

Experimental study on anti-hyperglycemic effect of *Naga Bhasma* (incinerated lead)

Dhirajsingh Rajput, Mukesh Nariya, Biswajyoti Patgiri, Pradeepkumar Prajapati



Abstract:

Hyperglycemia is major representative symptom of diabetes. Increasing global incidence of diabetes is serious issue and large numbers of researches are undergoing to find promising cure of this chronic disease. In Ayurveda, *Naga Bhasma* (incinerated lead) is mainly indicated in treatment of *Prameha* (diabetes) as one of the potent metallic formulations. There are few published research works in which antidiabetic effect of *Naga Bhasma* has been studied. However according to classical texts *Bhasma* prepared by using mercury are considered as superior than those prepared by using herbal media. Comparative antihyperglycemic study of *Naga Bhasma* prepared by using mercury (NBP) and by using *Vasa* (*Adhatoda vasica* Niss) as herbal media (NBH) is not available. Hence in present study an attempt has been made to explore antihyperglycemic effect of *Naga Bhasma* prepared by two different methods in Wistar strain albino mice. Both drug reduced the sugar level at 90 and 120 minutes at almost similar level as observed at initial reading and the effects were significant in comparison to control group. Experimental study shows that both samples of *Naga Bhasma* have no hypoglycemic action but possess moderate anti-hyperglycemic effect after one hour and significant anti-hyperglycemic effect compared to initial blood sugar level.

Key words: *Antihyperglycemic effect, Naga Bhasma, Incinerated lead,*

Introduction:

The origin of the term is Greek: *hyper-*, meaning excessive; *-glyc-*, meaning sweet; and *-emia*, meaning *of the blood*. Hyperglycemia or high blood sugar is a condition in which an excessive amount of glucose circulates in the blood plasma. This is generally a glucose level higher than 11.1 mmol/l (200 mg/dl). A subject with a consistent range between 100 and 126 (American Diabetes Association guidelines) is considered hyperglycemic, while above 126 mg/dl or 7 mmol/l is generally held to have diabetes [1]. A high proportion of patients suffering an acute stress such as stroke or myocardial infarction may develop hyperglycemia, even in the absence of a diagnosis of diabetes. Hyperglycemia is associated with a high risk of mortality after both stroke and myocardial infarction [2].

Diabetes comprises a group of common metabolic disorders that share the phenotype of hyperglycemia. With an increasing incidence worldwide, Diabetes is likely to continue to be a leading cause of morbidity and mortality in the near future. Herbo-mineral drugs of Ayurveda having potential of decreasing blood sugar levels have been tested in experimental animal models and found effective. *Naga Bhasma* is one of the well known

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Corresponding Author:

Dhirajsingh Rajput, Assistant Professor, Dept. of Rasashastra & Bhaishajya Kalpana, MGACH and RC, Wardha (MH), India

Email: dhiraj.ayu@gmail.com

Co-author (s):

Mukesh Nariya, Head, Pharmacological lab. I.P.G.T. & R.A., Gujarat Ayurved University, Jamnagar-361008

Biswajyoti Patgiri, Professor, Dept. of Rasashastra & Bhaishajya Kalpana, I.P.G.T. & R.A., Gujarat Ayurved University, Jamnagar-361008,

Pradeep kumar Prajapati, Director, I.P.G.T. & R.A., Gujarat Ayurved University, Jamnagar

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preparation frequently used in the treatment of various systemic diseases such as *Kasa* (cough), *Raktapradara* (hemorrhagia), *Shukradosha* (abnormalities in semen) etc [3] and specially for *Prameha* (diabetes) and *Naga Bhasma* familiar as *Pramehakarikeshari* i.e. one of the best drug for diabetes[4]. Hence an attempt has been made to elucidate and compare the anti-hyperglycemic effect of two samples of *Naga Bhasma* prepared by two different methods.

Methods:

Among the raw drugs, *Vasa* (*Adhatoda vasica* Niss.) leaves and *Danda* (stem) were collected from botanical garden, IPGT & RA, Jamnagar. Raw *Naga*, *Ashodhita Parada* (raw mercury), *Ashuddha Gandhaka* (raw sulphur) and *Tila tail* (sesame oil) were procured from the pharmacy of the Gujarat Ayurved University, Jamnagar. *Gomutra* (cow urine) and *Kulattha* (*Dolichos biflorus* Linn.) seeds were procured from local market of Jamnagar. *Kanji* (sour gruel), *Takra* (butter milk) and *Kulattha Kwatha* (decoction of *Dolichos biflorus* Linn.) were prepared as per mentioned in *Parada Vigyaniya*[5], *Sushruta Samhita* [6] and *Sharangadhara Samhita* [7] respectively. *Samanya* and *Vishesh Shodhana* of *Naga* was done by adopting the reference of *Sharangadhara Samhita* [8] and *Rasatarangini* [9] respectively. Three batches of *Naga Bhasma* were prepared by using *Parada* and *Gandhaka* media (NBP) [10] Another three batches of *Naga Bhasma* were prepared by using *Vasa* (*Adhatodia vasica* Niss.) as herbal media (NBH) [11]. Both NBP and NBH samples were formed in seven *Putra* (incineration cycles). Anti hyperglycemic study of NBP and NBH

was done after obtaining permission from institutional animal ethical committee. The study was done to find out the effect of *Naga Bhasma* on blood glucose level in glucose overloading induced hyperglycemia (Anti-hyperglycemic effect) in Wistar strain albino mice.

Hypoglycemic and anti-hyperglycemic activity:

Albino mice of either sex weighing 30 ± 5 g were selected in the experimentation and divided randomly into 3 groups, each containing 6 animals, 3 males and 3 females as follow,

Group I: Control group, received honey as vehicle (10 ml/kg, orally)

Group II: NBP, Therapeutically equivalent dose (TED) (65 mg/kg, orally)

Group III: NBH, TED (65 mg/kg, orally)

Group IV: Standard control group (glibenclamide as standard drug)

Animals were fasted overnight prior to the experiment. The fasting blood glucose level (initial reading) was measured with one touch glucometer (J & J). Test drugs were administered to respective groups. After one hour of test drug, glucose was administered at the dose of 5 g/kg, orally and again blood glucose level was recorded at 30, 60, 90, and 120 minutes interval to post glucose loading. The actual change in the blood glucose level was calculated over the initial blood glucose level.

Statistical analysis: The results are presented as Mean \pm SEM. The data generated during the study were subjected to Student unpaired t test as well as one way ANOVA with Holm-Sidak multiple's test as post-hoc test. $P < 0.05$ was considered as significant level.

Observations and Results:

* $P < 0.05$, ** $P < 0.02$ (Paired t test) compared to initial values, @ $P < 0.05$, @@ $P < 0.001$ (One way ANOVA followed by Holm-Sidak method) compared to control group.

Table No.1: Effect of NBP and NBH on fasting blood sugar level in glucose over loaded albino mice					
Groups	Initial (mg/dl)	30min (mg/dl)	60min (mg/dl)	90min (mg/dl)	120min (mg/dl)
Control	137.17 \pm 10.40	157.33 \pm 6.88**	157.83 \pm 9.87*	154.83 \pm 8.31*	152.33 \pm 7.86*
NBP	125.67 \pm 8.19	140.00 \pm 6.17**	136.00 \pm 9.79	128.50 \pm 10.65	130.00 \pm 6.58@
NBH	120.83 \pm 3.40	138.67 \pm 5.84*	141.67 \pm 5.92*	131.17 \pm 9.12	130.50 \pm 4.30@
Glibenclamide	87.00 \pm 3.13	82.33 \pm 1.89@@	75.33 \pm 2.04@@	66.33 \pm 1.75@@	62.67 \pm 2.04@@

Table No.1 shows effect of NBP and NBH on blood glucose level in glucose over loaded albino mice. Control group showed statistically significant increase in blood glucose level compared to their initial values. Both group showed statistically significant increase in blood glucose level up to one hour in comparison to initial level. However both drug reduced the sugar level at 90 and 120 minutes at almost similar level as observed at initial reading and the effects were significant in comparison to control group. In standard treated group, overloading of glucose did not produce any increase in blood glucose level and effect of standard drug was significant at all-time intervals in comparison to control group.

Discussion:

Modern science considers lead and lead compounds are toxic to human health. Manifestation of some extraordinary medicinal properties in *Naga Bhasma* indicates that, the Ayurvedic processes performed during its preparation must be bringing about some radical changes in lead, which not only destroy its toxic nature but impart some extraordinary medicinal properties ascribed to *Naga Bhasma*. According to modern science Lead is heavy metal and highly toxic in nature. Although toxic effect of Lead was also known to ancient seers of Ayurveda and the management of toxic effects is mentioned in classical texts in detail[12,13,14]. *Anandakanda* (12th century A.D.)[15] and *Rasaratnasamuchchya* (13th century A.D.) are well known comprehensive treatise of Ayurveda mainly used *Naga Bhasma* to treat diabetes[16]. Later on, many texts emphasized on the antidiabetic property of *Naga Bhasma*. This literary evidence supports the antihyperglycemic efficacy of *Naga Bhasma*, though it must be evaluated experimentally to establish literary claim on scientific basis.

In this experimental study, NBP and NBH significantly decreased the fasting blood sugar level of glucose overloaded Abino mice treated group in comparison to control group. Although, decrease observed in fasting blood sugar level (FBS) is more significant in NBP treated group than NBH treated group. This prediction suggests *Pramehagna* property of *Naga Bhasma* during the hyperglycemic condition. Results of both NBP and NBH on reducing FBS level is non significant in comparison to standard control group (glibenclamide administered group). Previous

study conducted by Pravin Tate *et al.* showed that 30 *Puti Naga Bhasma* also possesses similar results,[17] while according research of Anjana Choubeet *al.*, *Naga Bhasma* prepared by 60 *Puti* possess significant anti-hyperglycemic property[18]. However both NBP and NBH samples utilized in present study were prepared in seven *Puti*. *Naga Bhasma* can be prepared by giving 3, 7, 12, 21, 30, 60 or 100 number of *Puti*[19]. A pilot study conducted by Pravin Tate *et al* showed that *Naga Bhasma* did not pass classical tests of *Bhasma* after 3 *Puti*[20]. According to classical reference more the number of *Puti* more effectiveness will be in prepared *Bhasma*. Hence based on previous studies and results of present work it can be interpreted that minimum 30 *Puti* are required for anti-hyperglycemic activity of *Naga Bhasma*.

Conclusion:

Experimental study shows that both samples of *Naga Bhasmas* have no hypoglycemic action but possess moderate anti-hyperglycemic effect after one hour and significant anti-hyperglycemic effect compared to initial BSL. But this difference is statically non-significant when compare in between both the groups. More numbers of *Puti* are required to induce better significant antihyperglycemic property in *Naga Bhasma*.

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