A Comprehensive Review on Anti-Diabetic Formulations Employed in Siddha System of Medicine

Dayanand Reddy Gaddam, Rama Devi Bhogireddy, Dasari Pitchaiah, Vijaya Narasimha Kumar Godlaveti

ABSTRACT

Background: Diabetes mellitus (DM) is a carbohydrate metabolic disorder; Siddha system of medicine is providing several effective preparations with minimal side effects compared with allopathic system of medicine to treat diabetes mellitus. Methods: The information on Siddha anti-diabetic formulations were acquired from pre-historic Siddha books and by literature searching in electronic databases such as Science direct, Pub Med, Pub Med Cochrane and Google-Scholar for publications up to August 2018. Results: Seven effective and clinically used anti-diabetic Siddha formulations have been identified and 34 references have been cited. Conclusion: The current review presents the detail background of composition, dose and folklore uses of Siddha anti-diabetic preparations, particularly focusing on scientific validation of these formulations in the treatment of diabetes.

Keywords: Anti-diabetic formulations, Herbo-mineral, Madhumegam, Siddha, Traditional medicine.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder which is characterized by polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger). Traditional Systems of medicines are playing a key role in meeting the global health care needs. India has seven familiar systems of medicine; Ayurveda, Siddha, Unani, Yoga, Naturopathy, Homoeopathy and Sowa-Rigpa [1]. Among all the alternative medicinal systems, Siddha system of medicine is unique and has originated from Tamil language and culture [2]. Literally the word “Siddha” means “established truth” [3].

Diabetes mellitus (DM) is a carbohydrate metabolic disorder which is characterized by elevated blood sugar levels over a prolonged period [4]. Conventionally, diabetes has been divided into three types namely: Type 1 DM or insulin-dependent diabetes mellitus (IDDM) in which human body fails to produce sufficient quantity of insulin for its needs, and the person requires injecting insulin from external sources. Type 2 DM or non insulin-dependent diabetes mellitus (NIDDM), results from insulin resistance, a condition in which cells fail to use insulin properly, with or without an absolute insulin deficiency. The third main type is gestational diabetes which occurs when women without a previous history of diabetes develop a high blood glucose level during the period of pregnancy [5].

Diabetes in Siddha

In siddha system of medicine diabetes mellitus is called by different names such as neerizivanoi (neer means urine and izhiyav means excessive discharge), madhumegam (madhu means sweet and megam means venereal disease) and neeperukkalo noi (polyuric condition) [6]. Siddha system of medicine is claimed to alleviate the root cause of the diseases by maintaining the ratio of tridoshas; Vatham, Pitham and Kapham. These unique humors operate constantly between environment and individual and are required to maintain the integrity of a living system. Siddhars, fathers of Siddha system of medicine grouped the diabetes mellitus under Pitha disorders of “Mega” disease. Mega disease means excessive discharge of urological secretions and excretions from the body [6].

Diabetes mellitus prevalence is increasing rapidly and affects more than 6% of population worldwide (100 million people) [7]. According to WHO held on 27 January 2017, diabetes is the 6th leading cause of death globally [8]. India currently represents 49% of the world’s diabetes burden and every year nearly 1 million deaths were noted in Indians due to diabetes [9]. Pertaining to Tamil Nadu, has the highest death rate (53 deaths per 100,000 populations) contribution in the country and it is higher than the national average.
Though many siddha formulations are currently employed in the management of diabetes in India, the usage of these formulations among public is minimal due to unfamiliarity and lack of scientific validation. Thus the current review aims to explore about anti-diabetic formulations used in Siddha system of medicine with emphasis on their composition, method of preparation, traditional uses, safety and pharmacological studies done on these anti-diabetic formulations.

LITERATURE REVIEW STRATEGY

The literature for the present review was collected from two ways, one is from ancient Siddha related books and another one is literature searching in electronic data bases. Articles published only in English and Tamil language were included in the review. Furthermore, original research articles were only recruited for the purpose of review precludes review articles and theoretical research. The studies which did not fall in these categories were excluded from the review. Key words used for the purpose of this literature review include “Anti-diabetic formulations”, “Herbomineral” “Safety, “Siddha” and Traditional medicine.

Seven distinct Siddha anti-diabetic formulations have been studied in this context which includes Triphala churnam, Madhumega churnam, Seenthil churnam, Abraka chenduram, Rasa chenduram, Avarai kudineer churnam and Nilavembu kudineer.

Anti-diabetic formulations in siddha system of medicine

The formulations mentioned below are anti-diabetic Siddha preparations which are widely using clinically currently.

1. **Triphala churnam**
2. **Madhumega churnam**
3. **Seenthil churnam**
4. **Abraka chenduram**
5. **Rasa chenduram**
6. **Avarai kudineer churnam**
7. **Nilavembu kudineer**

1. **Triphala churnam** (TC)

Triphala (tri = three and phala = fruits), is the mixture of dried fruits of *Terminalia bellirica*-Bibhitaki (Combretaceae), *Terminalia chebula*-Haritaki (Combretaceae) and *Phyllanthus emblica*-Amla (Phyllanthaceae). Haritaki is good for vata dosha, bibhitaki is good for kapha dosha and amala is good for pitta dosha that govern the human life [10].

Composition: The ingredients of *Triphala churnam* are as follows [11].

Table 1: Ingredients of Triphala churnam

| S.No. | Name of the Ingredient | Quantity (%) |
|-------|-------------------------|--------------|
| 1.    | Kadukkaithol            | Terminalia chebula 33.33 |
| 2.    | Nellivattal              | Phyllanthus emblica 33.33 |
| 3.    | Thandrikkaithol         | Terminalia bellirica 33.33 |

Method of preparation: The dried fruits from all above plants were powdered separately and mixed. Then stored the powder in air tight container and labeled as *Triphala churnam* [12].

Dose: *Triphala churnam* at a dose of 1-3gm with water, honey or ghee, 2-3 times per day after food is advisable [11].

Traditional uses: *Triphala churnam* is used as anti-diabetic, anti-cancer, anti-inflammatory, anti-hyperlipidemic and anti-microbial agent [11]. It can also acts as immunomodulator. *Triphala churnam* can ensures clearer bowel movements and relieves flatulence. *Triphala churnam* is used to treat arthritis, and gout. It can stimulate and improves the blood circulation and eyesight [12].

Earlier scientific data published on anti-diabetic activity of *Triphala churnam*

1. Sowmya S Rajan et al. evaluated the hypoglycemic effect of *Triphala churnam* in selected non insulin dependent diabetes mellitus subjects. 5 gm of *Triphala churnam* with buttermilk daily two hours after dinner for a period of 45 days significantly decreases the fasting blood glucose levels in diabetic patients [13].

2. **Madhumega churnam** (MC)

Madhumega churnam is a poly herbal preparation which contains seven herbal extracts. They are *Murraya koenigii* (Rutaceae), *Terminalia chebula* (Combretaceae), *Emblica officinalis* (Phyllanthaceae), *Tinospora cordifolia* (Menispermaceae), *Syzygium cumini* (Myrtle), *Cyperus rotundus* (Sedges) and *Phyllanthus niruri* (Phyllanthaceae) [14].

Composition: The ingredients of *Madhumega churnam* are as follows [14].

Table 2: Ingredients of Madhumega churnam

| S.No. | Name of the Ingredient | Quantity (g) |
|-------|-------------------------|--------------|
| 1.    | Kadukkaithol            | Terminalia chebula 2 |
| 2.    | Karuveppilai             | Murraya koenigii 2 |
| 3.    | Nellikai                | Emblica officinalis 2 |
| 4.    | Arugadum                | Eugenia jambolana 1 |
| 5.    | Shindilakodi            | Tinospora cordifolia 1 |
| 6.    | keelanelli              | Phyllanthus amaras 1 |
| 7.    | koraikilangu            | Cyperus rotundus 1 |

Method of preparation: No literature survey was found for the method of preparation of *Madhumega churnam*.

Dose: 1-2 capsules/ tablets or 1 teaspoonful of MC twice a day or as directed by the Siddha physician [14].

Traditional uses: MC has good anti-diabetic, anti-hypertensive and anti-hyperlipidemic activities [14]. Due to the presence of high content of phenolic compounds it is also acts as a good anti-oxidant [15].

Earlier scientific data published on anti-diabetic activity of *Madhumega churnam*

1. Anti-diabetic activity of MC was evaluated by Vadivelan R et al. in alloxan induced diabetic rats. Oral administration of MC for 14 consecutive days at 100 mg/kg/day and 200 mg/kg/day significantly reduces the fasting blood glucose levels and triglyceride levels in diabetic rats [16].

2. Chidambaran Saravana Babu et al. evaluated the anti-diabetic activity of phenolic portion and non phenolic portions of MC in high fat diet induced diabetic rats and concluded that phenolic portion of MC at 100mg/kg significantly reduces glucose-6-phosphatase and fructose-1,6-bis phosphatase and increases glucokinase and glycogen levels when compared with vehicle treated animals. Non phenolic portion of MC did not reveal such effects [15].
3. Seenthil churnam (SC)

The principal ingredient of the Seenthil churnam is whole plant extracts of Seenthil or Tinospora cordifolia (Menispermaceae) and it also contains Eclipta prostrata (Asteraceae) and the dried powder form of Earthworm (Lumbricidae) [17].

Composition: The ingredients of Seenthil churnam are as follows [17].

Table 3: Ingredients of Seenthil churnam

| S. No. | Name of the ingredient | Scientific name | Quantity (%) |
|--------|------------------------|-----------------|--------------|
| 1.     | Seenthilsattha         | Tinospora cordifolia | NA           |
| 2.     | Karisaichurnam         | Eclipta prostrata | NA           |
| 3.     | Poonagachurnam         | Earthworm        | NA           |

NA= Not available

Method of preparation: No literature survey was found for the method of preparation of Seenthil churnam.

Dose: For children 250 mg to 1.5 gm and for adult 1 gm to 3 gm of SC twice daily after meal with ghee or warm water is advisable [17].

Traditional uses: SC has potential anti-diabetic, hepatoprotective and anti-inflammatory activities [18]. It is also used to treat rheumatism, orchitis, bronchitis, asthma, tuberculosis (TB), cough and various skin diseases [17]. SC with honey is also used in the treatment of various fevers and in the treatment of spleenomegaly [11].

Earlier scientific data published on anti-diabetic activity of Seenthil churnam:

1. Ushakanthan S. has done a great job on SC and conducted toxicity and efficacy studies (anti-diabetic, anti-inflammatory and hepatoprotective) of SC. Daily oral administration of Seenthil churnam at 200 and 400 mg/kg for 28 days significantly reduces the fasting blood glucose levels in streptozotocin (STZ) induced diabetic rats and also reduces the elevated urea levels in diabetic control rats [18].

4. Abraka chenduram (AC)

Abraka chenduram is a herbomineral Siddha formulation, over dosage may cause severe side effects and should be taken under medical supervision only.

Composition: The ingredients of Abraka chenduram are as follows [11].

Table 4: Ingredients of Abraka chenduram

| S.No. | Name of the ingredient | Scientific name | Quantity (%) |
|-------|------------------------|-----------------|--------------|
| 1.    | Manjalkarisaalai saaru  | Wedelia calendulaceae | Q.S.        |
| 2.    | Erukkampaal            | Calotropis gigantean | Q.S.        |
| 3.    | Vediyuppu              | Potassium nitrate | 33.33        |
| 4.    | Panaivellam            | Borassus flabellifer | 33.33       |
| 5.    | KaruppuAppirakkam      | Biotita          | 33.33        |
| 6.    | Arunachalam K et al.   | Yellow arsenic   | 8            |

NA= Not available

Method of preparation: Mercury and Sulphur were grounded with Ocimum sanctum in a mortar and subjected to the sand bath process of sublimation and grounded them into fine powder [20].

Dosage: Abraka chenduram should be taken at a dose of 50-100 mg once in a day for 10 days along with sufficient amount of honey or ghee after food. Amukkara chooranam is also be used as aduvant for RC [20].

Traditional uses: AC is used to treat Madhumegam (Diabetes mellitus) and hot flush [11].

Earlier scientific data published on anti-diabetic activity of Abraka chenduram:

1. Arunachalam K et al. evaluated the anti-diabetic activity of Ayakantha abraka chenduram in STZ induced diabetic rats and concluded that oral administration of 25mg/kg of Ayakantha abraka chenduram significantly reduces the elevated blood glucose levels in rats. On 14th day both Ayakantha abraka chenduram and glibenclamide had shown similar anti-diabetic activity [19].

5. Rasa chenduram (RC)

Rasa chenduram is a mineral/metal Siddha formulation.

Composition: The ingredients of Rasa chenduram are as follows [20].

Table 5: Ingredients of Rasa chenduram

| S. No. | Name of the ingredient | Weight (g) |
|--------|------------------------|------------|
| 1.     | Ircam                  | 140        |
| 2.     | Kantakam               | 35         |
| 3.     | Talakam                | 8          |

Method of preparation: No earlier scientific data was found for the method of preparation of Abraka chenduram.

Dose: 65-130 mg of AC should be taken along with 4 gm of mixture of Tanner cassia (4 parts), Withania somnifera root (4 parts) and seeds of Cuminum cyminum (1part) with cow’s butter milk twice daily [11].

Traditional uses: RC is known to be effectively employed in the treatment of diabetes and piles [20].

Earlier data published on anti-diabetic activity of Rasa chenduram:

No earlier scientific data was found for the anti-diabetic activity of Rasa chenduram.

6. Avarai kudineer churnam (AKC)

Avarai kudineer churnam is an effective traditional Siddha formulation to treat diabetes mellitus.

Composition: The ingredients of Avarai kudineer churnam are as follows [11].
The Journal of Phytopharmacology

Table 6: Ingredients of Avarai kudineer churnam

| S.No. | Name of the metal | Siddha name | Quantity (%) |
|-------|------------------|-------------|--------------|
| 1.    | Avarai samoolam  | Cassia auriculata | 14.28 |
| 2.    | Kondrai pattai   | Cassia fistula | 14.28 |
| 3.    | Naval pattai     | Syzygium cumini | 14.28 |
| 4.    | Koraikizhangu   | Cyperus rotundus | 14.28 |
| 5.    | Kostam           | Saussarea lappa | 14.28 |
| 6.    | Marutham pattai  | Terminalia arjuna | 14.28 |
| 7.    | Kadalingil ver   | Salacia reticulate | 14.28 |

Method of preparation: No literature survey was found for the method of preparation of Avarai kudineer churnam

Dose: 5gms of Avarai kudineer churnam should be boiled in 300ml of water and reduced the quantity to 30 ml and consumed it twice daily [11].

Traditional uses: Avarai kudineer churnam is mainly employed in the treatment of diabetes mellitus and diabetes insipidus. It protects the skin from hot sun and also used in the treatment of skin disorders [11].

Earlier data published on anti-diabetic activity of Avarai kudineer churnam:

1. Yoganandam G et al. evaluated the in-vivo anti-diabetic activity of AKC in streptozotocin induced diabetic rats. Avarai kudineer churnam at 500mg/kg shown significant hypoglycemic activity, moreover inhibitory effects on biochemical and histological parameters induced by AKC were almost comparable to that of standard drug, glibenclamide (5mg/kg) [20].

2. Bhavanapriya V et al. evaluated the anti-diabetic efficacy of AKC in alloxan-induced diabetic rats. AKC significantly reduced the blood glucose levels and reversed the elevated urea, creatinine, cholesterol levels and decreased protein values close to normal levels [21].

7. Nilavembu kudineer (NK)

Nilavembu kudineer is a pure herbal Siddha formulation contains nine herbs in equal proportions.

Composition: The ingredients of Nilavembu kudineer are as follows [22].

Table 7: Ingredients of Nilavembu kudineer

| S.No. | Name of the metal | Siddha name | Quantity (%) |
|-------|------------------|-------------|--------------|
| 1.    | Nilavembu        | Andrographis paniculata | 11.11 |
| 2.    | Vilaichai Ver    | Plectranthus verticiloides | 11.11 |
| 3.    | Vetiver          | Vetiveria zizanioides | 11.11 |
| 4.    | Chakku           | Zingiber officinale | 11.11 |
| 5.    | Milaga           | Piper nigrum | 11.11 |
| 6.    | Koraikizhangu   | Cyperus rotundus | 11.11 |
| 7.    | Santanam         | Santalum album | 11.11 |
| 8.    | Peyputtal        | Trichosanthes cucumerina | 11.11 |
| 9.    | Parpadagam       | Mollago cerviana | 11.11 |

Method of preparation: No earlier scientific data was found for the method of preparation of Nilavembu kudineer.

Dose: 10gm of Nilavembu kudineer should take with palm candy or honey [11].

Traditional uses: NK has anti-pyretic, anti-inflammatory, anti-viral, anti-diabetic and immunomodulatory actions. It can effectively treat dengue fever and chikungunya. It is also effective for reducing joint pain, joint swelling, muscle pain, headache. NK is also used to treat infertility, irregular periods and white discharge [22].

Earlier data published on anti-diabetic activity of Nilavembu kudineer

1. Ravi K evaluated the anti-diabetic effect of Nilavembu kudineer at different dose levels 100, 200 and 400 mg/kg in STZ induced diabetic rats. Oral administration of Nilavembu kudineer at dose of 200 mg/kg and 400 mg/kg significantly reduces the blood glucose levels in diabetic rats [23].

Various anti-diabetic formulations clinically used in Siddha system of medicine

Table 8: Anti-diabetic formulations used in Siddha system of medicine

| S.No. | Name | Vehicle | Dosage | Earlier work done | Reference |
|-------|------|---------|--------|-------------------|-----------|
| 1.    | Triphala churnam | Honey, ghee or water is the vehicles for Triphala churnam. | 1-3 gm with water, honey or ghee, 2-3 times per day. | 1. Clinical Study of ‘Triphala’ – A Well Known Phytomedicine from India. | Pulok K. Mukherjee et al., 2006. |
| 2.    | Madhumega churnam | Water is the ideal vehicle for MC. | 1-2 tablets per day. | 1. Antidiabetic activity of Madhumega churnam (Siddha formulation) in alloxan induced diabetic rats. | Vaidyavan Ret al., 2011. |
| 3.    | Seenthil churnam | The suitable vehicle for SC is warm water or ghee or honey. | 1-3 g twice daily after meals. | 1. Safety and pharmacological profile of Seenthil chooranam | Ushakanthan S., 2016. |
CONCLUSION

In present days high stress, amplified automation, junk food consumption and sedentary life style are the incidence factors of diabetes. Medical management and nutritional therapy, increased physical activity are the goals to alleviate the incidence of diabetes. Awareness about Alternative medicine has increased and the role of alternative medicinal systems such as Ayurveda, Siddha and Unani is also finding equal importance like Allopathy. The effort taken in the present review is a progressive step to prove that consistent use of Siddha anti-diabetic formulations that minimizes the incidence and early manifestation of diabetes.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest.

REFERENCES

1. Madhavan R, Sathish R, Murugesan M. Standardization of Sangu parpam a herba marine siddha drug. Int. J. Curr. Res. Chem. Pharm. Sci. 2016; 3:77-84.
2. Ravishankar B, Shukla VJ. Indian systems of medicine: a brief profile. Afr J Tradit Complement Altern Med. 2007; 4:319-337.
3. Thas JJ. Siddha medicine-background and principles and the application for skin diseases. Clin Dermatol. 2008; 26:62-78.
4. Manisha Modak, Priyani J Dixit, Jayant Londhe, Saroj Ghaskadbi, Thomas Paul A. Devasagayam. Indian Herbs and Herbal Drugs Used for the Treatment of Diabetes. J Clin Biochem Nut. 2007; 40:163-173.
5. Chinnay D Deshmukh, Anurekha Jain. Diabetes Mellitus: A Review. Int. J. Pure App. Biosci. 2015; 3:224-230.
6. Neerizhivu (Diabetes Mellitus). National Health Portal of India; 2018/6/16.
7. Muthukumar NJ, Manickavasakam K, Banumathi V. Characterisation and Elemental analysis of a Siddha herba mineral formulation – Vishnu Chakra Mathira. IJRCPS. 2016; 3:70-76.
8. Gambert S, Pinkstaff S. Emerging Epidemic: Diabetes in older adults–demography, economic impact, and pathophysiology. Diabetes Spectrum. 2006; 19:221-228.
9. Saddaf Naaz Akhtar, Preeti Dhillon. Prevalence of diagnosed diabetes and associated risk factors: Evidence from the large-scale surveys in India. JOSH-Diabetes. 2017; 5:28-36.
10. Sandhya T, Lathika KM, Pandey BN, Mishra KP. Potential of traditional ayurvedic formulation, Triphala, as a novel anticancer drug. Cancer Lett. 2006; 231:206-14.
11. Therapeutic index-Siddha. Published by SKM centre for Ayush Research and Education, 1st ed. 2010; 31-32.
12. Anonymous. The Ayurvedic Formulary of India, Controller of Publications, Ministry of H, F and W, Govt. of India. 2003; Part I. 2nd ed. New Delhi.
13. Sowmya S Rajan, Seema Antony. Hypoglycemic effect of triphala on selected non insulin dependent Diabetes mellitus subjects. Ancient science of life. 2008; 17.
14. Anupama. Madhumega choornam. Bimbina. 2014.
15. Chidambaram Saravana Babu, Sekar Sathiya, Chandrasekaran Anbarasi, Nettam Prathyusha, Ganapathy Ramakrishnan, Persyathambi Kalavi. Journal of Ethnopharmacology. 2012; 142:331-336.
16. Vadivelan R, Umasankar P, Dipanjan M, Dhanabal SP, Shanthi A, Sathishkumar MN. Antidiabetic activity of Madhumega Churanam (Siddha formulation) in streptozotocin induced diabetic rats. Periagia Research Library Der Pharmacia Sinica. 2011; 2:299-304.
17. Anupama. Seenthil choorannam Usage, Benefits and Side Effects. Bimbina, 2014.
18. Dr. Usukanthan S. Safety and Pharmacological Profile of Seenthil Chooranam (Thesis). 2013-2016.
19. Arunachalam K, Thiruthani M, Abdul Kader Jeylan M, Rajarajeswaria A, Chenthumari selvi G, Rajamaheswari K. Antidiabetic activity of Avarakudineer abraga chendhuram on streptozotocin induced diabetes in rats. IJCRMS. 2017; 3:1-14.
20. Prakash Yoganandam G, Gopal V, Thanka J. Aavirai Kudineer. A potent polyherbal Siddha formulation for management of Diabetes mellitus. IPDPT. 2014; 2:98-103.
21. Bhavapriya V, Kalpana S, Govindasamy S, Apparanantham T. Biochemical studies on hypoglycemic effect of Aavirai kudineer: a herbal formulation in alloxan induced diabetic rats. Pelagia Research Library Der Pharmacia Sinica. 2011; 2:299-304.
22. Anupama. Seenthil choorannam Usage, Benefits and Side Effects. Bimbina, 2014.
23. Dr. Usukanthan S. Safety and Pharmacological Profile of Seenthil Chooranam (Thesis). 2013-2016.
24. Arunachalam K, Thiruthani M, Abdul Kader Jeylan M, Rajarajeswaria A, Chenthumari selvi G, Rajamaheswari K. Antidiabetic activity of Avarakudineer abraga chendhuram on streptozotocin induced diabetes in rats. IJCRMS. 2017; 3:1-14.
25. Prakash Yoganandam G, Gopal V, Thanka J. Aavirai Kudineer. A potent polyherbal Siddha formulation for management of Diabetes mellitus. IPDPT. 2014; 2:98-103.
26. Bhavapriya V, Kalpana S, Govindasamy S, Apparanantham T. Biochemical studies on hypoglycemic effect of Aavirai kudineer: a herbal formulation in alloxan induced diabetic rats. Pelagia Research Library Der Pharmacia Sinica. 2011; 2:299-304.
27. Ravi K. Clinical Study on Siddha Medicine in the Management of “Madhumegam” (Type II Diabetes Mellitus) (Thesis). 2015.