Comparative Pharmaceutical Standardization and Oral Bioavailability Study on Praval Pishti and Praval Bhasma

Megha Satpute¹, Bharat Rathi¹*, Anita Wanjari¹ and Mujahid Khan¹

¹Department of Rasashastra and Bhaishajya Kalpana, Mahatma Gandhi Ayurveda College Hospital and Research Centre, Salod (H) Wardha, (MS), Datta Meghe Institute of Medical Sciences (Deemed to be university) Wardha, (MS), India.

Authors’ contributions

This work was carried out in collaboration among all authors. Author MS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author BR managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i31B31690

Editor(s):
(1) Dr. Jongwha Chang, University of Texas, USA.

Reviewers:
(1) Tripti Malik, Dolphin PG Institute of Biomedical & Natural Sciences, India.
(2) Jaideep Sarkar, KHPL, India.

Complete Peer review History: http://www.sdiarticle4.com/review-history/68585

Received 20 March 2021
Accepted 27 May 2021
Published 12 June 2021

ABSTRACT

Background: Praval (coral) is a very usually occurring calcium form. It is rich source of calcium & minerals. As per text it can be converted into two formulas which are bhasma (calcinated ash) and pishti (powdered form without agni). These forms may have different rate of immersion. This needs to be studied.

Aim: Pharmaceutical Standardization study of Praval Pishti & Praval Bhasma and comparative evaluation of their relative oral bioavailability.

Materials and methods: The two formulations will be prepared from Praval (coral). By triturating with Gulab jala Praval Pishti will be prepared and by traditional Puta method Praval Bhasma will be prepared. The prepared formulations will be assessed for Bhasma Pariksha mentioned in Ayurveda. Organoleptic characters, Physicochemical parameters and Particle size distribution analysis, SEM –EDX (Scanning Electron Microscopy, Energy Dispersive X-Ray Analysis), FTIR (Fourier-transform infrared spectroscopy), XRD (X-Ray Diffraction), and GCMS (Gas

*Corresponding author: E-mail: bharatrathi174@gmail.com;
1. INTRODUCTION

Ayurveda, the science of life is well known age old documented Indian system of Medicine. Rasashstra, commonly known as iatro chemistry a popular branch of an Ayurveda pharmacetics, developed during the medieval period. Rasashstra deals with ancient pharmaceutical preparation of Ayurveda [1]. Most emphasis is given regarding the therapeutic uses of mercurial, mineral and metallic preparations including calcium containing formulations indicated in various disorders [2]. Modern lifestyle have critical role in developing wide range of diseases and herbomineral formulations have a key role in combating these disorders [3].

Calcium compounds are known in Ayurveda sciences since 2nd Century BC but Praval is in use from 8th century. Praval is a known calcium compound described under the Sudha Varga (group of calcium drugs). It were first named by Yadavji Trikamji Acacharya [4].

Praval (Coral) belongs to the phylum coelenterate and found in the form of the calcareous skeleton of the minute marine organism which is a rich source calcium carbonate. The skeleton of coral is supposed to acquire a special affinity for iron which unites with a calcium organic complex to impart color pigments [5].

However the method of preparing calcium compounds in therapeutic dosage form is different according to different Archaryas. Praval Bhasma is one of such calcium supplement which is chief and abundantly available in nature, few studies showed clinical efficacy of Praval Bhasma in calcium deficiency disorder such as osteoarthritis. However considering the different methods of purification and incineration to prepare Praval Bhasma, its analytical standardization and oral bioavailability study is still a major gap in Ayurveda. Sea products having naturally digestible properties and attached with calcium and minerals”.

Some Acharya made Pishiti of Praval and some are made Bhasma of Pravala. All calcium compounds of Rasashashtra made Bhasmas except Pravala. Prava Bhasma and Praval Pishiti both drugs included under literally review but only Pishiti review is available. The efficacy of Praval Bhasma is not known today. That’s why the present study is planned to fill the gap. Praval Bhasma is indicated in various disorders such as Timira, Yakshma, Kasa etc [6].

In Ayurvedic system of medicine, the different collection processes, time zones and methods results the same Bhasma with dissimilar qualities. In many cases, inferior-quality products are prepared by wrong manufacturing and marketing processes. This ultimately affects the efficacy of products as well as safety parameters. Hence standardization of Bhasma and other Ayurvedic formulations is essential in order to minimize the variability and to strengthen the quality of Ayurvedic formulations [7-9].

1.1 Need of Study

Pishti kalpana is incorporated in Ayurveda from Unani which is used for preparation of amalgamated powders and the Bhasma kalpana comes under Ayurveda concepts. For Praval Pishiti preparation Bhavana (wet trituration) of Gulabjala (rose water) is mandatory, however Gulabjala doesn’t have calcium bioavailability enhancing action. On the other hand for Praval Bhasma preparation, Kumari Swaras Bhavana is given, and Kumari swaras have proven to increase bioavailability of calcium. In spite of this, Praval Pishiti is used in practice and Praval Bhasma is not even manufactured. As Bhasmas contain Nano particle which is having higher absorption and distribution property [10]. Thus
The utilization of Praval Bhasma at place of Praval Pishti may increase the effect of drug through few folds. However, scientific evidence is needed to be established to know the difference in calcium bioavailability between Praval Pishti and Praval Bhasma compared to standard compound. Such work is not done before and thus represents the need of hour for better drug discovery and development.

2. MATERIALS AND METHODS

2.1 Study Design

Randomized single blind controlled study.

2.2 Sample Size

The sample size calculation for a bioavailability and bioequivalent study is dependent on multiple factors like power, intra subject coefficient of variation, expected geometric mean ratio.

According to C. Bhupati and V.H. Vajjha. (STATISTICA, anno LXXVII, n.1, 2017), power of 85% would be reasonable for bioavailability study to be conducted on healthy volunteers. By considering the values of Lower Bound (LL) = 0.80, Upper bound (UL) = 1.25, Alpha=0.05, Geo Mean Ratio (GMR) = 0.947, Coefficient of Variation (CV) = 0.239 as fixed, the sample size can be calculated as shown in table no 1.

2.3 Pharmaceutical Study

Pharmaceutical preparation of Praval bhasma & Praval pishti will be prepared. It will be done by following steps.

2.4 Procurement and Authentication of Raw materials

1. Praval will be procured from Shri Shaila Agency, Nagpur and will be authenticated by the Department of Rasashashtra (MGACH & RC).
2. Kumari & Gulabpushpa will be collected from medicinal plants garden (MGACH & RC), and primarily authenticated by Dravyaguna Department.
3. Tandulodak & Gulabjal will be prepared in Dattatraya Rasashala which is required for Shodhan (purification) of Praval & preparation of Praval bhasma respectively.

| Sample | 54 | 50 | 47 | 44 | 35 | 30 | 26 | 24 |
|--------|----|----|----|----|----|----|----|----|
| Power  | 97.9 | 97.0 | 96.0 | 95.0 | 90.0 | 85.0 | 80.0 | 76.6 |

Preparation of Tanduliya swarasa [11]

The fresh Tanduliya Patra will be taken in Khalva Yantra and make into fine paste form.

\[\text{\textbullet\textbullet\textbullet\textbullet\textbullet}\]

The paste will be squeezed through clean cotton cloth.

\[\text{\textbullet\textbullet\textbullet\textbullet\textbullet}\]

The liquid will be obtained called Tanduliya Swarasa.

Extraction of Kumari Swarasa

The leaves of Kumari will be washed with tap water.

\[\text{\textbullet\textbullet\textbullet\textbullet\textbullet}\]

Then the thorny ridges and apex part of Kumari Patra will be cut by knife.

\[\text{\textbullet\textbullet\textbullet\textbullet\textbullet}\]

After cut into small pieces will be churned in mixer and then strained through clean cotton cloth.
Shodhana of Pravala [12]

The roughly pounded Pravala (coral) will be tide in a Pottali.

Subjected for 3 hours of Swedana in Dolayantra by keeping Tanduliya Jala as liquid media.

Later the drug will be washed, dried and stored in airtight container as Suddha Praval for further pharmaceutical use.

Maran (incinration) of prav[13]

Required quantity of Suddha Praval will be taken in clean Khalva Yantra and triturated to obtain it in the form of fine powder

This powder will be added with required quantity of Ghrita kumari Swarasa (Alovera) and triturated thoroughly to prepare the Chakrikas (pellets) of even size and shape

These pellets will be dried under sun, enclosed in sarava samputa and subjected for one Puta (Laghu Puta) all this process is repeated three times to obtained clean bright moon like white Bhasma of Pravala.

It will be stored in suitable airtight container for further pharmaceutical as well as therapeutic use

Preparation of Praval Pishti [14]

Required quantity of suddha Pravala will be taken in clean khalva yantra and triturated to obtain it in the form of fine powder.

Then it will be again one time triturated in iron kharal

Shuddha fine praval will be taken in to porcelain kharal and Gulab Jal will be added & triturated for 21 days per day 3 hrs to obtain of Praval Pishti.

It will be later stored in suitable airtight container for further pharmaceutical as well as therapeutic use.

2.5 Analytical Study

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

2.6 Bioavailability Study

It will be randomized single blinded study in which 30 healthy Male volunteers in each group will be selected (total 90 volunteers) from Swastharakshan OPD, MGACHRC, salod (H), Wardha.

2.7 Eligibility Criteria

Age group from 20 to 40 years of volunteers, after physical examination and complete blood count (CBC), blood sugar, Kidney function test liver function test, lipid profile, blood pressure with normal values will be selected.

2.8 Exclusion Criteria

Patients below 20 and above 40 years of the age, Patients with diabetes / hypertension /IHD/TB/ Nephrolithiasis/ peptic or duodenal ulcer, bowel disease, intestinal resection or mal absorption/ Parathyroid excess or other
endocrine disorder. Patients with other systemic condition such as Gouty arthritis, Rheumatoid arthritis and BMI index less than 18.5 and more than 24.9 and patient with regular medication.

2.9 Interventions

In total 90 volunteers one group with 30 volunteers will be standard group in which standard Calcium supplement will be given 500mg once a day before meal, second group with 30 volunteers Praval Pishti will be given 500mg once a day before meal and the third group with 30 volunteers Praval Bhasma will be given 500mg once a day before meal. The study will be conducted for 15 days.

2.10 Investigation during Treatment

Complete blood count, Kidney Function test, Liver Function test, Lipid profile, Blood sugar, Urine routine and microscopic, Blood Serum Calcium Level and Bone Density will be done.

2.11 Criteria for Discontinuing or Modifying Allocated Interventions

If patient having any problem related to consumption of medicine or having any sensitivity will be withdraw from study.

2.12 Follow up Period after Treatment

After 24 hours, 3rd day, 7th day, 15th day of drug administration.

2.13 Implementation

Principle invigilator will allocate and enroll the patient.

3. OBSERVATION AND RESULTS

Primary outcomes: The relative oral bioavailability of Praval Pishti and Praval Bhasma in comparison with standard calcium will be observed.

Statistical analysis: Statistical analysis will be done by applying unpaired ‘t’ Test & One-way ANOVA.

4. DISCUSSION

Praval are aquatic animals belong to Anthozoa class of Phylum Coelenterata usually existing in dense colonies of numerous equal individual “polyps”. The group comprises the significant reef builders that dwell in topical oceans and produce calcium carbonate (CaCO3) to form solid skeleton. A coral “head” is a colony of myriad genetically identical polyps. Each polyp is a spineless animal with a very small size and shape. A central mouth opening is surrounded by a set of tentacles and near the base an exoskeleton is excreted. Thus number of colonies creates a large skeleton over many generations that is characteristic of the species. Corals can be major contributors to the physical structure of the coral reefs that develop in tropical and subtropical waters. The Praval (Coral), which possesses the radiance of deep red color, which is smooth and soft, which has Long and bulky branch, which has no aberrations and which is heavy and strong; such a sample of Praval is considered fit and selected for therapeutic purposes.

Table 2. Intervention and dose frequency

| Sr no | Group                  | Sample size | Intervention                   | Dose & frequency | Anpan | Duration |
|-------|------------------------|-------------|--------------------------------|------------------|-------|----------|
| 1.    | Standard group         | 30 volunteers| Standard Calcium compound (SDC) | 500mg (OD) before meal | Water | 15 days  |
| 2.    | Comparative group      | 30 volunteers| Praval Pishti (PP) | 500mg (OD) before meal | Water | 15 days  |
| 3.    | Comparative group      | 30 volunteers| Praval Bhasma (PB) | 500mg (OD) before meal | Water | 15 days  |

Table 3. Blood collection after administration of drug

| Group | Blood collection after administration of drug |
|-------|-----------------------------------------------|
| SDC   | 24 hrs 3rd day 7th day 15th day               |
| PP    | 24 hrs 3rd day 7th day 15th day               |
| PB    | 24 hrs 3rd day 7th day 15th day               |
Ayurvedic medicines are gaining momentum throughout the globe. Growing population, cost effectiveness, no or minimum side effects, all time availability are few notable causes regarding increased emphasis on the utilization of herbs and minerals as source of medicines and health supplements [15]. But for the global acceptance it is the need of the hour to validate the drug scientifically and test its efficacy pre-clinically and clinically [16]. The analytical studies of all Ayurvedic formulations form the basis for standardization. For many formulations pharmacopeia standards are not available hence is the need of the hour to generate various parameters for existing literature and for reproducibility [17]. Few of the studies on standardization of Ayurvedic drugs and bio-availability studies were reviewed [18-21].

The analysis of Praval Bhasma and Praval Pishti will be compared. In both the samples organoleptic characters that is color, odor, taste will be assessed. Particle size will be assessed, which is a major parameter by means of which rate of absorption can be assessed in Praval Bhasma and Praval Pishti. From scanning Electron Microscopy Energy Dispersive X-Ray Analyzer (SEM EDX) is elemental identification along with quantitative composition can be finding out in Praval Bhasma and Praval Pishti. By Fourier Transform Infrared Spectroscopy (FTIR) chemical bonds will be identified in Praval Bhasma and Praval Pishti. With the help of X-Ray Diffraction (XRD) the crystalline structures of the molecule will be recognized in both the samples that is Praval Bhasma and Praval Pishti. GC-MS technique will be used to analyze complex organic and biochemical mixtures between Praval Bhasma and Praval Pishti. Few studies from modern medicine were reviewed [22,23]. It is protocol paper and study plan is described.

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 Praval Bhasma and Praval Pishti as calcium form. Praval Bhasma is used in many formulations and indicated in many gastrointestinal diseases but oral bioavailability study of Praval Bhasma is not conducted till now.

5. CONCLUSION

The conclusion will be drawn from the results obtained and observations which will be observed. The conclusions will contain analytical observations between Praval Bhasma and Praval Pishti. For relative oral bioavailability the maximum concentration of calcium by plotting area under curve (AUC) will be assessed between standard calcium supplement tablet, Praval Pishti and Praval Bhasma. And the drug with maximum area under curve will be concluded as better relative oral bioavailable. As this is a protocol paper and expected results are predicted here.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Rathi B, Rathi R, Pusadkar S. Contribution of text Rasapaddhati in the history of Indian alchemy: A review. Journal of Indian System of Medicine. 2019;7(2):72.
2. Mahulkar G, Rathi B. Pharmaceutical Standardisation of Kukkutanda Tvak Bhasma (Incinerated Egg Shell). Journal of Research In Traditional Medicine. 2017; 3(2):43-50.
3. Khan MB, Rathi B, Teirandhe S, Belsare A. Pharmaceutico-Analytical Standardization and In Vivo Evaluation of Acute Toxicity, Genotoxicity, Anti-Genotoxic Effect and Spermatogenic Action of Musalyadi Churna. Int J Curr Res Rev. 2020; 12(22):14.
4. Yadavji. T. Rasamritam DJ and GP. First Edition, Chaukambha Sanskrit Bhawan, Varanasi; 1998.
5. Kaushal A, Arora R. A comparative analytical study of Pravalabhasma and Pstiw.s.r. to Moola and Shakha. Int J Ayu Pharm Chem. 2015;2(1):69-77.
6. Sharma S. Rasa Tarangini, MotilalBanarasi Das., Varanasi. 1979;23/139-141.
7. Galib, Kar AC, Narayana A. Standardization of Bhasmas need of the hour. J Ayurveda. 2008;2:27-33.
8. Mishra LC. Scientific bases for ayurvedic therapies. CRC Press, Washington DC, USA: 2004;83-100.
9. Angadi R. Rasatarangini, Choukhamba Surbharati Prakashan, 1st Ed, Varanasi. 2015;23-129:417.
10. Sharma R. Prajapati PK. Nanotechnology in Medicine: Leads from Ayurveda. J Pharm Bioallied Sci. 2016;8(1):80-81.
11. Tripathi B. Sharangdhar Samhita, Madhyam Khand, 1/32, Choukhamba Surbharati Prakashan, Varanasi. 2019:88.
12. Angadi R. Rasatarangini, Choukhamba Surbharati Prakashan, 1st ed, Varanasi. 2015;23-133:418.
13. Angadi R. Rasatarangini, Choukhamba Surbharati Prakashan, 1st ed, Varanasi. 2015;23-134:418.
14. Krishnan and Rasatantrasar evem Sidhprayog sangraha-part-1.Krishnagopal Ayurveda Bhavan, Kaleda 23rd edition. 2014:93-98.
15. Rath B, Rath R. Quantitative analysis of medicinal plants used by the traditional healers of karanja block of wardha district for treating musculoskeletal disorders. International Journal of Ayurvedic Medicine. 2017:8(2):27-33.
16. Dukare P, Rath R. Pharmaceutico-Analytical Study of shankhabhasma Prepared by Two Different Methods and Evaluation of Its Relative Oral Bioavailability in Healthy Volunteers. European Journal of Molecular & Clinical Medicine. 2020;7(11).
17. Rath B, Rath R. Pharmaceutical standardization of Bakuchi vati: A modified dosage form of Dhatryadi Yoga, International Journal of Research in Ayurveda and Pharmacy. 2017;8(1):57-61.
18. Deogade, Meena Shamrao, Prasad KSR. Standardization of Wild Krushnatulasi (Ocimum Tenuiflorum Linn) Leaf. International Journal of Ayurvedic Medicine. 2019;10(1):52–61.
19. Gokarn Rohit Ajith, Dhiraj Singh Rajput, Pramod Yadav, Galib Biswajyoti Patgiri, Prajapati PK. Pharmaceutical Standardization of Svarna Vanga. Ancient Science of Life. 2013;33(2):97–102. Available:https://doi.org/10.4103/0257-7941.139046.
20. Khobragade Pramod D, Minal Khobragade, Digamber S Chothe. Phytochemical Analysis and Antimicrobial Activity of Galls of Pistacia Integerrima Stew Ex. Brand. International Journal of Ayurvedic Medicine. 2014;5(1):76–81.
21. Gupta Rahul Kumar, Meena Deogade. A critical review on ethnomedical, phytochemical and pharmacological investigations of Martynia annua Linn. International Journal of Ayurvedic Medicine. 2018;3(9):136–43.
22. Dixit, Anubhuti, Mahalaqua Nazli Khatib, Shilpa Gaidhane, Abhay M. Gaidhane, and zahiruddin quazi syed. Assessment of Serum Lipid Profile in Patients with Thyroid Disorders in a Rural Backdrop of Central India. Medical Science. 2020;24(101):1–11.
23. Khatib, Mahalaqua Nazli, Shilpa Gaidhane, Abhay M. Gaidhane, Padam Simkhada, and Zahiruddin Quazi Syed. Ghrelin O Acyl Transferase (GOAT) as a Novel Metabolic Regulator Enzyme. Journal of Clinical and Diagnostic Research. 2015;9(2):LE1–5. Available:https://doi.org/10.7860/JCDR/2015/9787.5514.