



## **Evaluation of Relative Oral Bioavailability of Shankha bhasma Prepared by Two Different Methods in Healthy Volunteers: A Study Protocol**

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### **Authors' contributions**

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

### **Article Information**

DOI: 10.9734/JPRI/2021/v33i63B35282

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/80853>

**Study Protocol**

**Received 20 October 2021**  
**Accepted 25 December 2021**  
**Published 29 December 2021**

## **ABSTRACT**

**Background:** *Rastarangini Shankha* (Conch Shell) *Bhasma* is one of the traditional medicines reported to be used for centuries in the treatment of calcium deficiency disorders. It proves to be a good source of calcium. But reports on its bioavailability are hardly available. This study aims to assess the methods of preparation of *Shankha Bhasma* and assess its relative oral bioavailability in healthy volunteers.

**Materials and Methods:** This study will include preparation of *Shankha Bhasma* in *Rasashastra* department. The traditional method will be giving *Putas*. Another method includes heating *Shudhha Shankha* on gas flame. The products obtained with these procedures will undergo *Bhasma Pariksha* that includes organoleptic characteristics, physicochemical parameters, microbial contamination and other relevant tests. This will be randomized single blind control study of 90 healthy volunteers (30 in each group). The data on oral bioavailability in healthy volunteers will be analyzed by using Pair and unpaired "t" Test, One way ANOVA and descriptive statistics.

**Results:** The relative oral bioavailability of *Shankha Bhasma* is expected to show all

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pharmaceutico analytical parameters within normal range and reflect significant effects on healthy volunteers.

**Conclusion:** Significant efficacy of this product directs a new gateway for the management of bioavailability of calcium drugs.

**Keywords:** Standardization; shankha bhasma; pharmaceutico-analytical parameters; bioavailability; calcium.

## 1. INTRODUCTION

Ayurveda is known as age old well-documented Indian system of Medicine. Rasashastra—a popular branch of an Ayurveda pharmaceuticals, flourished during the medieval period mostly deals with therapeutic uses of minerals, metals and mercurial preparations [1,2]. Rasashastra deals with the ancient pharmaceutical preparation of Ayurveda [3]. The subject is related to the procedures like *Shodhana*, *Marana*, *Jarana* of *Rasadi Dravyas* like *Rasa*, *Maharasa*, *Uparasa*, *Sadharanarasa*, *Dhatu* and *Updhatu* [4].

They have additional advantages over herbal drugs i.e. *Rasa-Aushadhies* are effective in smaller doses, having agreeable taste, quick action and require shorter duration of administration. Almost all the substances used in *Rasashastra* such as metals, minerals, poisons and animal origin drugs need to be transformed to make them human friendly, pharmacotherapeutically useful and safe. Multiple pharmaceutical processing like *Shodhana* and *Marana* were developed later which render toxic substances into non-toxic, more potent for elimination of disease and promoting health. *Sudhavarga* is one among them, which is considered as one of the group of drugs in the field of *Rasashastra*. It consists of many drugs like *Sudha*, *Shankha*, *Shukti*, *Godanti*, Egg shell *Mrigshringa*, *Khatika* etc. which content calcium compounds as a major component [5].

Calcium compounds were known in Ayurveda science since second centuries BC. However the method of preparing calcium compounds in therapeutic dosage form is different according to different *Acharyas*. *Shankha Bhasma* is one of such calcium supplement which is cheap and abundantly available in nature. Few clinical studies revealed clinical efficacy of *Shankha Bhasma* in calcium deficiency disorders such as osteoporosis. However considering the different methods of purification and incineration to prepare *Shankha Bhasma*, its analytical standardization and bioavailability study is steel a

major gap in Ayurveda. According to the various classical texts, the *Shodhan* of *Shankha Bhasma* is doing in the *Amladravya*. According to the *Acharya Siddhinandan Mishra*, the *Shodhana* of *Shankha* is done in *Amladravya* mainly in *Nimbuka Swarasa*, *Jambir Nimbu Swarasa*, *Tanduladaka*, *Kanji* and *Jayanti Patra Swarasa*.but in his text he also mentioned that *Shodhana* of *Shankha* can be done in various *Amla dravya varga* [6]. *Acharya Bhavpraksha* described *Amladravya Varga* in which various drugs are mentioned having *Amla* property. So for this study *Amlika* is one of the *Amladravya* can be used for the *Shodhana* of *Shankha*. *Amlika* is easily available and cheap drug. In *Sharangdhar Samhita* under the *Swarasa Kalpana* there are three methods described to prepare *Swarasa* from drugs. As *Amlika* is consider under the hard drug. *Swarasa* is prepared by soaking the drug with 2 parts of water overnight and then filtering it through a piece of cloth.

Calcium bioavailability is considered as significant when an individual is losing or growing bone or when calcium intake is low. Various dietary and environmental factors such as protein, sodium, caffeine vitamin D, fructose and phosphorous show impact on Calcium absorption in the body. in addition, individual's genetic makeup, including the vitamin D receptor genotype, may also play a key role in calcium absorption. Supplementation with various calcium preparations is now available. However it is observed that the bioavailability of many commercial calcium products is dissimilar [7]. Hence, this study is planned for the bioavailability of *Shankha Bhasma* compound.

### 1.1 Rational of Study

In today's era calcium deficiency disorders are increasing day by day. According to age dietary calcium intake is ranging from 400 to 1200 mg per day. Several modern diets failed to provide the required level of calcium. Large number of standard calcium supplements is available in market, but today's necessity is the high solubility

calcium content, that could be an efficient source of calcium through dietary intakes. *Bhasma* contain Nano particles which is having higher absorption and distribution property. There is no information available carrying the bioavailability of *Shankha Bhasma* as calcium form.

There were many studies conducted regarding the preparation of *Shankha Bhasma* by doing *shodhana in amaldravya swarasa*, but *Shodhana* in *Amlika Swaras* is not done before though this drug is freely available and economical. *Shankha Bhasma* is used in many formulations and indicated in many gastrointestinal diseases but oral bioavailability study of *Shankha bhasma* is not conducted till now. Therefore this study is planned to evaluate the oral bioavailability of *Shankha Bhasma* and compare with the Standard calcium supplement.

## 2. MATERIALS AND METHODS

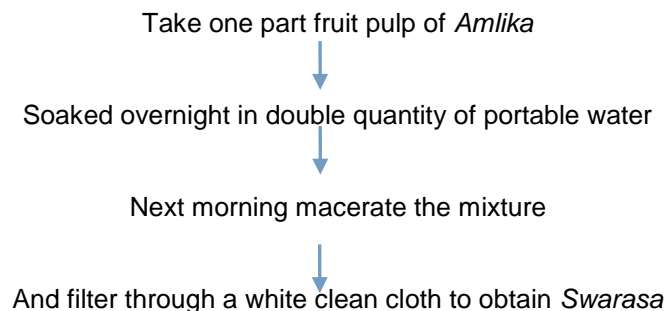
### 2.1 Study Design

This is the pharmaceutical, analytical and experimental study. Study will be conducted at Mahatma Gandhi Ayurved College, Hospital & Research Centre, Salod (H), Wardha. Present work will be conducted under following headings;

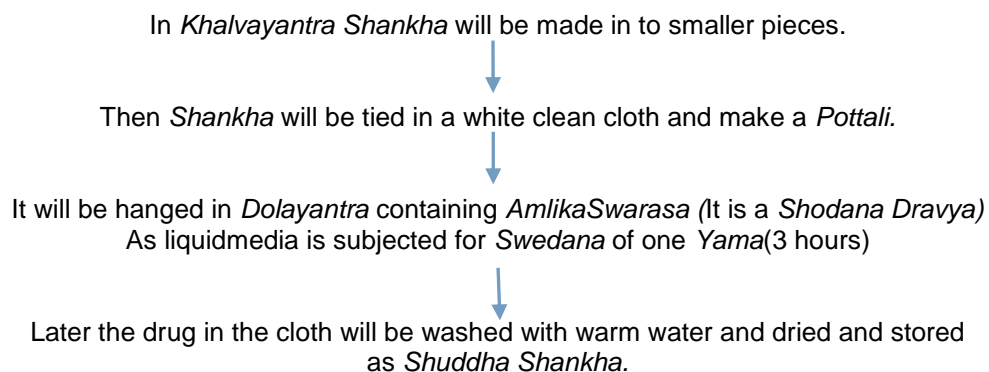
- a) **Pharmaceutical study:** This study is related to drug preparation in which two different batches of *Shankha Bhasma* will be prepared to establish pharmaceutical standardization. Pharmaceutical study will be done in following steps;
  - I) **Procurement of Raw materials:** All raw materials required for the study will be procured from authentic reliable sources. *Kumari* (Aloe Vera) will be procured from Herbal Garden (MGAC), *Amlika* from authenticated vender. *Shankha* will be collected from well known raw material supplier from Nagpur.
  - II) **Authentication of Raw materials:** Raw drugs (Herbs) will be verified and authenticated by Department of Dravyaguna of MGAC & RC. *Shankha* will be authenticated by Department of Rasashastra. Raw drugs will be standardized as per A.P.I.
  - III) **Shodhana (Purification) procedure of Shankha [8,9]**

*Shodhana* of *Shankha* will be done in *Dolayantra* in *Amlika swarasa* as per described in *Sharnagadhar smahita*.

### 2.2 Preparation of *Amlika Swarasa*

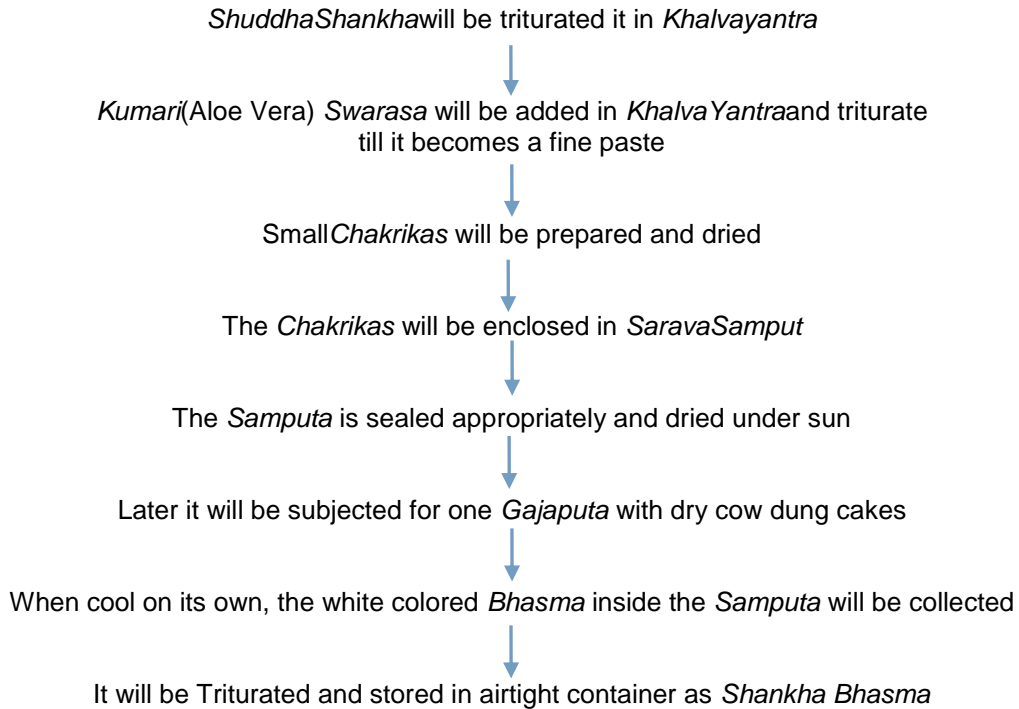


#### 2.2.1 Flow diagram of *Shodhana (Purification) of Shankha*



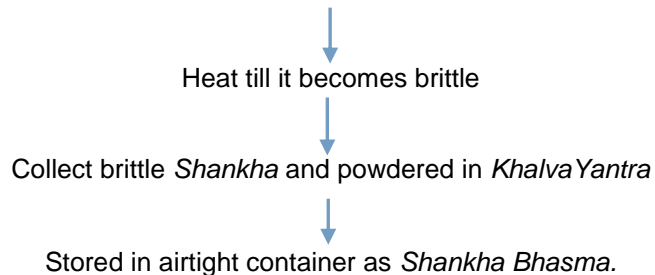
#### IV) *Marana* (Incineration) procedure of *Shankha* by Method 1 & Method 2 [10]

##### Flow diagram of *Marana* (Incineration) procedure of *Shankha* (Method 1)



##### V) Flow diagram of *Marana* (Incineration) procedure of *Shankha* (Method 2)

The *Shudhha Shankha* will be heated on gas flame with using Charcoal



#### b) Analytical study

For analytical study organoleptic characters and physicochemical parameters, microbial contamination, and other sophisticated tests like Particle size distribution analysis, SEM – EDX, AAS, FTIR, XRD, and GCMS will be done.

#### c) Bioavailability study

This will be randomized single blind control study of 90 healthy volunteers (30 in each group).The subject will be selected from Mahatma Gandhi Ayurveda College Hospital & Research Centre, Salod(H),Wardha.

#### 2.3 Eligibility Criteria

Volunteers between age group 20 – 40 years of male sex after physical examination and Complete blood count (CBC), Blood sugar, Liver function test, Kidney function test, Lipid profile, Blood pressure with normal values will be selected.

#### 2.4 Interventions

Total 90 healthy volunteers divided in 3 groups (30 in each group) one standard group and other two will be study groups. For standard control group, Calcium standard supplements will be given 500mg once a day before meal and for

**Table 1. Grouping and Posology**

Group	Group Code	Supplements	Dose	Anupan	Duration	Fallow-up	Participant
Standard Control	SC	Calcium Standard supplements	500mg Once a day Before meal	Water	15 Days	After 24 Hrs, 3 <sup>rd</sup> Day, 7 <sup>th</sup> Day, 15 <sup>th</sup> Day of drug administration	30
Study Group-1	SG-1	<i>Shankha Bhasma</i> (Method-1)	500mg Once a day Before meal	Water	15 Days	After 24 Hrs, 3 <sup>rd</sup> Day, 7 <sup>th</sup> Day, 15 <sup>th</sup> Day of drug administration	30
Study Group-2	SG-2	<i>Shankha Bhasma</i> (Method-2)	500mg Once a day Before meal	Water	15 Days	After 24 Hrs, 3 <sup>rd</sup> Day, 7 <sup>th</sup> Day, 15 <sup>th</sup> Day of drug administration	30

both study groups *Shankha Bhasma* tablet prepared by (Method-1) and (Method-2) will be given 500mg once a day before meals for 15 days.

## 2.5 Investigation During Treatment

Complete blood count (CBC), Liver Function Test (LFT), , Kidney Function Test (KFT), Lipid profile, Blood sugar, Urine routine and microscopic, Urine calcium, Blood Sr. Calcium Level.

### 2.5.1 Criteria for discontinuing or modifying allocated interventions

Subjects will be withdrawn from the study if any untoward incidence, features, feature of drug sensitivity or any other disease or problem arises the subjects will be offered from free treatment till problem subsides.

#### 2.5.1.1 Follow up period after treatment

After 24 hours, 3<sup>rd</sup> day, 7<sup>th</sup> day, 15<sup>th</sup> day of drug administration.

#### 2.5.1.2 Primary outcomes

The relative oral bioavailability of *Shankha Bhasma* will be observed.

#### 2.5.1.3 Implementation

Principle investigator will allocate and enroll the patients.

## 2.6 Statistical Analysis

Statistical analysis will be done by applying pair and unpaired "t" test, One way ANOVA and descriptive statistics.

## 3. OBSERVATION AND RESULTS

Observations will be noted and presented in the form of tables, charts, photographs etc. The expected result of the study is that study group B and C with intervention Standard calcium supplement will be potentially more effective as a good calcium source. Patient who will take all follow up by following *Pathya* and *Apathya* during treatment will have less chances of calcium deficiency disorders as compare to group A.

## 4. DISCUSSION

Conch is a common name that is applied to a number of different medium to large sized "sea snail" or their "shells". The term generally applies to large sea snails that have a high spire and a siphonal canal (comes to a point at both ends of the shell). True conch are marine Gastropoda Molluscs in the family Strombidae, specially in the genus *Strombus* and other closely related genera such as *Eustrombus*. Chemically it is Calcium Carbonate (CaCO<sub>3</sub>). It contains mainly carbonate of calcium, iron, magnesium, sulphate, phosphate and chloride.

Medicinal plants are the major source as a medicine for the majority of the population

throughout the globe. Increase in population, cost of allopathic treatment for general ailments, side effects of modern drugs and development of resistance have led to increase emphasis on the use of herbs and minerals as source of medicines and health supplements [11].

However according to the modern science, each drug needs to be scientifically, pre-clinically and clinically evaluated for the global acceptance [12]. In medical field, the analytical studies of Ayurvedic formulations help to form the base for standardization. It is the need of the hour to generate evidence for existing literature and for reproducibility [13-15]. Standardization of Ayurvedic medicines on pharmaceutical and analytical level is the most important aspect before beginning research on pre-clinical and clinical ground. In this protocol two different methods of preparation will be used to make *Shankha Bhasma*. There intervention will be with standard calcium supplement. One group will receive *Shankha Bhasma* prepared by method-1 and other will receive *Shankha Bhasma* prepared by method-2 and third group will receive Standard Calcium Supplement. The assessment will be done based on subjective and objective parameters. After that data will be analyzed by using statistical test and present in the form of table and charts [16-28].

## 5. CONCLUSION

This research work on *Shankha Bhasma* will show all pharmaceutico analytical parameters within range and significant effects on healthy volunteers to evaluate its relative oral bioavailability. As the ingredients are easily available and method of preparation does not require much time and man power therefore if this preparation show significant efficacy then this will open a new gateway for the management of bioavailability of calcium drugs.

## 6. SCOPE AND IMPLICATION OF PROPOSED STUDY

1. Discovery of new chemical structure with new action will be done, if the bioavailability is more then we can use *Shankha Bhasma* instead of current calcium compound.
2. Synthetic calcium supplement is having the side effects of bloating gas, constipation, heart diseases & kidney stone, but if these *Shankha* formulations are proved to be

better in bioavailability can be utilized very safely & effectively.

3. If the bioavailability of *Shankha Bhasma* will found significant then it will be used as one of the content in various Ayurvedic formulations or the separate *Shankha Bhasma* tablets can be prepared which will be useful in bone fractures, osteoporosis, healing etc.

## 7. TRANSLATORY COMPONENT

If the study is successful then this will be used in another clinical studies establishment on various calcium deficiency diseases.

## NOTE

The study highlights the efficacy of "Ayurveda" which is an ancient tradition, used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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