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Evaluation of hypoglycemic and hypolipidemic properties of *Swertia chirata*

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Abstract

The present study was undertaken to evaluate the hypoglycemic and hypolipidemic properties of *Swertia chirata* from Abbottabad, Khyber Pakhtunkhwa province of Pakistan. Grinded powder of *Swertia chirata* was orally given to patients of diabetes type-II to investigate its effect on glucose level and lipid profile. The results revealed that *Swertia chirata* reduced glucose level (14.5%), triglycerides (10.5%), cholesterol (8.6%), and LDL cholesterol level by 14.4% in diabetic patients. Further phytochemical analysis is suggested for the biochemical characterization of potential components.

Keywords: *Swertia chirata*, medicinal plants, diabetes mellitus, lipid profile, glucose

Introduction

Diabetes mellitus is one of the most prevalent endocrine disorders. It is basically caused when there is deficiency in insulin secretion in the body or due to insulin resistance and may be due to the beta cells destruction in pancreases^[1]. Diabetes mellitus can also cause other serious health problems such as neuropathy, nephropathy and retinopathy^[2]. According to the International Diabetes Federation, in 2010 there were 285 million people (6.4%) suffered from diabetes mellitus globally which is on rise and can be exceed up to 439 million (7.7%) in 2030^[19]. To prevail over this disorder three main treatments are being used i) Change in lifestyle (Proper diet and regular exercise), ii) Insulin replacement therapy and iii) by use of synthetic antidiabetic drugs which are being taken orally. Later is known as a most suitable treatment^[11]. However these therapies do have adverse effects on health such as insulin therapy cannot maintain or restore the glucose homeostasis, long term complications, atherogenesis and hypoglycemia risks are also noted^[17]. Long term use of synthetic antidiabetic drugs are also serious threat for the patient as they can cause hematological changes, coma, disturb the functioning of liver eye and kidney^[4, 7].

To overcome these problems medicinal plants gain significant interest of scientist. Herbal medicines and medicinal plants are noted to be more efficient, with no toxic effect and are easily available at low price. About 80% of patients are using herbal drugs to fight against diabetes mellitus worldwide^[3]. Many countries such as Egypt, Africa, Greece, China and India are using these plants as a medicine form ancient times and abundant number of modern medicine have been prepared from them^[16]. Different scientists have used different medicinal plants as antidiabetic agents viz: [2, 5, 8, 9, 13, 15, 18, 22, 23] *Swertia chirata* is one of these plants which have been tested for anti-hyperglycemic activity but no proper research is carried out on humans yet. Present investigation is therefore designed in order to know the proper effect *Swertia chirata*. Therefore, the present study was undertaken to evaluate the hypoglycemic and hypolipidemic properties of *Swertia chirata* from Abbottabad, Khyber Pakhtunkhwa province of Pakistan.

Materials and Methods

Study area

The present study was conducted in Abbottabad which is in Khyber Pakhtunkhwa province of Pakistan that covers an area of 1,967 square miles. It is bordered with Muzafarabad at its east, district Haripur is located at its west, district Mansehra is situated at its north and Rawalpindi lies at its south^[10].

Selection criteria

The present investigation was carried out on placebo group of diabetes Type-II patients with age between 30 to 60 years. Fasting blood glucose level of patients on the very first day was

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recorded by Glucometer. Members having glucose level below 135mg/dl were excluded from the study beside this Patient with diabetes type 1 and Gestational DM was also out of criteria. Performa was designed in which information regarding to gender, age, personal history, family history and medication for diabetes was recorded. A consent letter and contact numbers were also taken from patients before investigation and were in regular contact to avoid any serious condition. Patients with hypoglycemic drugs were allowed keeping on their therapy. A total of 12 patients were selected for investigation from both sexes.

Preparation of capsules

Selected medicinal plant was purchased from local market, dried and grind finely and was then sent to Alliance Pharmaceuticals (Pvt) limited, Peshawar, Pakistan for preparation of capsules. The company was suggested to make capsules with 0.5 gram of powered in it. These capsules were stored in dry cool place till further investigation.

Study duration

Duration of investigation was 30 days which were further divided into 3 intervals, first phase was considered as control period and no dose was given, the recorded glucose and triglyceride level on day first was 178.5±25.5 mg/dl and 265±40 mg/dl respectively. Second 15 days were experimental period in which *Swertia chirata* in powdered form was given to patients with the medicine they were already taking. Last 10 days were the wash period and no dose was given; blood samples were collected on day 30 so it can be easy to compare the results with and without herbal medication included in the study.

Laboratory Investigations

Blood samples of selected patients were taken using 5 mL syringe. Samples were taken in morning with at least 12 hours of fasting. 1 mL of blood was taken in EDTA tube for lipid profile and fasting glucose. 2 mL of blood sample taken in gel tube was centrifuged at 4000 rpm for 5 minutes. The serum was then placed in serum cup through micropipette and stored at -20 °C till further investigation. Further measurement of

glucose and Lipid profile was performed at diagnostic laboratory of Ayub Teaching Hospital, Abbottabad, by the use of fully automatic computerized BS-400 Mindray chemistry analyzer. Lipid profile and glucose unit was represented by mg/dL. The method provided by [7, 10] was adopted.

Statistical analysis

Data analysis was performed with the help of MS-excel and represented in the form of Mean ± Standard deviation.

Results

During present investigation fasting glucose level and lipid profile was taken on day 1, 5, 10, 20 and 30. Results showed that powdered form of *Swertia chirata* reduce 14.5% of glycemic level. Similarly it lowers the level of triglyceride to 10.5%, cholesterol to 8.6% and serum LDL level upto 14.4%.

Effect of *Swertia chirata* on Serum Glucose in Diabetic Patients

On the very first day, before use of *Swertia chirata* serum glucose level of patients was recorded as 178.5±25.5 mg/dl and considered as a control values for glucose concentration. After 5 days of in taking *Swertia chirata* dose, glucose level dropped to 155.5±24.5 mg/dl. On final day of herbal medication, levels of fasting serum glucose become 152.5±27.5 mg/dl. On the day 30 level of glucose level again rise to 162±29 mg/dl. This shows that this plant has exceptional hypoglycemic properties as shown in Table 1.

Effect of *Swertia chirata* on Lipid Profile of Diabetic Patients

Swertia chirata showed hypoglycemic effect as well as positive effect on lipid profile in diabetic patients. Results of present study showed that triglycerides level dropped down from 265±40 mg/dL to 237.5±32.5 showing 10.5% decrease. On the first day of screening, cholesterol level of patients was 254±21 mg/dL which drops down to 232±20 mg/dl with 8.6% decrease, whereas LDL- cholesterol level fall from 166±8 mg/dL to 142.5±8.5 mg/dL with 14.4% decrease, Moreover, HDL-cholesterol also showed positive change i.e from 35±5 to 42.5±5 as shown in Table 2.

Table 1: Effect of *Swertia chirata* Plant on Serum Glucose Level of Diabetic Patients

Fasting Serum Glucose mg/dl				
Before Herbal Medication		During Herbal Medication		During Herbal Medication
Day 1	Day 5	Day 10	Day 20	Day 30
178.5±25.5	160±25	155.5±24.5	152.5±27.5	162±29

Data represents means ± SD

Table 2: Effect *Swertia chirata* on Lipid Profile of Diabetic Patients

	Before Herbal Medication		During Herbal Medication		During Herbal Medication
	Day 1	Day 5	Day 10	Day 20	Day 30
TGL Level	265±40	267±38	252±37	237.5±32.5	253.5±31.5
Serum Cholesterol level	254±21	252±20.5	237.5±20.5	232±20	237.5±17.5
Serum HDL-Cholesterol	35±5	36±4	38.5±6.5	42±5	39.5±4.5
Serum LDL-Cholesterol level	166±8	154.6±8.9	148.1±6.6	142.5±8.5	146.8±6.7

Data represents means ± SD

Discussion

Currently health concerns have been increased due to many factors. It has been noted that most of the peoples are suffering from renal and cardiac diseases, hypertension, malnutrition and many other health complications. Uses of traditional medicines move the attention of pharmaceutical investigators to get rid of such diseases without any harmful

effects. The use of ethnobotanically important biochemical needs some precautions before commercialization.

In-vitro evaluation of plant material against foreign destructive agents is a common practice to control many diseases. In case of such disorders, like diabetes evaluation and effectiveness of plant material need care and comprehensive studies. In current investigation the plant

extract was taken in form of powder and utilized in human body through oral route. The placebo group was chosen in order to sidestep any clinical problems. It has been observed that during the whole period of research not a single member showed any type of disorder or malfunctioning in their normal metabolic activities. All the patients were given by the same amount of powdered plant and physical activities of normal routine were not disturbed.

The outcomes of current investigation revealed that selected plant material was not only decreasing agent for glycemic level but can control lipid profile also together with HDL and LDL levels. The use of such natural products could be very beneficial in controlling many complications related to diabetes type-II. The glycemic level of patients in the present study was 178.5 ± 25.5 before investigation and reduced up to 14.5% after 15 days of using powder of *Swertia* plant. Similarly, triglyceride level was reduced to 10.5%, cholesterol level to 8.6% and LDL to 14.4%. These results clearly indicated that selected plant has good efficacy to control lipid profile in diabetic patients. Some other medicinal plants have also been studied by different scientist for their antiglycemic properties in same manner as used in present investigation. Recently the *Swertia* has been found effective in lowering the glucose level in lab mice ^[1]. In another study by Renu ^[14] the extracts of *Swertia* considerably reduced the glucose and glyceride level. Verma ^[21] used *Swertia chirayita* and *Andrographis paniculata* in his experiment for lowering glucose level and found later one more effective than former. Due to informal accessibility, cheap price with no side effects and positive results ayurvedic plants are getting keen interest of researchers. *In-vitro* studies of crude extracts and powder of medicinal plants are proved as an effective remedy against hyperglycemia. However, comprehensive study and phytochemical analysis of such plants are still required before utilization by humans. It is recommended that pharmaceutical companies can use the results of present study for commercial use and manufacturing medicine with recommended dose.

Conclusion

In present investigation *Swertia chirata* was found effective in lowering of glucose level in diabetic patients without any harmful effect. Herbal material can be used as diabetic controlling agent, and should be phytochemically analyzed to purify the active ingredients. Results of current study and related researches should be evaluated by pharmaceutical point of view to provide effective medicines in cheap prices. Further investigations are recommended to avoid any conflict in preparation of patent medicine.

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