



Pharmacological Study

Hypoglycemic and antihyperglycemic activity of *Saptarangyadi Ghanavati*: An Ayurvedic compound formulation

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Abstract

Background: Diabetes mellitus is a persistent health problem that requires innovative strategies to improve health and needs a multifactorial approach for the treatment. *Saptarangyadi Ghanavati*, a formulated Ayurvedic compound consists of herbs with anti-diabetic potential. **Aim:** To evaluate the hypoglycemic and antihyperglycemic activities of *Saptarangyadi Ghanavati*. **Materials and Methods:** For hypoglycemic activity 18 Swiss albino mice were divided into three groups (6 in each). First group served as normal control, second group is the test drug and third is the standard control group. For antihyperglycemic activity 24 Swiss albino mice were divided into four groups (6 in each). First group served as water control, second negative control, third test drug and fourth as standard control group. Test drug *Saptarangyadi Ghanavati* was suspended in water and administered to animals at the dose of 400 mg/kg. Glibenclamide was used as reference standard in both the models at the dose of 0.65 mg/kg. **Results:** *Saptarangyadi Ghanavati* showed mild reduction in Blood Sugar Level (BSL) at all the time intervals in normoglycemic mice; however, the observed decrease of BSL was found to be statistically non significant. In antihyperglycemic activity, even though the drug failed to cease the hyperglycemia in the first hour after the glucose overload, it attenuated the same in later hours in nonsignificant extent. **Conclusion:** The study reveals that *Saptarangyadi Ghanavati* has moderate hypoglycemic and antihyperglycemic effect.

Key words: Albino mice, antihyperglycemic, glibenclamide, hypoglycemic, *Saptarangyadi Ghanavati*

Introduction

The herbal medicines are getting more importance in the treatment of diabetes around the globe because of the adverse effects of the conventional medicine used to treat diabetes mellitus. Herbal medicines are free from side effects and are less costly when compared to the synthetic anti-diabetic agents. The major side effect related to antidiabetic agents is hypoglycemia. Further a safe and reliable antidiabetic drug should lower the raised blood glucose levels to the desired level, not lowering the blood glucose levels to a life-threatening condition.

Saptarangyadi ghanavati is the combination of Ayurvedic drugs with potent antihyperglycemic drugs like *Saptarangi* (*Salacia chinensis* L.),^[1] *Karvellaka* (*Momordia charantia* L.),^[2,3] *Methika* (*Trigonella foenum-graecum* L.),^[4] *Guduchi* (*Tinospora cordifolia* (Thunb.) Miers)^[5-7] and *Triphala*.^[8,9] This formulation was specially formulated for the treatment of diabetic patients.^[10] To provide experimental basis to clinical findings, hypoglycemic antihyperglycemic activity has been undertaken.

Materials and Methods

Animals

Swiss albino mice (*Mus musculus*) of either sex weighing 28 ± 02 g were obtained from animal house attached to Pharmacology Laboratory of I.P.G.T and R.A, Gujarat Ayurved University, Jamnagar. Six animals were housed in each cage

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made of polypropylene with stainless steel top grill. The dry wheat (post hulled) waste was used as bedding material and was changed every morning. The animals were exposed to 12-hour light and 12-hour dark cycle with the relative humidity of 50-70% and the ambient temperature during the period of experimentation was $22 \pm 03^{\circ}\text{C}$. Animals were fed with Amrut brand rat pellet feed supplied by Pranav Agro Mills Pvt. Limited and for their drinking purpose tap water *ad libitum* was used. The experiments were carried out after obtaining permission from Institutional Animal Ethics Committee (Approval number: IAEC/07/2010/06/MD).

Test formulation

The genuine and authenticated raw materials [Table 1] of the test formulation were procured from Pharmacy, Gujarat Ayurved University, Jamnagar. They were made to coarse powder form and mixed in equal proportions. The decoction was prepared by following the classical method.^[11] The decoction was then filtered and further heated up to a concentrated form, i.e., *Ghana* was formed and then tablets (each of 200 mg).

Dose selection and schedule

The dose of *Saptaragyadi Ghanavati* for adult is 3 g/day. The dose for experimental animals (mouse) was calculated by extrapolating the human dose to animals (390 mg/kg rounded to 400 mg/kg) based on the body surface area ratio by referring to the standard table of Paget and Barnes.^[12] The test drug was suspended in distilled water with suitable concentration depending up on body weight of animals prior to administration. This was administered to animals orally with the help of gastric catheter sleeved to syringe. The drugs were administered to overnight fasted animals.

Hypoglycemic activity

Swiss albino mice of either sex were randomly divided into three groups of six each. The first group served as normal control and to the second group test drug *Saptaragyadi Ghanavati* was administered in the dose of 400 mg/kg and the third group served as standard control group to which glibenclamide (0.65 mg/kg) was administered.

The animals were fasted overnight prior to the experiment and in the morning the fasting initial reading of Blood Sugar Level (BSL) was measured with the help of One Touch Easy Glucometer by using One Touch Easy GlucoTest Strips as per user's guideline by anaesthetizing the animals with ether and collecting the blood sample from tail vein following aseptic

conditions. Then the test drug and vehicles were administered to respective groups. The BSL was recorded after 1 h, 2 h, 3 h and 5 h of test drug administration for assessing the hypoglycemic effect of test drug.^[13]

Antihyperglycemic activity

Swiss albino mice of either sex were randomly divided into four groups of six each. First group served as water control and second group served as negative control to which glucose (5 g/kg) solution alone was administered. To third group test drug *Saptaragyadi ghanavati* was administered in the dose of (400 mg/kg) was given. Forth group served as standard control group ($n = 6$) to which glibenclamide (0.65 mg/kg)^[14] was given.

The animals were fasted overnight prior to the experiment and in the morning the fasting initial BSL was measured as mentioned in hypoglycemic activity. Test drug *Saptaragyadi Ghanavati* and reference standard drug were given to the respective group of animals as per the body weight. After 1 h of drug administration glucose (5 g/kg) solution was administered to second, third and fourth groups orally by dissolving it in distilled water. Thereafter, BSL was recorded at 30 min, 60 min, 90 min and 120 min of postglucose overload for accessing the antihyperglycemic activity of test drug.^[13]

Statistical analysis

The results are presented as Mean \pm SEM. The data generated during the study were subjected to Student's 't' test for paired and unpaired data to assess the statistical significance. The values were considered significant at the levels of $P < 0.05$, $P < 0.01$ and $P < 0.001$.

Results

The administration of glibenclamide to overnight fasted mice leads to significant reduction in blood glucose level at almost all time intervals. In *Saptaragyadi Ghanavati* treated group also reduction in BSL was observed in all time intervals, however the observed decrease of BSL is found to be statistically insignificant [Table 2]. The result of this study indicates that *Saptaragyadi Ghanavati* is having mild hypoglycemic property.

Administration of glucose overload leads to insignificant increase in BSL in glucose control group [Table 3]. Test drug and reference standard drug insignificantly decreased BSL of glucose-overloaded mice at 30 minutes after glucose overload in comparison to glucose control group. At 60, 90 and 120 minutes also test drug did not attenuate the blood glucose level in significant manner. Standard control drug attenuated blood glucose level in time-dependant manner.

Discussion

An antidiabetic agent should be having a good effect on lowering the raised blood glucose levels in hyperglycemic subjects. But it should not lower the blood glucose levels below normal, in normoglycemic subjects. Hypoglycemia is a fatal medical emergency, which require immediate intervention in the form glucose administration to cover up the glucose deficiency in the blood. Thus hypoglycemic potential of *Saptaragyadi Ghanavati* was compared with the standard

Table 1: Formulation composition of *Saptaragyadi Ghanavati*

Drugs	Part used	Proportion
<i>Saptachakra (Salacia chinensis)</i>	Root	1
<i>Amalaki (Emblica officinalis)</i> - 4 parts	Fruit pericarp	1
<i>Bibhitaki (Terminalia bellerica)</i> - 2 parts		
<i>Haritaki (Terminalia chebula)</i> - 1 part		
<i>Methika (Trigonella foenum-graecum)</i>	Seed	1
<i>Karavellaka (Momordia charantia)</i>	Seed	1
<i>Guduchi (Tinospora cordifolia)</i>	Stem	1

Table 2: Effect of *Saptarangyadi Ghanavati* on blood sugar level in normal overnight fasted Swiss albino mice at various intervals

Groups	Initial (mg/dl)	1 hour (mg/dl)	2 hour (mg/dl)	3 hour (mg/dl)	5 hour (mg/dl)
Water control	080.50±9.55	88.50±13.3	73.16±11.43	69.5±11.3	67.0±11.3
<i>Saptarangyadi Ghanavati</i>	076.80±9.70	69.10±12.9	52.10±03.87	48.5±06.9	52.3±07.30
Glibenclamide	141.00±6.02	81.80±09.9	80.40±06.03	81.00±08.4	73.0±03.00

Table 3: Effect of *Saptarangyadi Ghanavati* on blood sugar level in glucose-overloaded Swiss albino mice at various time intervals

Groups	Initial (mg/dl)	30 min (mg/dl)	60 min (mg/dl)	90 min (mg/dl)	120 min (mg/dl)
Water control	094.42±06.8	104.43±05.9	101.43±4.80	104.85±4.00	109.43±1.63
Glucose control	102.14±06.5	149.43±21.2 [#]	103.70±9.80	102.00±6.80	106.00±8.30
<i>Saptarangyadi Ghanavati</i>	066.14±07.6	090.20±07.2	084.14±3.25	075.70±3.09	070.71±5.70
Glibenclamide	121.4±10.0	127.40±40.2	089.2±8.40	080.60±8.40*	067.80±6.50*

[#]P<0.05 (Paired t test), *P<0.05 (Unpaired t test)

reference drug, glibenclamide, of which hypoglycemia like side effects are not uncommon.^[15] The results of this study shows that administration of glibenclamide to overnight fasted mice leads to significant reduction in blood glucose level at almost all time intervals. In *Saptarangyadi Ghanavati* treated group also reduction in BSL was observed in all time intervals; however, the observed decrease of BSL is found to be statistically insignificant. The result of this study indicates that *Saptarangyadi Ghanavati* is having moderate hypoglycemic property.

The antidiabetic drugs which improve oral glucose response in the subjects are potent antihyperglycemic agent. Hence, *Saptarangyadi Ghanavati* was evaluated for antihyperglycemic activity against glucose overloading. In present study administration of glucose overload leads to insignificant increase in BSL in glucose control group. Both test drug and reference standard drugs insignificantly decreased BSL of glucose overloaded mice at 30 minutes after glucose overload. At 60, 90 and 120 minutes also test drug did not attenuate the BSL in significant manner. Standard control drug significantly attenuated BSL in time dependant manner. This shows that *Saptarangyadi Ghanavati* is having moderate antihyperglycemic activity. Being a polyherbal formulation it contains like *Methika*, *Karvellaka*, *Guduchi*, *Saptarangi* and *Triphala*, may be responsible for this observation.

Conclusions

Saptarangyadi Ghanavati has moderate hypoglycemic and antihyperglycemic effect. The study is only preliminary and based on the present findings antidiabetic potential of this formulation can further be studied in diabetic rats.

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हिन्दी सारांश

सप्तरंग्यादि घनवटी का हाइपोग्लाइसिमिक एवं एंटीहाइपरग्लाइसिमिक प्रभाव

कँवर सम्राट सिंग, अशोक बी.के., मन्दीप कौर, बी.रविशंकर, हरिमोहन चन्दोला

सप्तरंग्यादि घन वटी का हाइपोग्लाइसिमिक एवं एंटीहाइपरग्लाइसिमिक प्रभाव सामान्य व ग्लूकोज ओवरलोड चूहों पर देखा गया। सप्तरंग्यादि घन वटी का चूर्ण जल में घोल कर ४०० मि.ग्रा./कि.ग्रा. मात्रा में दिया गया, ग्लेबनक्लेमाइड दोनों वर्गों में रेफरेंस मानक रखा गया। सप्तरंग्यादि घन वटी के कारण नारमोग्लासेमिक वर्ग में सभी काल अंतराल में रक्तगत शर्करा में अल्प ह्रास देखा गया तथापि यह ह्रास सांख्यिकी के आधार पर महत्वहीन रहा। एंटीहाइपरग्लाइसिमिक वर्ग में यथापि ग्लूकोज ओवरलोड उपरांत प्रथम घण्टे में, सप्तरंग्यादि घन वटी हाइपरग्लाइसीमिया नहीं रोक सकी तथापि आने वाले घण्टों में रक्तगत शर्करा में सांख्यिकी के आधार पर महत्वहीन ह्रास देखा गया। इस आधार पर सप्तरंग्यादि घन वटी का औसत दर्जे का हाइपोग्लाइसिमिक एवं एंटीहाइपरग्लाइसिमिक प्रभाव पाया गया।