



A Conceptual Review of *Kajjali* (Black Sulphide of Mercury)

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Abstract:

Ayurveda explains the usage of various metals, minerals and herbo-mineral preparation in therapeutics which are mainly described in *rasashastra*. *Rasaushadhis* are used in various dosage forms like *Kharaliya*, *Parpati*, *Pottali*, *Kupipakwa Rasayana*. *Kajjali* is a *kharaliya kalpa* as it is prepared by trituration of *parad* with specific proportion of *gandhak* with the help of mortar and pestle till formation of black powder like collyrium. *Kajjali* is a novel concept of ancient Indian drug delivery system. *Kajjali* is also mentioned as *Kajjali Bandha*. Also, *Kajjali* is a *sagandha niragni moorchana* of *parad* by the means of which it has definite disease curing capacity called as *vyadhihaktva*. *Kajjali* is used as *sahapana*, *anupana*, acts as *sarvamayhara*, *vrishya* and cures disorders of *tridosha*. The present study deals with the conceptual study of *kajjali* in accordance with *parada bandha*, *moorchana*, preparation, types of *kajjali*, analysis of *kajjali*, Uses of *kajjali*, various formulations of *kajjali*, Toxicity of *Kajjali*.

Key Words: *Kajjali*, *Parad*, *Gandhak*, *Moorchana*, *Parad Bandha*.

Introduction:

Rasa Shastra is a science which deals with the study of *Mritaloha* (incinerated minerals), *Kandavisha* (Poisonous plant drugs) and *Parad* (Mercury).⁽¹⁾

Rasaushadhis are known for their superiority than other drugs by means of their effectiveness in low doses, being tasteless (easy palatable) and showing effect in short time span of treatment.⁽²⁾ Mercury is main ingredient of many *Rasaushadhis*. But it is unsuitable to use in its natural form.

Rasa bandha is a procedure to control unsteadiness of mercury like *Chanchalyatwa* (Quickness), *Durgrahatva* (Difficult to embrace), etc.⁽³⁾ There are 25 types of *Rasa bandhas* according to *Rasaratnasamucchaya*. *Kajjali* is described as one of the *Parad Bandha*.⁽⁴⁾

Description of *Kajjali* is first given by *Nagarjuna* in 8th century.⁽⁵⁾ *Rasaushadhis* are used in various dosage

forms like *Kharaliya*, *Parpati*, *Pottali*, *Kupipakwa Rasayana*.⁽⁶⁾ *Kharliya rasayana* are very large in number in which *Kajjali* is a key ingredient.⁽⁷⁾

Moorchana is a process in which mercurial compounds develop definite disease curing capacity called as *Vyadhighatakatva*.⁽⁸⁾ After *moorchana* mercury doesn't retain in its original form.⁽⁹⁾ *Kajjali* is *Sagandha Niragni Moorchana* of *Shuddha Parad* with definite proportion of *Shuddha Gandhak* till the formation of fine black powder like collyrium.⁽¹⁰⁾

Kajjali is used as *Sahapana* (taken together with medicine) and *Anupana* (a vehicle taken after medicine), acts as a *Sarvamayahara* (cures various diseases), *Vrishya* (aphrodisiac) and cures disorders of *tridosha*.⁽¹¹⁾ *Kajjali* is widely used in various forms of *rasaushadhis* and indicated as *Sarvamayahara*.⁽⁹⁾ The present study deals with the conceptual study of *kajjali*.

Materials and Methods:

Review of *Kajjali* was done from various texts:

1. **Definition:** When *Parad* is triturated with various types of *dhatu* like *Gandhak* in the absence of any liquid media to obtain a fine black powder like collyrium called as *Kajjali*.⁽¹²⁾ *Kajjali* is the *Sagandha Niragni Moorchana* of *Parad*. *Kajjali* is nothing but the *kajjalibandha* of *Parad*. A *kajjali bandha* formed by trituration of *Shuddha Parad* and *Shuddha Gandhak* in the *khalvayantra* till formation of very fine powder like *kajal* is called as *Kajjali Bandha*.⁽¹⁰⁾
2. **Synonyms of *Kajjali*:** *Kajjali*, *Kajjal*, *Kajjalika*.⁽¹³⁾
3. **Ingredients:** *Parad*, *Gandhak*
4. **Methodology:**
 - I. ***Parad Shodhan: Method for Purification of Mercury***:⁽¹⁴⁾

Parad is triturated with *Rason* in *khalwayantra* for 7 days to get *shuddha parad*.

II. *Gandhak Shodhan: Method for Purification of Sulphur*:⁽¹⁵⁾

Gandhak powder is melted in iron vessel with equal quantity of *Goghrita*. When the *Gandhak* is melted it is poured in *Godugdha* and then washed with warm water. In this way *Gandhak Shodhana* is done for all the purposes.

5. Preparation Of *Kajjali*:⁽¹⁶⁾

In various *rasagranthas* different processes and proportions are described to prepare the *kajjali*.

Method:

Preparation of *kajjali* is done by *mardana*(trituration) of *shuddha parada* with definite proportions like *ardha*, *sama*, *dwiguna*, *triguna*, *chaturguna*, *shadaguna*, etc. of *shuddha gandhak* till the formation of black powder like *Kajjal*(collyrium) and shining mercury particles completely disappears.

Siddhi Lakshanas of Kajjali:⁽¹³⁾⁽¹⁷⁾

1. *Shlakshnatva*
2. *Rekhapurnatva*
3. *Varitartva*
4. *Nishchandratva*
5. *Kajjalabho*

Analysis of *Kajjali*:

Prepared *Kajjali* can be assessed by Ayurvedic as well as modern parameters

➤ Ayurvedic Parameters:

Shabda, *Rupa*, *Rasa* – Not Applicable
Sparsha – *Shlakshna* (Soft fine powder) *Rekhapurnatva*
Rupa – Black, lusterless

➤ Modern Parameters:

Total Ash
Acid Insoluble Ash
Water Soluble Ash
Moisture Content
XRD (X-ray Diffraction Studies)
SEM (Scanning Electron Microscopy)
ICP-AES (Inductively coupled plasma Atomic Emission Spectroscopy)
AAS (Atomic Absorption Spectroscopy)
EDAX (Energy Dispersive X-Ray Analysis)

Types Of *Kajjali*:⁽¹⁸⁾

Ratio (Hg:S)	Nomenclature
1: $\frac{1}{2}$	<i>Ardhaguna</i>
1:1	<i>Samaguna</i>
1:1 $\frac{1}{4}$	<i>Sapada Samaguna</i>
1:1 $\frac{1}{2}$	<i>Sardha Samaguna</i>
1:2	<i>Dwiguna</i>
1:3	<i>Triguna</i>
1:4	<i>Chaturguna</i>
1:5	<i>Panchaguna</i>
1:6	<i>Shadaguna, etc .</i>

Properties Of *Kajjali*:⁽¹¹⁾

Kajjali is used as *Sahapana* (taken together with medicine) and *Anupana* (a vehicle taken after medicine), acts as a *Sarvamayahara* (cures various diseases), *Vrishya* (aphrodisiac) and cures disorders of *tridosha*.

Amayika Prayoga of Kajjali (Therapeutic Uses of Kajjali):⁽¹⁹⁾

- Vamanhara Yoga* (Vomiting):
Samabhaga Kajjali + Sukshma Ela

(Cardamom), *Maricha* (Piper Nigrum), *Karpura* (Camphor), *Musta* (Nagarmotha), *Lavanga* (Clove), *Badarasthi* (Bermingi) *Churna + Honey*

- Trushnahara, Vamanhara Yoga* (Thirst-Vomiting): *Dwiguna Gandhak Kajjali + Karpura* (Camphor), *Ushira* (Khus), *Maricha* (Piper Nigrum), *Shailaya* (Parmelia Perforate), *Sugar, Churna + Water*
- Bahya & Abhyantar Vidhradhi* (Internal & External Abscess): *Kajjali + Varunadi Gana Kwatha*: For some days
- Visarpa: Dwiguna Gandhak Kajjali + Karvellidala Patra Swarasa*
- Bahya & Abhyantar Vidhradhi* (Internal & External Abscess): *Dwiguna Gandhak Kajjali + Shigru* (Drum Stick Plant) *twak swarasa + Honey*: For some days
- Shwasa, Kasa, Tamakshwasa* (Asthma- Bronchitis): *Tulasi* (Ocimum Sanctum) *swarasa bhavita Dwiguna Gandhak Kajjali + Jyeshthamadha* (Glycerrhiza Glabra), *Vasa* (Adhatoda Vasaka), *Pippali* (Piper Longum), *Haritaki* (Terminalia Chebula), *Bibhitaki* (Terminalia Belerica) *churna*
- Ajeerna* (Indigestion): *Samaguna Gandhak Kajjali + Nimbukamla* (Citric Acid), *Shunthi* (Dry Ginger), *Pippali* (Piper Longum) *churna*.
- Swapnameha* (Night Fall): *Samabhaga churna of Kajjali, Ela* (Cardamom), *Ahiphena* (Papaver Somniferous), *Karpur* (Camphor), *Jatiphala* (Mysterica Fragrance), *Lavanga* (Clove); *Matra: 1 Ratti*

- ix. *Jeerna Charmadala: Kajjali + Shishapasara Tail or Navaneet* (Butter): *Lepanarth* (Ointment)
- x. *Kandu, Pama* (Scabies-Itching): 1-part *Kajjali* + 2-part *Dhattura patra + Chitrak* (Plumbago Zeylanica) *swarasa mardana: Lepanartha* (Application externally) with (*Navaneet*) Butter

Toxicity Of *Kajjali*:⁽²⁰⁾

In vivo study on rats has shown that- The effect of *Kajjali* on serum biochemical parameters is: Serum enzymes ALT, AST and ALP levels, as well as serum total and direct bilirubin, serum protein, albumin, glucose, hemoglobin, urea, uric acid and creatinine levels were not significantly altered by the *Kajjali* treatment. However, the treatment for 60 days decreased LDL levels whereas HDL levels were not significantly influenced. Total cholesterol and triglycerides levels were also decreased at the dose of 5 and 10 mg/kg. In sub-acute toxicity, 10 mg/kg (four times higher than the human dose) was investigated. Even in this dose, the *Kajjali* has shown no toxic effect. Both adverse drug reactions and poisonings associated with the use of herbal medicines have increasingly been reported. Herbal use has been associated with organ toxicities of heart, liver, blood, kidneys, central nervous system, and skin and carcinogenesis. In this contest, the present results are interesting. Normal human dose of *Kajjali* powder suspension is 125 mg/50 kg. In sub-acute toxicity, 10 mg/kg (four times higher than the human dose) was investigated and even in this dose, the *Kajjali* has shown no toxic effect.

The administration of *Kajjali* suspension did not show any sub-acute toxic signs in the experimental animals in terms of alteration in hepatic markers, renal markers and other behaviors such as food and water intake, body weight, stool, etc. Therefore,

this study concluded that the *Kajjali*, at doses investigated, did not provoke toxic effects to the animals' liver, heart and kidney. So, it can be concluded that *Kajjali* powder suspension has no acute and subacute toxicity.

Research Work Done on *Kajjali*:

1. 'X-ray Diffraction Analysis of *Samaguna Balijarita Kajjali* (Black Sulphide of Mercury)⁽²¹⁾
2. 'Pharmaceutics and Therapeutics of *Kajjali* (Black Sulphide of Mercury)-A Review'⁽²²⁾
3. 'Characterization of Hg-based ayurvedic drug *Kajjali*: classical and contemporary approaches'⁽²³⁾

Discussion:

Rasashastra has many herbal, mineral & herbomineral formulations in which *kajjali* is a key ingredient. The presence of *kajjali* in any formulation makes it *yogvahi*, *vyavayi*, *sukshma*, *laghu* and effective in low doses. As it is a *Khalvi Rasayana* it is made by *mardana samskara* and heat produced during *mardana samskara* is used make the formulation *Vyavayi*, *Vikashi*, *Sukshma*, *Laghu*. As *Kajjali* is prepared by continuous trituration process, it is definite that constant and consistent pressurized trituration of mercury and sulphur has definite role on *kajjali bandha* formulation. These *Kajjali bandha* are found to be effective in most of the *strotsas* when used with different *anupana*, *sahapana*, etc.

Conclusion:

In *ayurvedic* formulations, *Kajjali* has a significant importance and it is *sagandha niragni moorchana* of *parad* with having *kajjali bandha* in between *Parada* and *Gandhak* & it is obtained by trituration process. With different combinations *kajjali* proves to be *Aphrodisiac*, *Sarvamayahara*,

Tridhoshghna, *Rasayana*. When accompanied with other medicines it increases their potency and acts in low doses. It also helps to increase bio availability of drug which leads to greater efficacy of drug.

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