in developed countries include diet and administration of insulin, and/or hypoglycaemic agents. However, these methods may not be affordable for patients in developing countries due to socio-economic conditions (Ducorps *et al.*, 1996). This partly contributes to the high prevalence of non-compliance observed in minority, disadvantaged communities in industrialized countries, and rural folks in developing countries (Dyer *et al.*, 1998).

Recently, the search for appropriate hypoglycaemic agents has been focused on plants used in traditional medicine partly because of leads provided by traditional medicine to natural products that may be better treatment than the currently used drugs (Rates,

2001). Various medicinal plants like *Momordica charantia* L., *Azardiracta indica* and *Ficus racemosa* are known to possess antihyperglycemic activity (Atta-ur-Rahman, 1989).

The main objective of present investigation is to analyse the blood glucose level and histopathological changes in liver, kidney and pancreas of rats administered Streptozotocin, Streptozotocin with aqueous extract of Polyherbal Formulation Diabcure (PHFD) (125 mg/kg body weight) and Glibenclamide, a known hypoglycemic drug.

Polyherbal Formulation Diabcure (PHFD) consist of mixture of *Gymnema sylvestre* (40%), *Catharanthus roseus* (20%), *Evgenia jambolona* (30%) and *Aegle marmelos* (10%). While Glibenclamide, also known as Glyburide, is an anti-diabetic drug in a class of medications known as sulfonylureas, closely related to sulfa drugs. It was developed in 1966 in a cooperative study between Boehringer Mannheim (now part of Roche) and Hoechst (now part of sanofi-aventis). Streptozotocin (Streptozocin, STZ, Zanosar) is a naturally occurring chemical that is particularly toxic to the insulin-producing beta cells of the pancreas in mammals. It is used in medicine for treating certain cancers of the Islets of Langerhans and used in medical research to produce an animal model for Type 1 and 2 diabetes.

MATERIAL AND METHOD

Adult male albino rats (Wistar strain) were collected from Central Animal House, Rajah Muthiah Medical College, Annamalai University and were used for the present study. The rats were housed in polypropylene cages at room temperature (27 ± 2 °C). The animals were randomized and separated into normal and experimental groups of body weight ranging from 180-210 g. The animals received a diet of standard pellets (Hindustan Lever Ltd., Mumbai). Rats were provided free access to water *ad libitum* and food through the tenure of acclimatization to the environment for a minimum period of two weeks prior to commencement of experiment. The entire study was conducted in accordance with Committee for the purpose of control and supervision on experiments and animals (CPCSEA) norms and the National Institute of Health guidelines "Guide for the care and use of Laboratory Animals". CPCSEA Registration No. 160/1999/IAEC/CPCSEA.

A histopathological study was carried out on wistar rat in which comparative remedial effectiveness was studied of 2 different medicines Diabcure and Glibenclamide. The rats were divided into 4 groups with 6 rats in each group and were treated accordingly. Group 1: Control rats given physiological saline solution 10mL/Kg body wt. Group 2: Rats injected Streptozotocin (45mg/kg ip body wt.) intraperitonially. Group 3: Rats injected Streptozotocin (45 mg/kg ip body wt.) intraperitonially + Polyherbal Formulation Diabcure (PHFD) (125 mg/kg body wt.) administered orally using an intragastric tube. Group 4: Rats injected Streptozotocin (45 mg/kg ip body wt.) intraperitonially + Glibenclamide (125mg/kg body wt.) administered orally using an intragastric tube. After 30 days of the treatment the rats were killed and blood glucose level was determined by the method of *o*-toluidine using the modified reagent of Sasaki *et al.* (1972). Histological study of the liver, pancreas and kidney was carried out by routine hematoxylin – eosin staining technique.

RESULTS AND DISCUSSION

Histopathological changes were observed in Streptozotocin treated rats, showed fatty changes, necrosis, vacuolization, space formation and loss of cell boundaries in liver, proximal tubular necrosis, tubular degeneration and glomerular swelling in kidney and reduced islet cells and necrosis of pancreas.

Oral administration of aqueous extract of Polyherbal Formulation Diabcure (PHFD) (125 mg/kg body weight) and Glibenclamide to Streptozotocin treated rats brought back the above - mentioned changes to near normal. But in case of PHFD the rate of normalcy was faster and more as compared to that of Glibenclamide.

Figure 1. Microphotographs & Histopathology of Liver examined by routine Hematoxylin-eosin of Streptozotocin treated animals. A) Control, B) Streptozotocin, C) Streptozotocin + PHFD (125 mg/kg body wt.), D) Streptozotocin + Glibenclamide (125 mg/kg body wt.).

Figure 2. Microphotographs & Histopathology of Kidney examined by routine Hematoxylin-eosin of Streptozotocin treated animals. A) Control, B) Streptozotocin, C) Streptozotocin + PHFD (125 mg/kg body wt.), D) Streptozotocin + Glibenclamide (125 mg/kg body wt.).

Figure 3. Microphotographs & Histopathology of Panreas examined by routine Hematoxylin-eosin of Streptozotocin treated animals. A) Control, B) Streptozotocin, C) Streptozotocin + PHFD (125 mg/kg body wt.), D) Streptozotocin + Glibenclamide (125 mg/kg body wt.).

Group	Blood Glucose Level (mg/dL)
Control	80.22 ± 7.18
Streptozotocin	295.38 ± 26.28
Streptozotocin + PHFD (125 mg/kg body wt.)	126.72 ± 11.15
Streptozotocin + Glibenclamide (125 mg/kg body wt.)	131.36 ± 11.78

Table 1. Blood Glucose Levels. All the values are mean ± SD of six observations

But the histopathological results (Figure 1-3) and Glucose level (Table 1) analysis revealed that Diabcure was more effective than glibenclamide.

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