Published online in http://ijam.co.in ISSN No: 0976-5921

International Journal of Ayurvedic Medicine, Vol 15 (1), 2024; 137-142

Clinical evaluation of therapeutic efficacy of a Siddha herbo mineral formulation "*Kumaara Veeriya Kaantha Chenduram*" with "*Nellikkai Legiyam*" (internal) in the treatment of Iron Deficiency Anemia

Research Article

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Abstract

Kumaara Veeriya Kaantha Chenduram (KVKC) is a siddha herbomineral formulation indicated for *paandu noi* in Siddha literature. *Paandu noi* is a disease characterised by changes in the body's natural colour and pallor found in the skin, nails and conjunctiva. Objectives: To determine the efficacy of the *KVKC*, the open labeled clinical study was conducted in National Institute of Siddha OPD. Materials and Methods: The 30 patients with Iron deficiency anaemia were selected and treated with KVKC orally with the dose of 260 milligram twice in a day with *Nellikai legiyam* 6 gram continuously for 45 days. Laboratory investigations for haemoglobin was done on 1st day and every 15 days once of the study. Results: Clinical assessment was done, based on the before and after treatment scores which were compared statistically and recorded. Regarding Haemoglobin level, 24(80%) patients showed increase of 1 to 3 grams from base level, 6(20%) patients showed increase of 0.1 to 0.9 grams from base level. Regarding Serum Ferritin, out of 30 patients, 9 (30%) patients showed 0.1-3.5ng/ml increase from its base level, 21 (70%) patients showed 3.6-7.0ng/ml increase from its base level.From the Statistical studies, the Mean ± Standard deviation for Haemoglobin before treatment was 9.7 ± 0.93 and after treatment was 11.18 ± 1.08 which was statistically highly significant ($p<0.0001$).And Serum ferritin before treatment was 9.27 ± 3.31, after treatment was 13.5 ± 3.49 which was statistically significant ($p<0.0001$). Conclusion: It is concluded that *Kumaara Veeriya Kaantha Chenduram* is proved safe and clinically effective in treating Iron deficiency anaemia.

Keywords: *Paandu noi*, *Kumaara Veeriya Kaantha Chenduram*, Iron deficiency anemia, *Nellikai legiyam*, Siddha Medicine.

Introduction

As per Siddha tradition the term "*Veluppu*" is derived from the character of "*Paandu*"(1). In *Mahabharatam*, the father of the five heroes '*Pancha pandavar*' is known as "Paandu" It is said that this man was very pale when born. Thus, this condition was named after him as *Paandu*. (2) *Paandu noi* is a disease characterised by changes in the body's natural colour and pallor found in the skin, nails, and conjunctiva.As per modern science, Anaemia is not classified as a disease. But Siddha science has placed Anaemia neither as a state nor as a condition but as a disease. One of the predominant causes for Anaemia is iron deficiency. There are many formulations used in siddha for treating iron deficiency anaemia. One such siddha herbo-mineral formulation is *Kumaara Veeriya Kaantha Chenduram* (3) which is indicated with any one of the *legiyam* as *anubanam* (adjuvant to medicine). In this study *nellikkai legiyam* was selected as adjuvant to KVKC (4)

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Materials and methods

Initially, this study had been approved by Institutional ethical committee.(IEC Approval number- NIS/IEC/14/2018-19/4-20.09.18) After obtaining approval, the clinical study was registered in the Clinical Trials Registry of India.(CTRI Registration number- CTRI/2019/04/018795) The clinical trial was started in Ayothidoss Pandithar hospital National Institute of siddha. After screening of 100 iron deficiency anaemia patients, 30 cases were included to this trail. In this study, 30 patients with iron deficiency anaemia were selected from according to inclusion and exclusion criteria. Before starting the trial, the informed consent was obtained from all the patients.

Inclusion criteria:

- Age : 18-65

- Sex : Both sex and transgender
- Hb level less than normal range,
  - For male : 9-11g/dl (normal: 13-18g/dl)
  - For female : 8-11g /dl (normal: 11.5-16.5g/dl)

Exclusion criteria:

- Hyper tension
- Presence of any associated severe systemic illness (e.g. Cancer, AIDS)
- Endocrine disorder (Thyroid abnormality, Diabetes mellitus)
- Severe Cardiac diseases or IHD.
- Inherited defects (Sickle Cell Anaemia, Thalassemia, Aplastic Anaemia).

Withdrawal criteria

- Intolerance to the drug and development of adverse drug reactions (Stomach Pain, Diarrhoea, Nausea, Burning sensation in stomach and Throat etc) during the study.
- Poor patient compliance and defaulters.
- Patients turned unwilling to continue in the course of clinical trial.
- Patients who were not take medication regularly.

Safety study

For the safety evaluation of *Kumaara Veeriya Kaantha Chenduram*, Institutional Animal Ethical Committee (IAEC) approval (NIS/IAEC-VII/ 28082018/01) was obtained by submitting the duly filled Form B. The male & female albino rats were obtained from the authorised animal breeders of the animal laboratory in Tamil Nadu Veterinary & Animal Sciences University (TANUVAS), Madhavaram Chennai. The Acute and repeated dose 90 days toxicity study (As per OECD Guideline - 408) was performed in Animal House, National Institute of Siddha, Chennai.

Conduct of the study

As and when patients reported at OPD of Ayothidoss Pandithar hospital, National Institute of Siddha with the symptoms were subjected to screening test and documentation had been done by using screening proforma. Patients who have satisfied inclusion and exclusion criteria were recruited for the study. On 1st day the patient was advised to take purgative medication i.e. soup of sesban leaves (*Sesbania grandiflora.* L.) mixed with palm jaggery ½-1 *aazhakku* (84-168ml), at early morning in empty stomach.(5) He/She was advised to take rest on next day. On 3rd day patient was asked to take oil bath with *Seeraga thylam*.(6) Then the study drug "*Kumaara Veeriya Kaantha Chenduram*" was given at a dose of 260 milli gram twice in a day with *Nellikai legiyam* 6 gram continuously for 45 days, patients should visit the hospital once in 5 days. At each clinical visit clinical assessment was done and noted prognosis. Laboratory investigations for haemoglobin was done on 1st day and every 15 days once of the study.

Observations

Table 1: Age distribution

Age in years	Frequency	Percentage
18-25	6	20
26-35	8	26.67
36-45	14	46.67
46-55	2	6.66
56-65	0	0

Among the 30 patients treated 6(20%) patients were reported from the age 18-25 years, 8(26.67%) patients were reported from the age 26-35 years, 14(46.67%) patients were reported from the age 36- 45 years and 2(6.67%) patients were reported from the age 46-55 years. The percentage is more in the age group of 36-45 years. No patients were reported in the age group of 56-65 years.

Table 2: Gender distribution

Gender	Frequency	Percentage
Male	2	6.67
Female	28	93.33

Among 30 patients 28 (93.3%) patients were female and 2(6.67%) patients were male.

Table 3: Religion distribution

Religion	Frequency	Percentage
Hindu	26	86.66
Christian	2	6.67
Muslim	2	6.67

Out of 30 patients, 26 (86.66%) patients were Hindus, 2(6.67%) patients were Christians and 2(6.67%) patients were Muslims.

Table 4: Socio-economic distribution

Socioeconomic status	Frequency	Percentage
Upper	11	36.67
Middle	17	56.67
Lower	2	6.66

Among the 30 patients, 11(36.67%) patients were Upper economic status, 17(56.67%) patients were middle class people and 2(6.66%) were poor economic status. The percentage is more in middle economic group.

Table 5: Occupational distribution

Occupation	Frequency	Percentage
Students	5	16.67
Working women	13	43.33
House wives	12	40.00

Of the 30 patients, 5(16.7%) patients were students, 13(43.3%) patients were working women and 12(40%) patients were house wives. The percentage is more in working women as well as house wives.

Table 6: Educational status

Education	Frequency	Percentage
Literate	21	70.00
Illiterate	9	30.00

Out of 30 patients, 21(70%) patients were literate and 9(30%) were illiterates.

Table 7: Demographic distribution

Demographic distribution	Frequency	Percentage
Urban	27	90.00
Rural	3	10.00

Out of 30 patients, 27 (90%) patients were belonged to urban area and 3(10%) patient were belonged to rural area. The percentage was more in urban area people.

Habitual distribution

Among 30 patients, none of the patients had betel nut chewing, tobacco chewing and alcoholism.

Table 8: Treatment history

Treatment history	No of patients [frequency]	No of patients [percentage%]
Modern medicine	9	30.00
Siddha	6	20.00
Ayurvedha	2	6.67
Homeopathy	1	3.33
No medication	**12**	**40.00**

Out of 30 patients, 9 (30%) patients were taken allopathy treatment, 6 (20%) patients were taken Siddha treatment, 2 (6.67%) patients were taken Ayurvedic treatment, 1 (3.33%) patients were taken Homeopathy treatment and 12 (40%) patients were not under any medication.

Table 9: Dietary distribution

Diet	Frequency	Percentage
Veg	2	6.67
Non-veg	28	93.33

Among 30 patients, 28 patients (93.33 %) had non- vegetarian dietary habit and 2 (6.67%) patients had vegetarian dietary habit.

Table 10: Marital status distribution

Marital status	Frequency	Percentage
Married	24	80.00
Unmarried	6	20.00

Of the 30 patients, 6 (20%) patients were unmarried, 24 (80%) patients were married. The percentage was more in married status.

Table 11: Menstrual history distribution

Menstrual history	No of patients [frequency]	No of patients [percentage%]
Regular	23	76.66
Irregular	3	10.00
Menopause	2	6.67
Not applicable (male)	2	6.67

Of the 30 patients, 23(76.67%) patients had regular menstrual history, 3(10%) patients had irregular menstrual history noted as oligo menorrhea, 2(6.67%) patients attained menopause.

Table 12: Distribution of patients by body built

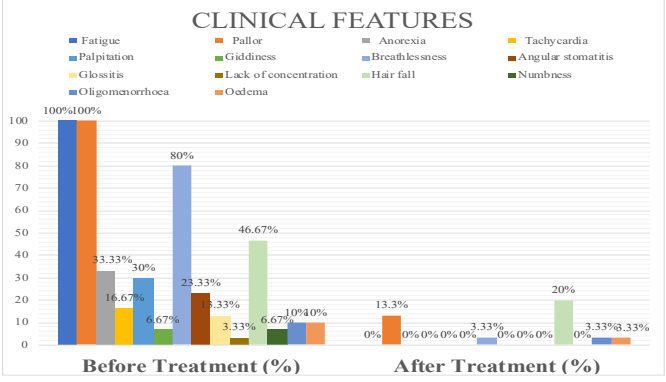
Body built (BMI)	No of patients [frequency]	No of patients [percentage%]
Normal weight (18.5-24.9)	14	46.67
Under weight (< 18.5)	1	3.33
Over weight (25-30)	12	40.00
Obesity (> 30)	3	10.00

Among the 30 patients, 3(10%) patients were obese, 12(40%) patients were overweight, 1(3.33%) patient was under weight, 14 (46.67%) patients were normal weight.

Table 13: Clinical features before and after treatment

Clinical features	Number of patients affected before treatment [frequency]	Before treatment (%)	Number of patients affected after treatment [frequency]	After treatment (%)
Fatigue	30	100	0	0
Pallor	30	100	4	13.33
Anorexia	10	33.33	0	0
Tachycardia	5	16.67	0	0
Palpitation	**9**	**30**	**0**	**0**
Giddiness	2	6.67	0	0
Breathlessness	24	80	1	3.33
Pungent or bitter taste of tongue	0	0	0	0
Angular stomatitis	7	23.33	0	0
Glossitis	**4**	**13.33**	**0**	**0**
Lack of concentration	1	3.33	0	0
Hair fall	14	46.67	6	20.00
Numbness	2	6.67	0	0
Tingling sensation	0	0	0	0
Amenorrhoea	**0**	**0**	**0**	**0**
Oligo-menorrhoea	3	10.00	1	3.33
Oedema	3	10.00	1	3.33
Koilonychia	0	0	0	0

Figure 1



Results

Results of the safety study

The results of the acute study done previously as per OECD guidelines, reveals the non-toxicity of the drug at the dose level in 2000 mg/kg. (7) Since treatment duration of the trial drug was 45 days, we did the repeated dose 90-days oral toxicity study as per the OECD guidelines 408 with standard methods in animal model. In this study, the results like haematological investigations, biochemical investigations, gross pathological examination of animals proved that *Kumaara Veeriya Kaantha Chenduram* had no-observed-adverse-effect level (NOAEL) It showed the drug's safety up to the high dose of 400mg/kg b.wt that proved its effectiveness in long-term administration without harming the human being.(8)

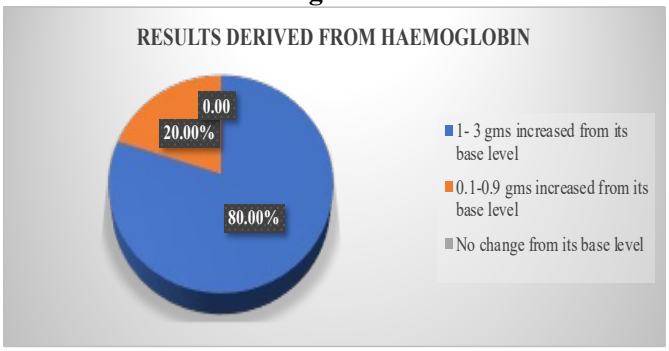
Before treatment among 30 patients, **Pallor** and **Fatigue** was noted in all 30 patients, **Anorexia** was noted in 10 (33.33%) patients, **Tachycardia** was noted in patients 5 (16.67%), **Palpitation** was noted in patients 9 (30%), **Giddiness** was noted in 2 (6.67%) patients , **Breathlessness** was noted in 24 (80%) patients, **Angular stomatitis** was noted in patients 7 (23.33%), **Glossitis** was noted in 4 (13.33%) patients, **Lack of concentration** was noted in 1 (3.33%) patient, **Numbness** was noted in 2 (6.67%) patients, **Hair fall** was noted in 14 (46.67%) patients, **Oedema** was noted in 3 [10%] patients, **Oligomenorrhoea** was noted in 3 (10%) patients.

After treatment **Pallor** was noted in 4 (13.33%) patients, **Breathlessness** was noted in 1 (3.33%) patient, **Hair fall** was noted in 6 (20%) patients, **Oedema** and **Oligomenorrhoea** was noted in 1 [3.33%] patient. **Fatigue, Anorexia, Tachycardia, Palpitation, Giddiness, Angular stomatitis, Glossitis, Lack of concentration, Numbness** were normal in all patients.

Table 14: Results derived from the Haemoglobin before and after treatment

Haemoglobin	No of patients [frequency]	No of patients [percentage%]
1- 3 gms increased from its base level	24	80.00
0.1-0.9 gms increased from its base level	6	20.00
No change from its base level	0	0

Figure 2



Among the 30 patients, of which 24(80%) patients showed increase of 1 to 3 grams in the haemoglobin level, 6 (20%) patients showed increase of 0.1 to 1.9 grams in the haemoglobin level and none of the patients were observed without improvement in haemoglobin level.

Results from complete blood count before and after treatment

Table 15: Results from RBC

RBC	Number of patients [frequency]	Number of patients [%]
0-0.5 (10^6/mm^3 cells) increased from its base level	23	76.67
0.51-1 (10^6/mm^3 cells) increased from its base level	6	20
No change from its base level	0	0
Reduced from its base level	1	3.33

Regarding RBC of the 30 patients, 23(76.67%) patients showed 0-0.5 (10^6/mm^3 cells) increased from its base level increased from its base level, 6(20%) patients showed 0.51-1 (10^6/mm^3 cells) increased from its base level,1 patient (3.3%) showed reduction from its base level. None of the patients were observed without improvement in RBC level.

Table 16: Results from PCV

PCV	Number of patients [frequency]	Number of patients [%]
0.1-4% increased from its base level	27	90.00
4.1-8% increased from its base level	3	10.00
No change from its base level	0	0.00
Reduced from its base level	0	0.00

Regarding PCV of the 30 patients, 27 (90%) patients showed 0.1-4% increased from its base level, 1 (10%) patients showed 4.1-8% increased from its base level. None of the patients were observed without improvement in PCV level and reduced from its basal level.

Table 17: Results from MCV

MCV	Number of patients [frequency]	Number of patients [%]
0.1-5 ft increased from its base level	20	66.67
5.1-10 ft increased from its base level	9	30.00
No change from its base level	0	0.00
Reduced from its base level	1	3.33

Regarding MCV of the 30 patients, 20 (66.67%) patients showed 0.1-5ft increased from its base level, 9 (30%) patients showed 5.10ft increased from its base level and 1(3.3%) patient showed reduction from its base level. None of the patients were observed without improvement in MCV level and reduced from its basal level.

Table 18: Results from MCH

MCH	Number of patients [frequency]	Number of patients [%]
0.1-3.5 pg increased from its base level	18	60.00
3.6-7.0 pg increased from its base level	10	33.34
No change from its base level	1	3.33
Reduced from its base level	1	3.33

Regarding MCH of the 30 patients, 18 (60%) patients showed 0.1-3.5pg increase from its base level, 10 (33.34%) patients showed 3.6-7pg increase from its base level, 1 (3.33%) patient did not showed any improvement in its base level and 1 (3.33%) patient showed reduction from its base level.

Table 19: Results from MCHC

MCHC	Number of patients [frequency]	Number of patients [%]
0.1-3.5 g/dl increased from its base level	23	76.67
3.6-7.0 g/dl increased from its base level	7	23.33
No change from its base level	0	0.00
Reduced from its base level	0	0.00

Regarding MCHC of the 30 patients, 23 (76.67%) patients showed 0.1-3.5 g/dl increase from its base level, 7 (23.33%) patients showed 3.6-7.0 g/dl increase from its base level. None of the patients were observed without improvement in MCHC level and reduced from its basal level.

Table 20: Results from Morphology of RBC

Smear study	No of patients before treatment [frequency]	Before treatment (%)	No of patients after treatment [frequency]	After treatment (%)
Normocytic normochromic	0	0.00	21	70.00
Mild microcytic hypochromic	18	60.00	4	13.33
Moderate microcytic hypochromic	12	40.00	5	16.67
Severe microcytic hypochromic	0	0	0	0

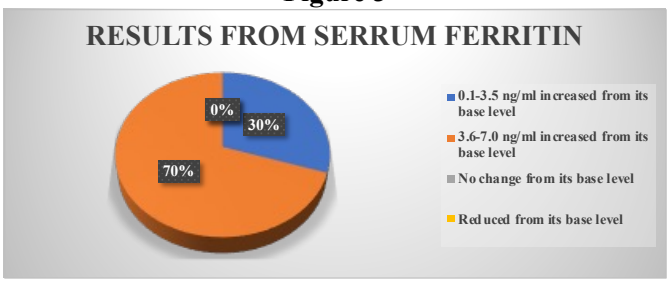
Regarding Morphology of RBC, before treatment among 30 patients,18(60%) patients showed Mild microcytic hypo-chromic, 12(40%) patients showed Moderate microcytic hypo-chromic.

After the treatment 21 (70%) patients showed Normocytic Normochromic, 4(13.33%) patients showed Mild microcytic hypo-chromic, 5(16.67%) patients showed Moderate microcytic hypo-chromic.

Table 21: Results from serum ferritin

Serum ferritin	No of patients [frequency]	No of patients [percentage%]
0.1-3.5 ng/ml increased from its base level	9	30.00
3.6-7.0 ng/ml increased from its base level	21	70.00
No change from its base level	0	0.00
Reduced from its base level	0	0.00

Figure 3



Regarding Serum Ferritin, out of 30 patients, 9 (30%) patients showed 0.1-3.5ng/ml increase from its base level, 21 (70%) patients showed 3.6-7.0ng/ml increase from its base level. None of the patients were observed without improvement in serum ferritin level and reduced from its basal level.

Statistical analysis

The Statistical report states that the Mean ± Standard deviation for,

a. Haemoglobin before treatment is 9.7 ± 0.93 and after treatment is 11.18 ± 1.08 which is statistically significant ($p<0.0001$).
b. RBC before treatment is 4.06 ± 0.56 and after treatment is 4.4 ± 0.57 which is statistically significant ($p<0.0001$).
c. PCV before treatment is 32.19 ± 2.41 and after treatment is 35.04 ± 2.68 which is statistically significant ($p<0.0001$)
d. MCV before treatment is 75.57 ± 6.76 and after treatment is 79.03 ± 5.91 which is statistically significant ($p<0.0001$)
e. MCH before treatment is 23.5 ± 2.84 and after treatment is 26.17 ± 2.06 which is statistically significant ($p<0.0001$).
f. MCHC before treatment is 29.95 ± 2.04 and after treatment is 31.93 ± 1.54 which is statistically significant ($p<0.0001$).
g. Serum ferritin before treatment is 9.27 ± 3.31 and after treatment is 13.5 ± 3.49 which is statistically significant ($p<0.0001$).

Discussion

Siddhars specialised in herbomineral preparations like *Parpam, chendooram, chunnam, mezhugu* and *kattu*. These preparations are based on their knowledge of bringing inorganic substances into ionic form which can be easily absorbed by the body. The advantages of these preparations over herbal formulations are longer shelf life (75 years in case of *chenduram*) (9) and

efficacy with very little dosage. *Kumaara Veeriya Kaantha Chenduram* is one of the *chenduram* types of medicine preparation.

The safety study of the *Kumaara Veeriya Kaantha Chenduram* reveals that the drug had no-observed-adverse-effect level (NOVEL). (8) According to the bio chemical, phytochemical and physicochemical analysis results, the phytochemicals present in the *Kumaara Veeriya Kaantha Chenduram* have proven its hematinic activity. (10) And the hemetinic activity of *Kumaara Veeriya Kaantha Chenduram* is proven by phenyl hydrazine induced anaemia in animal model which showed highly statistical significant elevation in blood parameters when compared to control group. (11)

The Adjuvant drug *Nellikkai legiyam*, contains *nellikkai (Phyllanthus emblica.* L*)* one of the richest source of Vitamin C (Ascorbic acid) which enhances the absorption of iron in the trail drug.(12) The Biochemical, Phytochemical, Physicochemical analysis of *Nellikai legiyam showed* that the presence of carbonate, sulphate, Iron, Zinc, Calcium, Ammonium, Sulphide, Starch, Alkaloids, Flavonoids & Tannic acids. (13) The ingredients of *nellikkai legiyam* are having proven haematinic, antioxidant, anti-inflammatory, immuno-modulatory, anti-asthmatic, anti-microbial and anti-cancerous activities.(14)

According to the previous study on iron deficiency anemia with *chenduram* based siddha drug named *annabedhi chenduram,*it had been proved that good clinical improvement in 80% of the cases and moderate clinical improvement in 20% of the cases. (15)

In this clinical trial with *Kumaara Veeriya Kaantha Chenduram* the clinical signs and symptoms of the patients like Pallor, Breathlessness, oedema and oligo menorrhoea are decreased well after treatment. And also the blood parameters improved significantly after treatment.

Conclusion

In this clinical trial, the *Kumaara Veeriya Kaantha Chenduram* did not cause any adverse reactions to the patients. The clinical trial of *Kumaara Veeriya Kaantha Chenduram* with *Nellikkai legiyam* in 30 patients explores the efficacy of drug by reducing the symptoms of iron deficiency anaemia efficiently and increase the hemoglobin, ferritin level significantly. Hence it is concluded that *Kumaara Veeriya Kaantha Chenduram* is proved clinically to be effective in treating Iron deficiency anaemia.

Reference

1. Kuppusamy mudaliyar "*Pothu maruthuvam*" Edition: 6th,2004.Published by Department of Indian medicine and homeopathy Page No 345-352
2. Kuppusamy mudaliyar "*Pothu maruthuvam*" Edition: 6th,2004.Published by Department of Indian medicine and homeopathy Page No 345-352
3. Hakkim Abdulla sahib "*Anuboga vaidhya navaneetham* part 1" Edition: September1995 published by Thamarai noolagam Page no: 102-103
4. Shanmugam M & Naidu GD -The Pharmacopoeia of siddha research medicines, Edition 1, 1973, published by Sri.G.D.Naidu, President I.L.W.A.Ltd Page no-219
5. Kuppusamy mudaliyar "*Pothu maruthuvam*" Edition: 6th,2004.Published by Department of Indian medicine and homeopathy Page No 351
6. Kaa. Naa. Kuppusamy mudaliyar, Kaa. Su. Uthamarayan "Siddha vaidhya thirattu" Edition: 8th,2021.Published by Department of Indian Medicine and Homeopathy Page No 379
7. Vijaya Lakshmi K, Toxicity study on Kumaara veeriya kaantha chenduram, Department of Nanju noolum Maruthuva neethi noolum at National institute of siddha, Chennai on academic year 2012-2014 academic year (Dissertation number – D254)
8. Siva Lakshmi et al Repeated Dose 90-Day Oral Toxicity Evaluation Of *Kumaara veeriya kaantha chenduram*, A Siddha Herbo mineral Formulation In Wister Albino Rats, Indo American Journal of Pharmaceutical Research, Vol 10 Issue 08, 2020ISSN NO: 2231-6876
9. Ra Thiyagarajn "Gunapaadam thathu vaguppu" Edition: 3rd ,2019.Published by Department of Indian medicine and homeopathy Page No 83
10. Siva Lakshmi.S, H. Vetha Merlin Kumari, S. Mohan, R. Meena Kumari, Standardization Of A Siddha Herbomineral Formulation *Kumara Veeriya Kantha Chenduram*, International Journal of Research in Ayurveda and Pharmacy, *Int. J. Res. Ayurveda Pharm. 11 (4), 2020* ISSN:2229–3566
11. Sasi Priya. T, Visweswaran. S "Evaluation of haematinic activity of Kumara Veeriya Kaantha Chendhuram in phenyl hydrazine induced Anemia in experimental rats" World Journal of Biology Pharmacy and Health Sciences Feb 28, 2023
12. Scartezzini P et al "Vitamin C content and antioxidant activity of the fruit and of the Ayurvedic preparation of *Emblica officinalis* Gaertn."
13. Siva Lakshmi.S, H. Vetha Merlin Kumari, S. Mohan and R. Meena Kumari, Physicochemical Evaluation Of A Siddha Poly Herbal Formulation *Nellikkai* Legiyam, International Journal of Advanced Research, Int. J. Adv. Res. 8(06), 771-778 ISSN: 2320-5407
14. Siva Lakshmi.S, H. Vetha Merlin Kumari, S. Mohan, R. Meena Kumari therapeutic effectiveness of the siddha immuno modulatory polyherbal formulation Nellikai legiyam against covid-19 pandemic-a review, World Journal of Pharmaceutical Research, Volume 9, Issue 7, 712-731, ISSN 2277– 7105
15. Martin Dinesh Kumar K, Manckavasakam K "An open clinical trial of Annabethi chenduram in the treatment of vadha paandu", Journal of Siddha, Vol 2, Issue 1, June 2009.

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