Journal of Ayurveda & Holistic Medicine

https://jahm.co.in

eISSN-2321-1563

ORA – Clinical Research

Effectiveness of Vadavanala Vati as an adjunct in the Management of Hypothyroidism: An Open Label, Single Arm Clinical Study

[1*]Meghana K A, [2]Girish K J

ABSTRACT:

Background and objectives: Hypothyroidism is the most common thyroid disorder, with a prevalence of 4-5 % in developed countries and 10.5% in India. In *Ayurveda*, the disease can be understood in the light of *dosha* (humors), *dushya* (bodily constituents), *agni* (digestive fire) and *srotas* (channels). The signs and symptoms match with the description of *agnimandya* (suboptimal digestive fire) at the level of *koshta* (alimentary tract) and *dhatus* (tissues). Hence treatment could be focused on *agni deepana* (improving the digestive fire) at the level of *koshta* and *dhatu* especially *rasa dhatu*. For this purpose, *Vadavanala vati* is selected, which contains ingredients such as *saindhava* (rock salt), *pippali* (*Piper longum L.*), *pippali moola* (root of *Piper longum L*), *chavya* (*Piper chaba Hunter*), *chitraka* (*Plumbago zeylanica L.*), *nagara* (*Zingiber officinale Roscoe*) and *haritaki* (*Terminalia chebula Retz.*), which have *agni dipana* (improving the digestive fire), *ama pachana* (detoxification) and *vatanulomana* (balancing of *vata*) properties. **Methods:** An open label, single arm study, with convenience sampling technique was conducted in adult patients with Primary Hypothyroidism (n = 19), out of which 16 completed the treatment. They were administered *Vadavanala vati* 2 tablets thrice daily before food with *ushnodaka* (warm water) as *anupana* (vehicle) for 45 days. For statistical analysis subjective parameters were assessed with Cochran Q test with McNemar test with Bonferroni correction as post hoc test and objective parameters including biomedical parameters were assessed with paired t test. **Results:** There was a statistically significant improvement in both primary and secondary outcome measures. Changes in Serum TSH, T4, and clinical symptoms like diminished sweating, dry skin, constipation, and weight were particularly notable. **Interpretation and conclusion:** *Vadavanala vati* appears to be an effective formulation in the management of Hypothyroidism.

KEYWORDS: *Ayurveda, Vadavanala vati*, Hypothyroidism, *agni dipana*, thyroid function

CTRI Reg no.: CTRI/2021/03/032116

RECEIVED ON:
02-06-2025

REVISED ON:
08-09-2025; 10-10-2025

ACCEPTED ON:
28-10-2025

Access This Article Online:

Quick Response Code:

Website Link:

https://jahm.co.in

DOI Link:

https://doi.org/10.70066/jahm.v13i10.1961

Corresponding Author Email:

meghana.sringeri@gmail.com

CITE THIS ARTICLE AS

Meghana K A, Girish K J. Effectiveness of Vadavanala Vati as an adjunct in the Management of Hypothyroidism: An Open Label, Single Arm Clinical Study. *Journal of Ayurveda and Holistic Medicine (JAHM).*2025;13(10):1-11

1. INTRODUCTION

Hypothyroidism; commonly encountered in clinical practice, is a condition characterized by hypometabolism resulting due to hyposecretion of thyroid hormones. The cause may be primary thyroid disease or less commonly disease of pituitary or hypothalamus. The prevalence of Hypothyroidism in developed world is 4-5% and that of subclinical hypothyroidism is 4 – 15%. [1] In India more than 42 million people stand affected from this disease. The prevalence of hypothyroidism in India is 10.95%, [1] females being six times more affected than males.

The signs and symptoms of hypothyroidism is found to be similar with few conditions mentioned in different texts of *Ayurveda*. The concept of *Ashta nindita purusha* (eight undesirable body types explained in *Charaka samhita*) resounds with many endocrine disorders. The description of *Galaganda* (goiter) resembles goiter presentation of hypothyroidism. The symptoms of hypothyroidism are found in few of the conditions such as *amajeerna* (impaired digestion), *kaphaja pandu* (various pathologies leading to anemia)*, kaphaja sopha* (various pathology that leads to edema), *avarana* (obstruction) and *bahudoshavastha* (imbalance of multiple humors)

Critical analysis of the pathogenesis and symptoms of hypothyroidism reveals that this is basically caused due to *mandata* of *agni* (suboptimal metabolism). *Agnimandya* at the level of *jatharagni* (gastric or digestive fire)*,* which in turn leads to *dhatvagni mandya* (suboptimal tissue metabolism) brings about the disease manifestation. This clinical study is taken up with an aim to treat *agni* especially *rasa dhatvagni* (tissue metabolism) in 45 days, which is 3 days more than the minimum number of days to correct the hypothalamo – pituitary- thyroid axis, that is 42 days. Study includes both freshly detected cases of hypothyroidism and patients who are on oral thyroxine therapy but are found to be refractory to it. There has not been much advance in treatment of Hypothyroidism since introduction of Levothyroxine monotherapy in the 1970's and it does not always normalize the Quality of Life among the users. This research was taken up with an intention to treat Hypothyroidism in minimum number of days and also to normalize the Quality of Life among the users with a relatively simple herbal formulation.

2. MATERIALS AND METHODS

Study Design:

This was an open-label (no blinding), single-arm, prospective clinical study with no randomization, conducted at the *Kayachikitsa* (General Medicine) OPD of SDM College of Ayurveda and Hospital, Hassan, Karnataka, between February 2020 to December 2020. The unit of assignment was the individual participant. Participants were selected using a convenience (non-random) sampling method and informed written consent was obtained from each participant after explaining the trial. The same investigator assessed the participants for outcome throughout the study, which reduced inter- observer bias but, as the observer was aware of the intervention, symptom rating may have been influenced. To mitigate the observer bias, all the

blood samples were analyzed at the same laboratory using CLIA method.

Participants:

Inclusion criteria: Adults aged 18 to 60 years, exhibiting clinical signs of hypothyroidism (e.g., lethargy, weight gain, cold intolerance), either newly diagnosed or already on thyroxine but not showing adequate response. And with Serum TSH value above 5.5mIU/L and below 20mIU/L

Exclusion criteria: Individuals with a history of thyroidectomy, congenital hypothyroidism, severe systemic illnesses, and pregnant or lactating women.

Ethics and Registration:

The study received ethical approval from the Institutional Ethics Committee and was registered on the Clinical Trials Registry of India (CTRI). IEC clearance letter numbered SDM/IEC/35/2019 and CTRI registration number CTRI/2021/03/032116 (https://ctri.nic.in/Clinicaltrials/pmaindet2.php?EncHid=MzUyNTk=&Enc=&userName=)

Intervention:

Participants received *Vadavanala Vati* (500 mg, 2 tablets thrice daily) for 45 days, administered before meals with warm water. In patients who showed persistence of symptoms and elevated Serum TSH values despite the Levothyroxine monotherapy, *Vadavanala vati* was introduced along with Levothyroxine monotherapy. The failure of the Levothyroxine monotherapy to normalize the symptoms and Serum TSH is a recorded phenomenon, due to its decreased absorption from the gastric mucosa. Among 19 participants, 16 participants were newly diagnosed cases of Hypothyroidism who were treated with *Vadavanala vati* alone and 3 were on Levothyroxine therapy and *Vadavanala vati* was introduced along with it.

Ingredients include *Saindhava* (1 part), *Pippali* (2 parts), *Pippali Moola* (3 parts), *Chavya* (4 parts), *Chitraka* (5 parts), *Nagara* (6 parts), and *Haritaki* (7 parts), all recognized for their *agni dipana* (improving the digestive fire), *vata anulomana* (vata balancing) and *amapachana* (detoxifying) properties. The required raw drugs were procured from Sri Dharmasthala Manjunatheshwara Ayurveda Pharmacy, Udupi, a GMP certified pharmacy. The above-mentioned ingredients were taken and powdered into coarse form. 1 part of coarse powder was boiled with 16 parts of water on mild flame and reduced to ¼th quantity and filtered. The above-mentioned ingredients were taken as per prescribed quantity and finely powdered. The fine powder was triturated with the prepared *kashaya* until it attained required consistency to form *vati* (500 mg tablet) and stored in air tight containers, with 90 tablets in each container. The containers were stored in the dispensary, from where the pharmacist delivered the medicines for free to those participants who had obtained a coupon from the principal investigator. The medicine was given thrice in the span of 45 days, at the interval of 15 days each. Participants were instructed to self-administer the medicine. The patients were asked to bring the empty containers back for their subsequent visit to ensure the adherence to treatment.

Objectives / Hypothesis:

Primary objective: To clinically evaluate the effectiveness of *Vadavanala vati* on Serum TSH, T3 and T4 at 45 days, in adults with Primary Hypothyroidism.

Secondary objectives: 1. To evaluate the effectiveness of *Vadavanala vati* on clinical symptoms using Zulewskis score. [2]

2. To evaluate the safety and tolerability of *Vadavanala vati* in study population.

Outcome Measures:

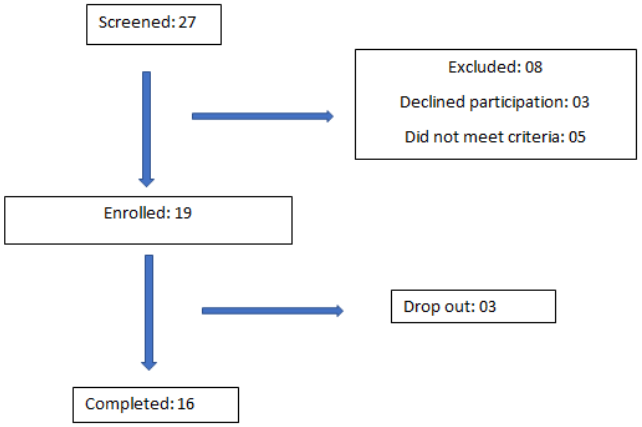
- **Primary Outcomes:** Changes in serum TSH, T3, and T4 levels measured before and after the 45-day treatment period.
- Serum T3, T4, TSH were measured using automated chemiluminescence immunoassay (CLIA/ECLIA). Fasting venous blood samples were drawn between 08:00 am to 10:00 am.
- **Secondary Outcomes:** Improvement in clinical symptoms such as diminished sweating, dry skin, constipation, weight changes, and overall quality of life, assessed using the Zulawski's clinical score.
- Zulewski score was used to assess the signs and symptoms of Hypothyroidism. It contains a total of 12 items, (6 signs and 6 symptoms) each scored as present (1) or absent (0). A score of ≤ 2 is considered euthyroid, 3- 4 suggesting borderline and ≥5 suggests hypothyroidism. The assessment was carried out by the principal investigator alone.

Sample size:

Sample size was determined as 30, with a two -tailed, α = 0.05, power = 80%, paired mean calculation with expected mean paired reduction in Serum TSH of 1.8mIU/L and assumed Standard Deviation of 3.5mIU/L. But the required sample size of 30 was not met, as the research was carried out during the Covid – 19 pandemics, with lockdowns in place. As the research was taken up as a part of post-graduation dissertation work with defined time to complete it, the recursion of participants was closed at the preplanned schedule.

Number of participants:

27 participants were screened for eligibility, out which 19 were enrolled in the study. 16 participants completed the study while 03 participants were drop outs because of adverse drug reactions. Among 03, 02 participants reported burning sensation in chest and abdomen and 01 participant reported bleeding per rectum. The symptoms improved upon withdrawal of medicine.



Statistical Analysis:

Analysis was conducted per – protocol basis including 16 participants who completed the trial. Subjective parameters were analyzed using the Cochran Q test and McNemar test with Bonferroni correction, while objective biochemical parameters were evaluated using paired t-tests in SPSS software. An exploratory sensitivity analysis excluding those on Levothyroxine (n= 3) was performed to assess robustness of the primary

outcomes. The same analysis method was adapted to the reduced dataset.

3. RESULTS

Table 01: Baseline characteristics (n = 19)

Characteristics	All (n =19)	Completers (n=16)	Drop outs (n=03)
Age	Between 31- 40	Between 31- 40	Between 41- 50
Sex (M/F)	1/18	1/15	3
BMI	Between 26 – 30	Between 26 – 30	Between 26 – 30
Baseline Serum TSH, mean ± SD	9.96 ± 4.98	9.91 ± 4.0	10.12 ± 5.4
Baseline Serum T3, mean ± SD	110.51 ± 39.66	106.35 ± 35.01	112 ± 40.95
Baseline Serum T4, mean ± SD	7.0138 ± 1.77	6.32 ± 1.4	9.60 ± 2.0

Table 02: Comparison of effect of *Vadavanala vati* on diminished sweating, weight increase, dry skin and constipation between four intervals of treatment

		BT	15th day	30th day	45th day	N	Cochran Q	P value
Diminished sweating	Present	9	8	5	2	16	15.000[a]	.002
	Absent	7	8	11	14			
Weight increase	Present	15	15	0	0		45.000a	.000
	Absent	1	1	16	16			
Dry skin	Present	15	15	12	3		26.769[a]	.000
	Absent	1	1	4	13			
Constipation	Present	15	15	3	1		38.000[a]	.000
	Absent	1	1	13	15			

Cochran Q test, BT – Before Treatment, N – Number of subjects

Table 03: Pairwise comparison of diminished sweating, weight increase, dry skin and constipation during therapy

	Parameter	b	c	No change	N	P value
Diminished sweating	BT – 15th day	0	1	15	16	>.012
	15th – 30th day	0	3	13		>.012
	30th – 45th day	0	3	13		>.012
	BT - 45th day	0	7	9		>.012
Weight increase	BT – 15th day	0	0	16		>.012
	15th – 30th day	0	15	1		<.012
	30th – 45th day	0	15	1		<.012
	BT - 45th day	0	15	1		<.012

Dry skin	BT – 15th day	0	0	16		>.012
	15th – 30th day	0	3	13		>.012
	30th – 45th day	0	9	7		<.012
	BT - 45th day	0	12	4		<.012
Constipation	BT – 15th day	0	0	16		>.012
	15th – 30th day	0	12	4		<.012
	30th – 45th day	0	2	14		>.012
	BT - 45th day	0	14	2		<.012

McNemar test, BT – Before treatment, N – number of subjects

Table 04: Comparison of effect of *Vadavanala vati* on hoarseness of voice, impaired hearing, slow movements, delayed ankle reflex, coarse skin and cold skin between four intervals of treatment

		BT	15th day	30th day	45th day	N	Cochran Q	P value
Hoarseness of voice	Present	1	1	1	1	16	No change, no test performed	
	Absent	15	15	15	15			
Impaired hearing	Present	1	1	1	1			
	Absent	15	15	15	15			
Slow movements	Present	13	13	13	13			
	Absent	3	3	3	3			
Delayed ankle reflex	Present	2	2	2	2			
	Absent	14	14	14	14			
Coarse skin	Present	1	1	1	1			
	Absent	15	15	15	15			
Cold skin	Present	5	5	4	3		4.714[a]	>.05
	Absent	11	11	12	13			

Cochran Q test, BT – Before Treatment, N – number of subjects

Table 05: Effect of *Vadavanala vati* on Serum T3, Serum t4 and Serum TSH

Parameters	Mean		Paired difference				
	BT±SD	AT±SD	Mean difference	SD	SE	't' value	'p' value
Serum T3 (ng/dl)	105.5381	110.5175	-4.97937	49.92686	12.481	.399	>.05
Serum T4 (µg/dl)	7.013	7.797	-.7837	1.1695	.29238	-2.681	<.05
Serum TSH (mIU/L)	9.9681	6.3125	3.65563	4.36420	1.09105	3.351	<.05

Paired t test, BT – Before treatment, AT – After treatment, SD – Standard deviation, SE – Standard error, S – Significant

Table 06: Adverse events

Adverse event	n (%)	95% CI	Severity	Casualty	Management	Outcome
Burning sensation in chest and abdomen	2 (10.5%)	1.3- 33.1%	Mild	Related	Withdrawal of trial drug	Resolved
Bleeding per rectum	1 (5.3%)	0.1 – 26.0 %	Mild	Possibly related	Withdrawal of trial drug	Resolved

4. DISCUSSION

Effect of *Vadavanala vati* on biochemical parameters – Serum T3, Serum T4 and Serum TSH

Paired T test was carried out with confidence interval of 95% and normality was tested for the same with Shapiro - wilk test with p≥.05, which showed normal distribution of data. In all the three parameters, mean difference was calculated as BT – AT, hence a negative value in the table indicates an increase in the said parameters after treatment.

Effect of *Vadavanala vati* on Serum T3

Administration of *Vadavanala vati* resulted in increase of Serum T3 by 4.97ng/dl. This may be due to increased production of T3 hormones or due to proper release from thyroglobulin. But increase in the Serum T3 is statistically insignificant with p>.05. The effect size was calculated as; Cohen's d = 0.02 (95% CI -0.51, 0.56), which is negligible. It may be due to deficiency of deiodinase enzyme at the periphery, since deiodinase enzyme is responsible for conversion of T4 into T3 by releasing one molecule of iodine from thyroxine.

Effect of *Vadavanala vati* on Serum T4

There was statistically significant improvement in level of Serum T4 after treatment at p <0.05. Increase in mean T4 was 0.78 µg/dL, effect size was calculated as; Cohen's d = 0.58 (95% CI, 0.15 to 0.99), which is moderate.

Among the hormones secreted by the thyroid gland, 7 percent is triiodothyronine and 93 percent is thyroxine. Thyroxine is converted into triiodothyronine in the tissues. *Vadavanala vati* was found to be effective in increasing the level of Serum thyroxine.

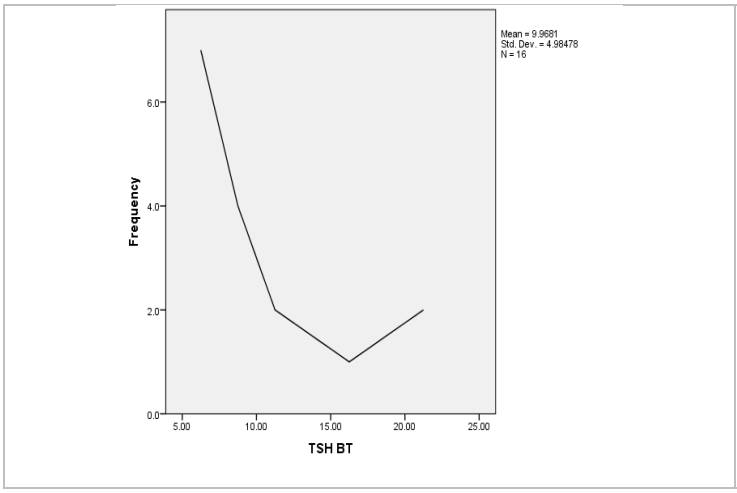
It has *agni dipana* and *pachana* properties which enhances the bioavailability of micronutrients required for the synthesis of thyroxine. It also reduces *srotorodha* (obstruction in metabolic pathways) which promotes endocrinal harmony, correcting the negative feedback mechanism of Hypothalamo- pituitary- thyroid axis. And thus, it may have helped in elevating the Serum T4 levels.

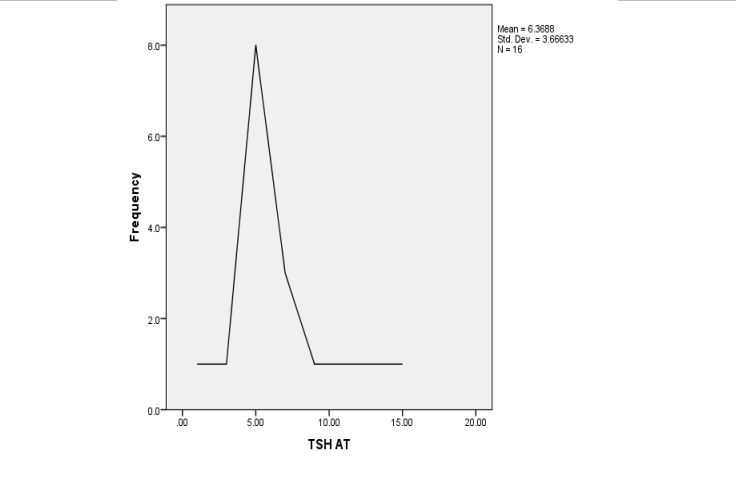
Effect of *Vadavanala vati* on Serum TSH

There was statistically significant improvement on Serum TSH levels after treatment (n=16) with mean of 3.65563 mIU/L (p <0.05). In the exploratory analysis excluding 3 participants on Levothyroxine (n=13), the mean change in Serum TSH was 4.05 mIU/L (p < 0.05) at 95% confidence interval. *Vadavanala vati* helped in increasing the level of thyroid hormones there by reducing the level of Serum TSH through activation of negative feedback mechanism of Hypothalamo-

pituitary-thyroid axis. Effect size was calculated as; Cohen's d = 0.83 (95% CI -5.01 to -2.31), which is large.

Table 7: Table showing line graphs of Serum TSH before and after treatment





Effect of *Vadavanala vati* on signs and symptoms of hypothyroidism

Effect of *Vadavanala vati* on diminished sweating and dryness of skin

Cochran Q test showed statistically significant improvements in diminished sweating after treatment at p <0.05. McNemar test did not show statistically significant improvement at any intervals at p<.012. Bonferroni correction was applied to adjust multiple comparisons. As four McNemar tests were conducted, significance was kept at .012 (.05/4 = .012)

Diminished sweating is caused due to reduced metabolic rates and reduced secretion from the sweat glands. [3] *Sweda kshaya* (diminished sweating) or *aswedana* (absence of sweating) results from *swedavaha* (channels regulating sweating) as well as *medovaha sroto dushti* (channels regulating adipose tissue), as *sweda* (sweating) is *mala* (byproduct) of *medo dhatu* (adipose tissue). *Vadavanala vati* contains drugs like *pippali, chitraka* which by their *ushna* (hot) and *teekshna* (penetrating) properties result in *sweda utpatti* (generation of sweat).

Cochran Q test showed statistically significant improvement on dryness of skin after treatment at p <0.05. McNemar test showed statistically significant improvement on dryness of skin at two intervals i.e., 30^{th} – 45^{th} day and before treatment and 45^{th} day at p<.012

In hypothyroidism, skin is dry and rough. Depletion of T3 results in elevated levels of transglutaminase, which is involved in the formation of cornified envelope. [3]

Twak rukshata (dryness of skin) is one of the *lakshana* (symptom) of *rasa kshaya* (suboptimal tissue), which can be bought about by *rasa dhatvagni mandya* (suboptimal tissue metabolism at the initial tissue). [4] *Kapahavrutha vata* (pathological state of one humor interfering with functions of other) may also lead to *rukshata* (dryness). [5] *Swedalpata* (diminished sweating) also leads to dryness of skin as *sweda* provides *kleda* (moisture) to skin. [6]

Vadavanala vati contains *pippali, pippalimoola, chavya, chitraka* and *nagara* which *have katu rasa* (pungent taste) and *ushna veerya* (hot potency) and does *agni dipana* by doing *srotomukha vishodhana* (opening the obstructed channels). There by resulting in formation of proper *rasa dhatu* and nourishment of *twacha* (skin).

Effect of *Vadavanala vati* on constipation

Cochrane Q showed statistically significant improvement on constipation after treatment at p <0.05. McNemar test showed statistically significant improvement on constipation at two intervals i.e., 15^{th} – 30^{th} day and before treatment and 45^{th} day at p<.012

In Hypothyroidism, there will be reduction in peristaltic movement of intestine and colon which results in constipation. [7] *Jataragni mandya* leads to formation of *ama* (undigested food residue), which leads to *anila moodhata* (impaired movement of *Vata*). [8] The ingredients of *Vadavanala vati* has *agni dipana* property and there by relieve *ama*. The formulation contains *haritaki* and *shunti* which does *anulomana* (restoring right direction). *Pippali moola* and *chavya* has *bhedi* (laxative) properties and *pippali* has *rechana* (purgative) property.

Effect of *Vadavanala vati* on weight increase

Cochrane Q showed statistically significant decrease in weight after treatment at p <0.05. Post hoc test with McNemar showed statistically significant improvement at three intervals at 15^{th} – 30^{th} day, 30^{th} – 45^{th} day and between before treatment and 45^{th} day at p<.012

Weight gain may be understood as a resultant of *agni mandya* at the level of *rasa dhatvagni* and *medo dhatvagni*. *Rasa dhatvagni mandya* results in *rasa dahtu vruddhi* (excess accumulation of tissue) and there by leading to fluid retention. *Medo dhatvagni mandya* (suboptimal metabolism of adipose tissue) results in *medo dhatu vruddhi* (excess accumulation of adipose tissue).

Vadavanala vati contains drugs which does *dhatvagni vriddhi* (improve tissue metabolism) at the level of *rasa* and *medas* owing to their *katu rasa* (pungent) and *ushna veerya*.

Parameters like paresthesia and periorbital puffiness were absent in all the patients.

5. DISCUSSION ON PROBABLE MODE OF ACTION:

Vadavanala vati is a combination of *saindhava, pippali, pippalimoola, chavya, chitraka, nagara* and *haritaki* in increasing proportions. These drugs have properties such as *katu rasa*, *laghu* (light), *ruksha, ushna guna, dipana, pachana, anulomana, rechana, bhedi* actions. Drugs like *haritaki, pippali* have *rasayana* (rejuvenating) property. Most of the drugs are *vata – kaphahara* property. Due to above properties *Vadavanala vati* does *agni dipana* at the level of *koshtha,* relieves *sroto rodha*, improves *agni* at the level of *dhatus.*

Strength and limitations of the study:

Strength:

- Correction of hypothalamo-pituitary -thyroid axis in minimum number of days
- Significant improvement in Serum TSH levels

Limitations:

- Small sample size and per protocol analysis reduces the precision of estimates.
- The concurrent Levothyroxine therapy (n=3) introduces heterogenicity although a sensitivity

analysis excluding these participants produced results consistent with the main analysis.

- Adverse drug reaction noted in three subjects

Scope:

- Increasing the duration of the study to evaluate the effects on Serum T3
- Larger controlled group trials to further validate the results found in this trial.

6. CONCLUSION

Improvement was observed in the management of Primary Hypothyroidism with *Vadavanala vati*, in a dose of 500mg 2 tablets thrice daily before food over a period of 45 days, with minimal adverse effects. Statistically insignificant increase of Serum T3 by 4.97ng/dl and statistically significant improvement in level of Serum T4 (0.78 µg/dL). There was statistically significant improvement on Serum TSH levels after treatment (n=16) with mean of 3.65563 mIU/L ($p < 0.05$). Cochrane Q showed statistically significant decrease in weight after treatment at $p < 0.05$. Post hoc test with McNemar showed statistically significant improvement.

Authors Details:

[1*]Assistant professor, Department of Kayachikitsa, SDM College of Ayurveda, Udupi, Karnataka

[2]Professor & Vice principal, Patanjali Ayurved College, Haridwar, Uttarakhand

Authors Contribution:

Conceptualization and clinical management: MKA

Data collection and literature search: MKA

Writing – original draft: MKA

Reviewing & editing: GKJ

Approval of final manuscript: All authors

Declaration of Generative AI

The authors declare this manuscript was written without the use of generative artificial intelligence tools. All the content, including text generation, data analysis and references was developed and reviewed by the author without assistance from AI technologies.

Conflict of Interest – The authors declare no conflicts of interest.

Source of Support – The authors declare no source of support.

Additional Information:

Authors can order reprints (print copies) of their articles by visiting: https://www.akinik.com/products/2281/journal-of-ayurveda-and-holistic-medicine-jahm

Publisher's Note:

Atreya Ayurveda Publications remains neutral with regard to jurisdictional claims in published maps, institutional affiliations, and territorial designations. The publisher does not take any position concerning legal status of countries, territories, or borders shown on maps or mentioned in institutional affiliations.

REFERENCES:

1. Unnikrishnan A, Bantwal G, John M, Kalra S, Sahay R, Tewari N. Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. Indian Journal of Endocrinology and Metabolism [Internet]. 2013;17(4):647. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3743364/ DOI: 10.4103/2230-8210.113755
2. Kalra S, Goyal A, Khandelwal S. Clinical scoring scales in thyroidology: A compendium. Indian Journal of Endocrinology and Metabolism [Internet]. 2011 [cited 2019 Sep 10];15(6):89. Available from:DOI: 10.4103/2230-8210.83332 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3169861/
3. Safer JD. Thyroid hormone action on skin. Dermato-endocrinology [Internet]. 2011 Jul 1;3(3):211–5. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3219173/ DOI: 10.4161/derm.3.3.17027
4. Paradakara HS (editor). Ashtanga Hrudaya of vagbhata, Sutrasthana, chapter 11, verse no.16. Reprint edition. Varanasi; Chukhamba Surbharati Prakashan; 2013;185
5. Yadavji Trikamji (editor). Charaka Samhita of Charaka, Chikitsa Sthana, chapter 28, verse no. 63. Reprint edition, Varanasi; Chaukhamba Prakashan;2013;619

6. Paradakara HS (editor). Ashtanga Hrudaya of Vagbhata, Sutrasthana, chapter 11, verse no.5. Reprint edition. Varanasi; Chaukhamba Surabharathi Prakashan;2013;183
7. Daher R, Yazbeck T, Jaoude JB, Abboud B. Consequences of dysthyroidism on the digestive tract and viscera. World Journal of Gastroenterology. 2009;15(23):2834. DOI: 10.3748/wjg.15.2834
8. Paradakara HS (editor). Ashtanga Hrudaya of Vagbhata, Sutrasthana, chapter 13, verse no.23. Reprint edition. Varanasi; Chaukhamba Surabharathi Prakashan;2013;21