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Experimental evaluation of antihyperglycemic activity of *Vangasindhoora* against streptozotocin (stz) induced diabetes in wistar albino rats

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ABSTRACT

Rasasastra refers to the science of making metals and minerals assimilable for the body so they can be used as medicines and give effective result even in smaller dose. *Kupipakva Rasayana* bears a unique place in *Rasasastra* as it has quicker action and synergistic effect in body at very low dose. *Vangasindhoora* is a *Kupipakva Rasayana* preparation mentioned in *Rasendra Sambhava* and is indicated in all *Prameha*. *Vangasindhoora* contains *Vanga, Parada, Gandhaka* and *Navasara* as ingredients. Diabetes is caused due to absolute or relative deficiency of insulin. Today's lifestyle has been changed and sharp increase in the incidence and prevalance of diabetes mellitus has been perceived. In the present study experimental evaluation of antihyperglycemic effect of *Vangasindhoora* has been dealt and the result were assessed using one-way Anova followed by Dunnet's multiple comparison t-test using graph pad instant software. Result shows that *vangasindhoora* has antihyperglycemic effect.

Key words: *Vangasindhoora, Antihyperglycemic activity.*

INTRODUCTION

Vangasindhoora[1] selected for the present study is a mineral preparation mentioned in *Rasendra Sambhava* in *Kuppipakva Prakarana*. The ingredients present in the formulation are *Vanga, Parada, Gandhaka* and *Navasara.* This is indicated for *Sarva Prameha, Balya, Deepana, Pachana, Prajnakaram* and *Dhatusthairyakara.* Considering the plausible incidence of *Prameha* in the society, *Vangasindhoora* is considered for the study which has *Sarvapramehahara* property. *Prameha* is defined as a disease, which is to be characterized with excessive urination and turbidity. *Acharya Charaka* has mentioned *Prameha* as one of the *Anushangi Roga*. *Acharya Chakrapani* has commented *Anushangi as Punarbhavi*, which means it is very difficult to cure.[2]

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Hyperglycemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over a time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. WHO projects that diabetes will be the 7th leading cause of death in 2030[3]

In this study, *Prameha* being a broad spectrum to be more confined non- insulin dependent diabetes mellitus is considered and a trial is undertaken to

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examine the antihyperglycemic effect of *Vangasindhoora* in the experimental study.

METHODOLOGY

Vangasindhoora was prepared according to reference *Rasendrasambhava. Sodhana of Vanga, Parada, Gandhaka and Navasara* was carried out according to the classical reference. *Vanga Sodhana*[4] was done by *Dalana* method *in Nirgundi Swarasa* containing *Haridra Churna. Parada Sodhana* was carried out by *Ashtasamskara.*[5] *Gandhaka Sodhana*[6] done by *Kurmaputa Vidhi* and *Navasara Sodhana*[7] by *Nirjalikarana* method. *Kajjali* was prepared out of these *Sodhita* ingredients and *Bhavana* done in *Jalajata Swarasa (Homonoea Riparia). Kupipakva Rasayana Vidhi* was carried out to prepare *Vangasindhoora.*

Experimental study was conducted after attaining prior permission from institutional animal ethical committee (IAEC), SDM Centre for Research in Ayurveda and Allied sciences, Udupi, Karnataka. Approval number SDMCRA / IAEC/MVR 28.

Study design

Experimental study carried out on wistar albino rats weighing 150-250gm in SDM animal house. They were maintained at a temperature of 25-27°C, humidity of 55% and 12hr light and dark cycles. They were fed with Champak feeds and foods brand rat pellets feed and water ad libitum.

Sources of data

Experimental source

The healthy wistar albino rats were obtained from the animal house attached to the department of Pharmacology & Toxicology of SDM Centre for Research in Ayurveda and Allied Sciences, Udupi, Karnataka, India.

Drug source

- Test drug - Prepared in *Rasasala* of MVRAMC, Parassinikkadavu, Kannur, Kerala.
- Standard drug - Market sample obtained from Udupi
- Streptozotocin - For inducing diabetes obtained from the department of Pharmacology & Toxicology of SDM Centre for Research in Ayurveda and Allied Sciences, Udupi, Karnataka.

Duration of study - 21 days

Method of data collection

- The healthy wistar albino rats were obtained from the animal house attached to the department of Pharmacology & Toxicology of SDM Centre for Research in Ayurveda and Allied sciences Udupi, Karnataka, India
- They were housed in standard transparent polypropylene cages with wheat husk bedding, renewed every 24 hours. They were maintained at a temperature of 25-27°C, humidity of 55% and 12hr light and dark cycles. Healthy wistar albino rats of both sexes weighing about 150-250gm were selected and divided into four groups. The selected animals were maintained properly under the prevailing husbandry conditions. They were marked over the head, neck, body and tail for easy identification in each group.
- Cares of animals were undertaken as per CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals) guidelines.

Inclusion criteria

- The healthy wistar albino rats weighing 150-250gm of either sex.

Exclusion criteria

- Wistar strain albino rats weighing less than150gm and more than 250gm.
- Pregnant and diseased rat.
- Rats used for and under trial of other experiments.

Animal grouping

Selected wistar albino rats of either sex weighing around 150-250gm were placed randomly under 4 groups, each group containing 8 rats.

1. Group 1 - Tap water control group
2. Group 2 - Positive control group

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3. Group 3 - Glibenclamide (Standard drug group)
4. Group 4 - *Vangasindhoora* (Test drug group)

Dose fixation

The dose of the formulation was calculated by extrapolating the human dose to rat dose on the basis of body surface area ratio (conversion factor 0.018 for rats) by referring to the table of "Paget and Barnes"(1969).

For rats: Human dose × 0.018 × 5 × wt of rat/1000gm.

Drug used

Test drug- *Vangasindhoora*

Standard drug- Glibenclamide

Route of administration - Oral

Induction of diabetic

70mg of streptozotocin (STZ) dissolved in 20ml ice-cold citrate buffer 0.1M, pH 5.5 and kept in ice and administered within 5 minutes at a dose of 35-40mg/kg body weight intra-peritoneally. After 48-72 hrs of STZ administration, rats with moderate diabetes having glycosuria and hyperglycemia (i.e., with a blood glucose of 200-300mg/dl) was taken for the experiment.

Dose preparation

22.5mg of prepared medicine, *Vangasindhoora* was powdered well and added 100mg CMC (Carboxymethyl cellulose). These were mixed thoroughly and to this 20ml distilled water was added and stirred well. From this, dose was administered to each rat according to the body weight. This dose was prepared daily and administered to the group 4 for 21 days.

20 tablets of glibenclamide (5mg) were powdered and 25ml of distilled water was added and mixed thoroughly. From this, dose was administered to each rat according to the body weight. This dose was prepared daily and administered to the group 3 for 21 days.

Numbering and identification: The animals were marked with saturated picric acid solution in water for proper identification. The marking within the cage is as follows.

Marking of rats

Animal number	Marking
1.	Head
2.	Neck
3.	Body
4.	Tail

Testing parameters

- Biochemical parameters
- Histopathology

Observations and Results

Observed mean values of biochemical parameters

Parameters	Normal control group	Positive control group	Standard group	Test group
RBS	93	548.16	327.85	436.57
SGOT	116.83	136.16	108.66	103.83
SGPT	55.5	116.16	82.71	91.83
ALP	716	108.66	898.4	710.16
T. Protein	5.03	5.96	6.08	4.85
Albumin	2.86	3.2	2.68	3.25
T. Bilirubin	0.7	0.81	0.316	0.46
D. Bilirubin	0.7	0.13	0.20	0.12
Cholesterol	70.33	71.83	73.28	46.5
Triglyceride	89.66	152.83	82.57	39
HDL	45	41.16	31.28	17
LDL	15.15	4.71	27.38	21.7
VLDL	17.9	2.76	16.51	7.8

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Globulin	2.16	2.76	3.4	1.6

Consolidated statement of experimental study

Parameters	Compared with N.C	Compared with positive control	
	Positive control	Standard drug group	Test drug group
RBS	SI	SD	NSD
SGOT	NSI	NSD	NSD
SGPT	SI	NSD	NSD
ALP	SI	SI	SI
Total protein	NSI	NSI	NSD
Albumin	NSI	NSD	NSI
Total bilirubin	NSI	SD	SD
Direct bilirubin	SD	NSI	NSD
Cholesterol	NSI	NSI	SD
Triglyceride	SI	SD	SD
HDL	NSD	NSD	SD
LDL	NSD	SI	SI
VLDL	SD	SI	NSI
Globulin	NSI	NSI	NSD

Histopathology

Liver - Injection of STZ resulted in mild fatty changes, sinusoidal dilatation and diffused degenerative changes in hepatocytes. Liver sections from reference standard group exhibited normal cytoarchitecture in majority of the rats, however, fatty degenerative changes along with sinusoidal dilatation, bile stasis was observed in few sections. Liver sections from TED dose administered groups exhibited mild to moderate fatty changes and sinusoidal dilation.

Pancreas - Scanning of sections from STZ control group exhibited few islets of small size with much reduced granulation, cellularity was less, vacuolization was observed. In sections from reference standard group - medium to large sized islets with good cellularity and granulation, mild vacuolization was observed. In sections from TED dose administered group - medium sized islets with medium cellularity and much reduced vacuolization was observed.

DISCUSSION

Effect on blood sugar level

Data shows there was decrease in random blood sugar level in test drug group when compared to positive control group, the observed decrease was found to be statistically non-significant.

Effect on SGOT

Data shows there was decrease in SGOT level in test drug group when compared to positive control group, the observed decrease was found to be statistically non-significant.

Effect on SGPT

Data shows there was decrease in SGPT level in test drug group when compared to positive control group, the observed decrease was found to be statistically non-significant.

Effect on alkaline phosphatase

Data shows there was increase in alkaline phosphatase level in test drug group when compared to positive control group, the observed increase was found to be statistically significant.

Effect on total protein

Data shows there was non-significant decrease in total protein level in test group when compared to positive control group, the observed decrease was found to be statistically non-significant.

Effect on albumin

Data shows there is no significant increase in albumin level in test group when compared to positive control group, the observed increase was found to be statistically non-significant.

Effect on total bilirubin

Data shows there was decrease in total bilirubin level in test drug group when compared to positive control group, the observed decrease was found to be statistically very significant.

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Effect on direct bilirubin

Data shows there is decrease in direct bilirubin level in test group when compared to positive control group, the observed decrease was found to be statistically non-significant.

Effect on cholesterol

Data shows there was decrease in cholesterol level in test group when compared to positive control group, the observed decrease was found to be statistically very significant.

Effect on triglyceride

Data shows there is decrease in triglyceride level in test drug group when compared to positive control group, the observed decrease was found to be statistically very significant.

Effect on HDL

Data shows there was decrease in HDL level in test drug group when compared to positive control group, the observed decrease was found to be statistically significant.

Effect on LDL

Data shows there was increase in LDL level in test drug group when compared to positive control group, the observed increase was found to be statistically significant.

Effect on VLDL

Data shows there was increase in VLDL level in test drug group when compared to positive control group, the observed increase was found to be statistically non-significant.

Effect on globulin

Data shows there was decrease in globulin level in test group when compared to positive control group, the observed decrease was found to be statistically non-significant.

Based on the above results, *Vangasindhoora* has antihyperglycemic activity.

Conclusion

Diabetes or as in Ayurvedic classical texts - *Prameha* has become one of the leading lifestyle diseases in world. Prevalence of diabetes is tremendously increasing. *Vangasindhoora,* a *Kupipakva* preparation indicated in *Sarvaprameha. Sudha Vanga, Sudha Parada, Sudha Gandhaka* and *Sudha Navasara* are the ingredients in *Vangasindhoora.* Experimental evaluation of *Vangasindhoora* shows that it is effective in hyperglycemia but not as effective as standard drug glibenclamide.

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