



Research Article

A comparative clinical study to evaluate the efficacy of *Deepa Ghrita* and *Ashtamangala Ghrita* in the management of ADHD (*Vataja Unmada*) in children

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Abstract

Attention deficit hyperactivity disorder (ADHD) is most common neurobehavioral disorder in childhood, the prevalence of ADHD was 11.3% in children. ADHD is characterized by developmentally inappropriate motor hyperactivity, inattention and impulsiveness leading to impairment at home and school. Aim & Objectives: The main aim of the present study is to evaluate the effect of *Deepa Ghrita* over *Ashtamangala Ghrita* in the management of ADHD (*vataja unmada*) in children. Materials and Methods: A clinical study with total number of 40 children diagnosed with ADHD were selected and randomly allocated into two groups in each 20, were Group A *Deepa Ghrita* and Group B *Ashtamangalaghrita* were administered orally for 30 days. Observation& Results: Statistically there is highly Significant difference in mean of all parameter of Group A and Group B. Group A had slightly more subjects in the moderate response category whereas Group B had greater proportion of subjects in mild response category. But overall assessment in mean value of group A had better improvement than Group B. Discussion: ADHD can be considered as *vataja unmada*, so the treatment and selection of drug is based on *Vataharachikista*. *Deepa ghrita* having *Medhya*, *rasayana*, *Deepana*, *pachana*, *vata hara* properties and *Ashtamangalaghrita* is taken as standard drug in control group for ADHD. Conclusion: Statistically both the group shows moderate result. But clinically more eminent outcome is observed in Group A compare to Group B. The treatment modality is safe since no adverse effects of the therapy were observed during the study. An increasing concentration power, memory, attention capacity and reduced hyper activity were observed in the present study.

Keywords: Attention deficit hyperactivity disorder, ADHD, *Deepa Ghrita*, *Ashtamangalaghrita*, *Vataja unmada*, Ayurvedic management, Children

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Introduction

Attention deficit hyperactivity disorder is most common neurobehavioral disorder in childhood characterized by inattention including distractibility and difficulty in sustaining attention, poor impulse control, decreased self- inhibitory capacity, motor overactivity and motor restlessness (1).

Its prevalence across the globe 9.8 % from 2016-2019, it includes 3-5 years 2%, 6-11 years 10%, 12-17 years 13% of children (2) and in India is about 2-17% of children(3)and its incidence is common in males than females.

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ADHD often co-occurs with other emotional, behavioural, language and learning disorders. Treatment includes psychosocial treatment, behavioural management, medication includes psychostimulant drugs, antidepressant drugs which are not much effective and has various side effects such as headache, anorexia, abdominal pain, seizure, sedation and depression(4).

The clinical features mentioned in *vataja unmada* of Ayurvedic literature are more or less similar to that of ADHD like constant wondering, riding undesirable vehicles, constant and incoherent speech and laughing, smiling, dancing, singing, moving limbs of the body in inappropriate situation(5).

In Ayurvedic classics various treatments mentioned in the management of *unmada* like *snehana*, *swedana*, *mrudushodhana*, *bastikarma* etc. Among them *snehapana* is the main stay of treatment in the management of *vataja unmada*(6). Hence the drug been selected in the form of *ghrita*, for which *Deepa Ghrita*(7) has been selected to prove its clinical efficacy in the management of ADHD.

Even in the recent researches includes ketogenic diet is one of the integral protocol in the management of ADHD(8), ketogenic diet may also influence neuronal plasticity by modifying neural circuits and cellular properties to normalize functions of mitochondrial dysfunction and it may be relevant in some mental disorders including schizophrenia, ASD and ADHD.

Where *Ghrithas* mentioned in Ayurveda not only having ketogenic effect but also having *medhya*, *sangnastapana*, *deepana* and *pachana* properties, hence this concept is considered to prove its efficacy in the management of ADHD. So far few researches have been done on the effect of *sneha* in ADHD, but *Deepa ghrita* not been proven yet.

Hence the present study has been taken to evaluate the efficacy of *Deepa Ghrita* in the management of ADHD and which will be compared with *AshtamangalaGhrita*(9), which was proved to be effective in the management of ADHD.

The main objective of the present study is to evaluate the effect of *Deepa Ghrita* over *AshtamangalaGhrita* in the management of ADHD (*vataja unmada*) in children.

Materials and Methods

Research Design

The research design set for the present study is an open label randomized control clinical trial.

Composition of Drug

Sample Size: A minimum of 40 patients were selected and were distributed into group A and Group B respectively after satisfying the inclusion criteria.

Source of Data

A) Literary source

Review of Literature

The literary aspects of *vataja unmada* was collected from Ayurveda classics, textbooks and ADHD was reviewed from modern textbooks, authenticated journals and internet sources.

Drug review

1. *Deepa ghrita* from *Harita samhita* 18th chapter- *Mrigaaadi roga adhyaya*.

2. *Ashtamangalaghrita* from *Bhaisajya Ratnavali* - *Balarogadikara adhyaya*.

B) Drug source

The study formulations were collected and authenticated with the assistance of Dravyaguna experts. The trial formulations were prepared in the GMP certified pharmacy following standard operating procedures. Physicochemical analysis of the drugs was carried out in the the AYUSH-approved Analytic lab at Rajiv Gandhi educational Society's Ayurvedic Medical College and Research Centre, Ron, Karnataka.

Table 1: Composition of Deepa Ghrita (10)

S.NO	DRUG	BOTANICAL NAME	PART USED	QUANTITY
1	<i>Rasna</i>	<i>Pluchea lanceolata</i> [C.B.clarke]	<i>Patra</i>	2 parts
2	<i>Pippalimula</i>	<i>Piper longum</i> [Linn]	<i>Moola</i>	2 parts
3	<i>Bilva</i>	<i>Aegles marmelos</i> [Linn]	<i>Phala</i>	2 parts
4	<i>Agnimantha</i>	<i>Premna integrifolia</i> [Linn]	<i>Moola</i>	2 parts
5	<i>Gambhari</i>	<i>Gmelina arborea</i> [Linn]	<i>Moola</i>	2 parts
6	<i>Syonaka</i>	<i>Aroxylum indicum</i> [Linn]	<i>Moola</i>	2 parts
7	<i>Patola</i>	<i>Stereosprum sauvealens</i>	<i>Moola</i>	2 parts
8	<i>Bruhati</i>	<i>Solanum indicum</i>	<i>Moola</i>	2 parts
9	<i>Salaparni</i>	<i>Desmodium gangeticum</i> [Linn]	<i>Moola</i>	2 parts
10	<i>Prishnaparni</i>	<i>Uraria picta</i> [Desv]	<i>Moola</i>	2 parts
11	<i>Kantakari</i>	<i>Solanum surattense</i>	<i>Moola</i>	2 parts
12	<i>Goksura</i>	<i>Tribulus terrestris</i>	<i>Phala</i>	2 parts
13	<i>Shatavari</i>	<i>Asparagus racemosus</i>	<i>Tuberous roots</i>	2 parts
14	<i>Chana</i>	<i>Cicer arietinum</i>	<i>Bija</i>	2 parts
15	<i>Trivrt</i>	<i>Operculina turpethum</i>	<i>Moola</i>	2 parts
16	<i>Eranda</i>	<i>Ricinus communis</i> [Linn]	<i>Moola</i>	2 parts
17	<i>Yashtimadhu</i>	<i>Glycyrrhiza glabra</i> [Linn]	<i>Moola</i>	1 part
18	<i>Mrudhika</i>	<i>Vitis vinifera</i> [Linn]	<i>Phala</i>	1 part
19	<i>Shankapushpi</i>	<i>Convolvulus pluricaulis</i> [Chois]	<i>Moola</i>	1 part
20	<i>Manjistha</i>	<i>Rubia cardifolia</i> [Linn]	<i>Moola</i>	1 part
21	<i>Dalchini</i>	<i>Cinnamomum zeylanicum</i>	<i>Twak</i>	1 part
22	<i>Elayachi</i>	<i>Elettaria cardamomum</i>	<i>Ela</i>	1 part
23	<i>Teja patra</i>	<i>Cinnamomum tamala</i>	<i>Patra</i>	1 part
24	<i>Lajjalu</i>	<i>Mimosa pudica</i> [Linn]	<i>Moola</i>	1 part
25	<i>Kushta</i>	<i>Saussurea lappa</i> [C.B. clark]	<i>Moola</i>	1 part
26	<i>Shruthakam</i>	Cow's milk		
27	<i>Grita</i>	Clarified butter		

Table 2: Composition of Ashtamangala Ghrita(10)

S.NO	DRUG	BOTANICAL NAME	PART USED	QUANTITY
1	<i>Brahmi</i>	<i>Bacopa monneri</i> [Linn]	Moola	1 part
2	<i>Vacha</i>	<i>Acorus calamus</i> [Linn]	Rhizome	1 part
3	<i>Pippali</i>	<i>Piper longum</i> [Linn]	Moola	1 part
4	<i>Sariva</i>	<i>Hemidismus indicus</i> [R.Br]	Moola	1 part
5	<i>Kustha</i>	<i>Psaurusialeppa</i> [C.B.Clark]	Moola	1 part
6	<i>Sarsapa</i>	<i>Brassica campestris</i>	Beeja	1 part
7	<i>Saindavalavana</i>	Rock salt		
8	<i>Ghrita</i>	Clarified butter		

Plan of the study**Table 3: Plan of the study**

GROUPS	GROUP A Trial group	GROUP B Control group
Sample size	20	20
Internal medicine	<i>Deepa Ghrita</i>	<i>Astamangala Ghrita</i>
Dose (11)	The dose of the <i>Ghrita</i> was calculated based on the age of the childlike at the age of 1 year the dose was 1.5 gm and each successive year 1gm is increased upto the age of 16 years.	The dose of the <i>Ghrita</i> was calculated based on the age of the childlike at the age of 1 year the dose was 1.5 gm and each successive year 1gm is increased upto the age of 16 years.
Time of administration	Half an hour before food, twice in a day	Half an hour before food, twice in a day.
<i>Anupana</i>	<i>Sukoshnaja</i>	<i>Sukoshnaja</i>
Duration	30 days	30 days
Assessment time line	Day 1 th -Before treatment Day 30 th -After treatment Day 60 th - Fallow up day	Day 1 th -Before treatment Day 30 th -After treatment Day 60 th -Fallow up day

Diagnostic Criteria

Children with ADHD was diagnosed based on DSM-V Diagnostic criteria(12) which was included Symptoms of Inattention-Hyperactivity-Impulsivity.

Inclusion Criteria

Children were included in the study after obtaining written informed consent (parental acceptance) from their parents or legal guardian.

Exclusion Criteria

ADHD in children associated with other behavioural disorders like autism spectrum disorder, intellectual disability, learning disability, seizures and other systemic disorders were excluded.

Assessment Criteria

Outcome assessment was done before, after treatment and after follow up.

1.The swan rating scale for ADHD(13): consists of 18 parameters of assessment of the attention of the children. Each parameter is rated in 0-3 scale and the total score obtained was noted before treatment (0th day), after treatment (30th day) and on follow up day (60th day) in the following manner.

Table 4: SWAN rating score before and after treatment

Parameter	Before Treatment(1 st day)	After treatment(30 th	Fallow up day (60 th day)
SWAN RATING			

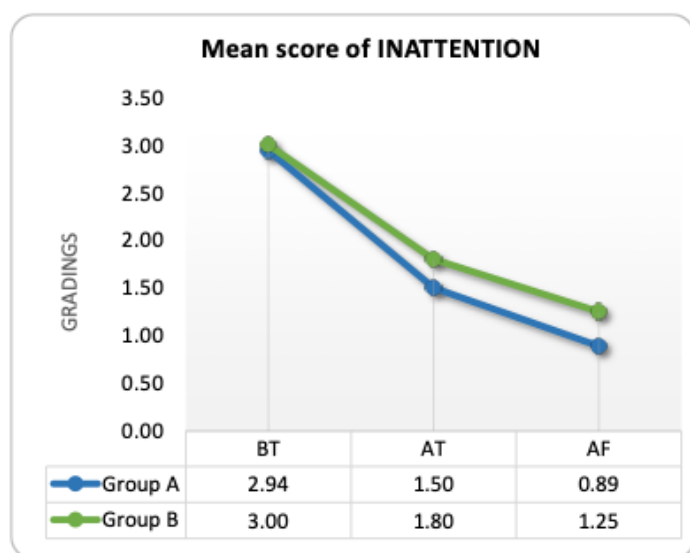
Statistical Analysis

A detailed proforma was prepared and assessment was done based on gradation given for the parameter, then the data were analysed by using Wilcoxon signed rank test, Mann Whitney U test.

Results**Effect of treatment within GROUP A on Inattention**

The statistical analysis of the treatment effect for each paired observation within Group A on Inattention are presented in Table. In the treatment pair of BT (Before Treatment) and AT (After Treatment), the mean score for Inattention are; 2.94 ± 0.24 and 1.50 ± 0.51 units respectively. This indicates mean difference of 1.44 with a notable 49% of reduction in Inattention between BT and AT. The Wilcoxon Signed Rank Test results show sum of ranks (+R) = 171 with Z-score of 3.84 and a p-value of which is <0.001 indicating, a highly significant reduction in Inattention.

Similarly, Inattention mean score for AF (After Follow-up) value is 0.89 ± 0.32 units. The paired comparison between BT and AF demonstrating mean difference of 2.05 with a substantial 70% of reduction. The Wilcoxon Signed Rank Test results reveal sum of ranks (+R) = 171 with Z-score of 4.15 and a p-value of 0.00 which is <0.001 indicating, a highly significant reduction in Inattention. Next, If the paring is done between AT and AF that give us mean difference of 0.61 with a reflecting 21% of reduction. The Wilcoxon Signed Rank Test results give sum of ranks (+R) = 66 with Z-score of 3.32 and a p-value of S which is <0.001 indicating, a highly significant reduction in Inattention during AT and AF stage.

Figure 1: Mean score of Attention**Effect of treatment within GROUP B on Inattention**

The statistical analysis of the treatment effect for each paired observation within Group B on Inattention are presented in Table. In the treatment pair of BT (Before Treatment) and AT (After Treatment), the mean score for Inattention values are; 3.00 ± 0.00 and 1.80 ± 0.41 units respectively. This indicates mean difference of 1.2 with a notable 40% of reduction in Inattention between BT and AT. The Wilcoxon Signed Rank Test results show sum of ranks (+R) = 210 with Z-score of 4.18 and a p-value of which is <0.001 indicating, a highly significant reduction in Inattention.

Similarly, the Inattention mean score for the AF (After Follow-up) value is 1.25 ± 0.55 units, demonstrating mean difference of 1.75 with a notable 58% of reduction in paired comparison between AF and BT. The Wilcoxon Signed Rank Test results reveal sum of ranks (+R) = 210 with Z-score of 4.06 and a p-value of 0.00 which is <0.001 indicating, a highly significant reduction in Inattention. Next, If the paring is done between AT and AF that give us mean difference of 0.55 with a reflecting 18% of reduction. The Wilcoxon Signed Rank Test results give sum of ranks (+R) = 66 with Z-score of 3.32 and a p-value of 0.001 which is <0.001 indicating, a highly significant reduction in Inattention during AT and AF stage.

Comparisons Between Groups A with B in Inattention**Table 5: Comparison between Group A and B In inattention**

Observations Recorded on	Descriptives		Mean Difference & (Effect % Diff. from pre stage)	Mann-Whitney U		Test Statistics		
	Group	Mean Score $\pm$ SD		Sum of Ranks	U Statics	Z	P	Remarks
AT	A (n=18)	1.56 ± 0.51	0.29 (9.7%)	298.0	127	1.97	0.049 (<0.05)	MS
	B (n=20)	1.85 ± 0.37		443.0				
AF	A (n=18)	1.11 ± 0.47	0.39 (13.0%)	286.0	115	2.26	0.024 (<0.05)	MS
	B (n=20)	1.50 ± 0.51		455.0				

NS - Non-Significant; MS - Moderately Significant; S - Significant; HS - Highly Significant.

This table involves comparisons between GROUP A and GROUP B concerning the Inattention variable. The Mann-Whitney U Test, for independent groups, was used to assess the differences between the two groups.

The comparison of After Treatment (AT) observations, the mean difference between Groups A and B is 0.3, and individual groups effect percentage difference reflecting 9.0%. The sum of ranks for

Group-A is 297 and for Group-B is 444. The test statistic (U) is calculated as 126, and the corresponding Z-value is 1.92. The p-value for this comparison is reported as 0.055, denoting a statistically No-Significant difference between the two groups in terms of Inattention reduction After Treatment (AT) period.

The comparison of Follow-up (AF) observations, the mean difference between Groups A and B is 0.36, and individual groups effect percentage difference from previous stage reflecting 11.4%. The sum of ranks for Group-A is 292 and for Group-B is 449. The calculated test statistic (U) is 121, and the associated Z-score is 2.32. The p-value for this comparison is 0.02, indicating that there is a statistically Moderately Significant difference between the two groups in terms of Inattention reduction after Follow-up (AF) period. Based on the mean values we can say that GROUP A in reduction is statistically Moderately Significantly better than GROUP B.

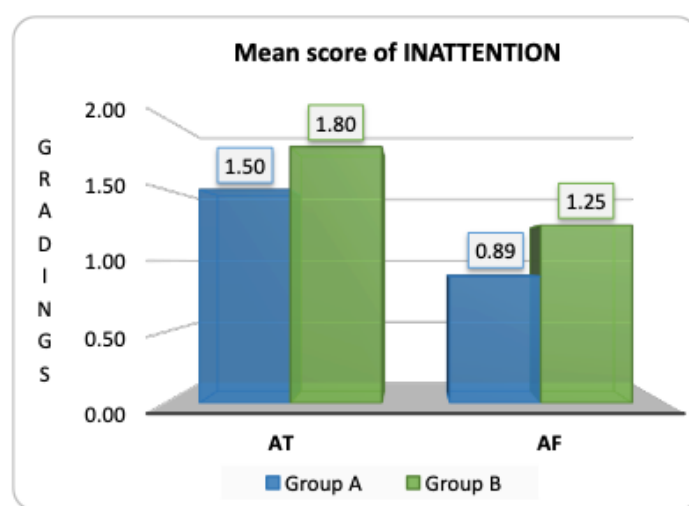
Figure 2: Mean score of Inattention**Effect of treatment within GROUP A on Hyperactivity and Impulsivity.**

Table6: Effect of treatment within the GROUP A on HYPERACTIVITY AND IMPULSIVITY									
Descriptives				Wilcoxon Signed Ranks for Total sample n = 18		Test Statistics			
Paring BTwith AT	Mean Score $\pm$ SD	Mean diff.	Change in %			Z	P	Remarks	
BT	3.00 $\pm$ 0.00	1.44	48%	+R (BT>AT) [n=18] Sum of Ranks =171		3.84	(<0.001)	HS	
AT	1.56 $\pm$ 0.51			Ties (BT=AT)[n=0] - R (BT<AT)[n=0]					
Paring BT with AF		1.89	63%	+R (BT>AF) [n=18] Sum of Ranks =171		3.94	(<0.001)	HS	
AF	1.11 $\pm$ 0.47			Ties (BT=AF)[n=0] - R (BT<AF)[n=0]					
Paring AT with AF		0.45	15%	+R (AT>AF) [n=8] Sum of Ranks =36		2.83	0.005 (<0.01)	S	
NS - Non-Significant; MS - Moderately Significant; S - Significant; HS - Highly Significant.									

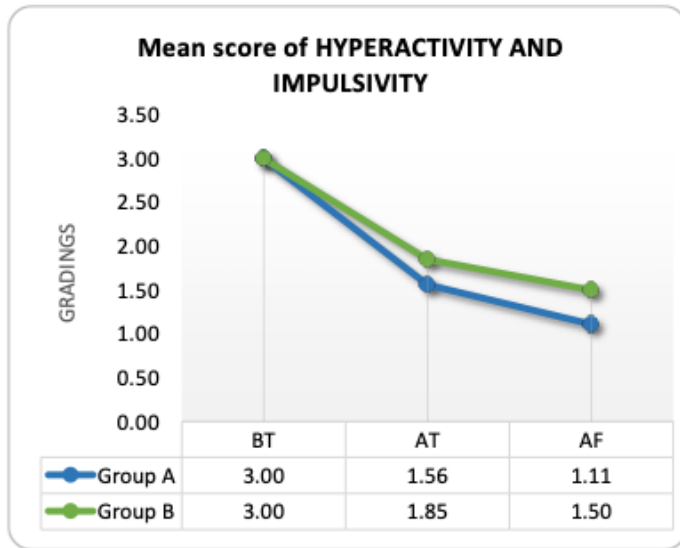
NS - Non-Significant; MS - Moderately Significant; S - Significant; HS - Highly Significant.

The statistical analysis of the treatment effect for each paired observation within Group A on Hyperactivity and Impulsivity are presented in Table. In the treatment pair of BT (Before Treatment) and AT (After Treatment), the mean score for Hyperactivity and Impulsivity are; 3.00 ± 0.00 and 1.56 ± 0.51 units respectively. This indicates mean difference of 1.44 with a notable 48% of reduction in Hyperactivity and Impulsivity between BT and AT. The Wilcoxon Signed Rank Test results show sum of ranks (+R) = 171 with Z-score of 3.84 and a p-value of which is <0.001 indicating, a highly significant reduction in Hyperactivity and Impulsivity.

Similarly, Hyperactivity and Impulsivity mean score for AF (After Follow-up) value is 1.11 ± 0.47 units. The paired comparison between BT and AF demonstrating mean difference of 1.89 with a

notable 63% of reduction. The Wilcoxon Signed Rank Test results reveal sum of ranks (+R) = 171 with Z-score of 3.94 and a p-value of which is <0.001 indicating, a highly significant reduction in Hyperactivity and Impulsivity. Next, If the paring is done between AT and AF that give us mean difference of 0.45 with a reflecting 15% of reduction. The Wilcoxon Signed Rank Test results give sum of ranks (+R) = 36 with Z-score of 2.83 and a p-value of 0.005 which is <0.01 indicating, a significant reduction in Hyperactivity and Impulsivity during AT and AF stage.

Figure 3: Mean score of Hyperactivity and Impulsivity



Effect of treatment within GROUP B on Hyperactivity and Impulsivity.

The statistical analysis of the treatment effect for each paired observation within Group B on Hyperactivity and Impulsivity are presented in Table. In the treatment pair of BT (Before Treatment) and AT (After Treatment), the mean score for Hyperactivity and Impulsivity values are; 3.00 ± 0.00 and 1.85 ± 0.37 units respectively. This indicates mean difference of 1.15 with a reflecting 38% of reduction in Hyperactivity and Impulsivity between BT and AT. The Wilcoxon Signed Rank Test results show sum of ranks (+R) = 210 with Z-score of 4.23 and a p-value of 0.00 which is <0.001 indicating, a highly significant reduction in Hyperactivity and Impulsivity.

Similarly, the Hyperactivity and Impulsivity mean score for the AF (After Follow-up) value is 1.50 ± 0.51 units, demonstrating mean difference of 1.5 with a notable 50% of reduction in paired comparison between AF and BT. The Wilcoxon Signed Rank Test results reveal sum of ranks (+R) = 210 with Z-score of 4.04 and a p-value of 0.00 which is <0.001 indicating, a highly significant reduction in Hyperactivity and Impulsivity. Next, If the paring is done between AT and AF that give us mean difference of 0.35 with a reflecting 12% of reduction. The Wilcoxon Signed Rank Test results give sum of ranks (+R) = 28 with Z-score of 2.65 and a p-value of 0.008 which is <0.01 indicating, a significant reduction in Hyperactivity and Impulsivity during AT and AF stage.

Comparisons Between Groups A with B in Hyperactivity and Impulsivity.

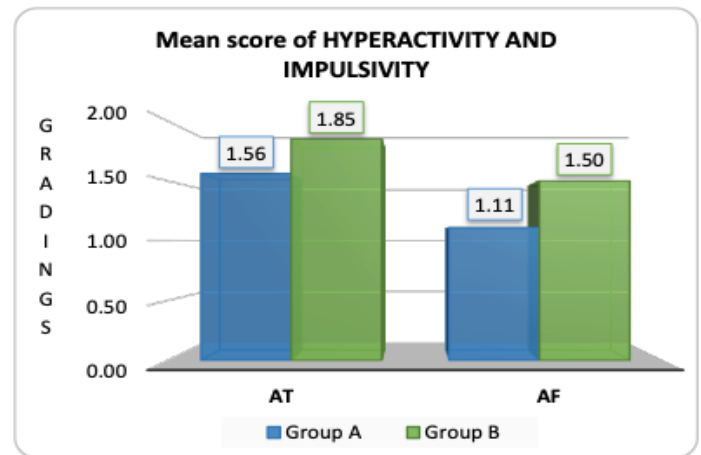
This table involves comparisons between GROUP A and GROUP B concerning the Hyperactivity and Impulsivity variable. The

Mann-Whitney U Test, for independent groups, was used to assess the differences between the two groups.

The comparison of After Treatment (AT) observations, the mean difference between Groups A and B is 0.29, and individual groups effect percentage difference reflecting 9.7%. The sum of ranks for Group-A is 298 and for Group-B is 443. The test statistic (U) is calculated as 127, and the corresponding Z-value is 1.97. The p-value for this comparison is reported as 0.049, denoting a statistically Moderately Significant difference between the two groups in terms of Hyperactivity and Impulsivity reduction After Treatment (AT) period.

The comparison of Follow-up (AF) observations, the mean difference between Groups A and B is 0.39, and individual groups effect percentage difference from previous stage reflecting 13.0%. The sum of ranks for Group-A is 286 and for Group-B is 455. The calculated test statistic (U) is 115, and the associated Z-score is 2.26. The p-value for this comparison is 0.024, indicating that there is a statistically Moderately Significant difference between the two groups in terms of Hyperactivity and Impulsivity reduction after Follow-up (AF) period.

Figure 4: Mean Score of Hyperactivity and Impulsivity



Based on the mean values we can say that GROUP A in reduction is statistically Moderately Significantly better than GROUP B.

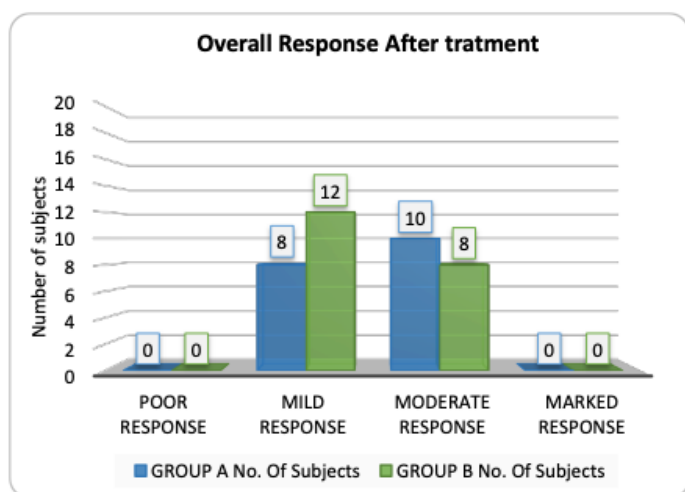
Overall Response After treatment

The data presented compares the overall response rates to a treatment between two groups, Group A and Group B, with each group consisting of 20 subjects. Here are the key findings:

Overall, the distribution of responses shows that both groups had differences in outcomes, with a significant proportion of subjects in both the mild and moderate response categories. Group A had slightly more subjects in the moderate response category whereas Group B had greater proportion of subjects in mild response category based on results.

Table 9:Overall Response After treatment					
Response Rate	Response	GROUP A		GROUP B	
		No. Of Subjects	%	No. Of Subjects	%
(0%-25%)	Poor Response	0	0%	0	0%
(25%-50%)	Mild Response	8	44%	12	60%
(50%-75%)	Moderate Response	10	56%	8	40%
(75%-100%)	Marked Response	0	0%	0	0%
Total		18	100%	20	100%

Figure 5: Overall response after treatment



Overall Response After Follow-Up

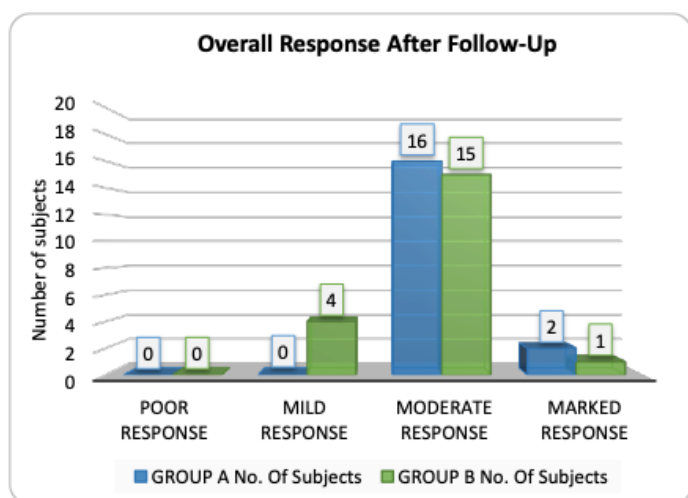
The follow-up data illustrates the overall response rates to a treatment in both Group A and Group B, with each group consisting of 20 subjects. Here are the findings:

Overall, the follow-up data shows that Group A and Group B have some differences in response distributions. Group A had no subjects in the mild response category whereas Group B had fewer subjects. Then Group A had slightly higher proportion in the moderate response category compared to Group B. Additionally, while Group A had a higher percentage of marked responses, Group B had a larger proportion of mild responses.

Table 10: Overall Response Follow-Up

Response Rate	Response	GROUP A		GROUP B	
		No. Of Subjects	%	No. Of Subjects	%
(0%-25%)	Poor Response	0	0%	0	0%
(25%-50%)	Mild Response	0	0%	4	20%
(50%-75%)	Moderate Response	16	89%	15	75%
(75%-100%)	Marked Response	2	11%	1	5%
Total		18	100%	20	100%

Figure 6: Overall response after follow up



Discussion

Discussion on probable mode of action of drug

Medhya dravyas are explicit group of drugs described in Ayurveda for promotion of mental health and management of various psychological and psychosomatic problems. It acts as Nootropic agent which promotes learning acquisition and memory, which decreases the actions of amnesic agents and also results in positive effect on higher mental functions.

The mode of action of the drug may be, up to certain extent, understood on the basis of *Rasa – Panchaka*.

Rasna, Pippalimula, Bilva, Agnimantha, Syonaka, Brhati, Kantakari, Eranda, Ela, Kusta, Gambhari, Goksura, Satavari, Dalchini Drugs are *Vata kapha shamaka*. Since ADHD in Ayurveda is apparently similar to the condition *Anavashitachitta*, which is one of the *Vata nanatmajavyadhi*, the drug by its *Vata shaman* property may help in alleviating the symptoms of ADHD. *Kapha shamaka* property of the drug helps in breaking the *Srotorodha* and digestion of *Ama*, which leads to the proper functioning of the body as well as brain.

Rasna, Bilva, Agnimantha, Gambhari, Patola, Brhati, kantakari, Trivrit, Sankhapushi, Lajjalu, Kushta drugs having **Tikta rasa pradana**. *Tikta rasa* is having **medhya property**. i.e. it improves higher mental functions. *Tikta rasa* by virtue of its *Aakasha* and *Vayu Mahabhutas*, *Laghu Guna*, *Dipana*, *Pachana* and *Sroto Visodhana Karma* acts as *Medhya*. Since *akashmahabhuta* is the element that carries the properties of *satvaguna* (mental humour responsible for clarity) the most, *tikta rasa* is expected to improve mental function and helps in correcting *sadhaka pitta* which is responsible for *medha* and *buddhi* and it **pacifies kapha and pitta dosha**.

Syonaka, Salaparni, Prsniparni, Goksura, Satavari, Eranda, Yastimadhu, Manjista, Ela, Dalchini, Kushta drugs having **Madhura rasa** *Pacifies vata pitta dosha* and acts as **Shadindriyaprasadakar** have a direct effect over the site of the *indriyas* i.e. *shiras*. *Medhya, Dhātu vardana, ojavardana*.

Goksura, Satavari, Eranda, Yastimadhu, Sankapushpi, Ela, Lajjalu drugs having **Sheetaveerya** which **pacifies pitta dosha** acts as *jeevaniya* and *balya* also *sheetaveeryatmaka* drugs are responsible for *dharana shakti* which helps to overcome the forgetful nature in ADHD children (14).

Pippalimula, salaparni, goksura, satavari, yastimadhu, Gambhari, sankapushpi having *rasayana* and **Medhya properties** act as neuroprotective and helps in improvement in memory enhancement and learning.

Vacha, pippali, manjista, yastimadhu, shankapushpi have a Anti oxidant and neuroprotective effects.

Bilva having neuroprotective activity (15), **Bhrigat** having CNS depressant activity (16), **SATAVARI** Antidepressant activity (17), **SANKHAPUSHPI** neuroprotective activity, Memory enhancing (18) **YASTIMADHU** Memory-strengthening activity and antioxidant activity and acts as brain tonic. (19) **VACHA** Antidepressant activity memory-enhancing activity (20)

Ghritha which is a lipid media helps the drug easily cross blood brain barrier there by reaching the CNS. *Deepa Ghrita* alleviates all the tridoshas mainly **vata pitta dosha**. Because *vata pitta* are the main doshas involved in Pathophysiology of ADHD and even *kapha* involved for some extent. So by virtue of the action of drug

Deepa Ghrita is beneficial in ADHD, moreover *Deepa Ghrita* is described as *unmada*, *apasamara hara*. Hence by all these properties *Deepa Ghrita* found to be beneficial in reducing the Hyperactivity, increases the memory, concentration and attention hence it is effective in the management of ADHD. Even in the recent researches includes ketogenic diet is one of the integral protocol in the management of ADHD, ketogenic diet may also influence neuronal plasticity by modifying neural circuits and cellular properties to normalize functions of mitochondrial dysfunction and it may be relevant in some mental disorders including schizophrenia, ASD and ADHD(21). The strongest experimental evidence currently comes from animal studies. In a spontaneously hypertensive rat (SHR) model of ADHD demonstrated that a ketogenic diet significantly improved ADHD-like behaviours compared with a normal diet. The ketogenic intervention increased cerebral concentrations of serotonin (5-HT), norepinephrine (NE), acetylcholine (ACh), and cyclic AMP, while upregulating proteins involved in dopaminergic signaling, including dopamine receptor D1 (DRD1), dopamine transporter (DAT), protein kinase A (PKA), and DARPP-32. Furthermore, ketogenic feeding significantly increased gut microbial richness and altered the abundance of beneficial genera such as *Bifidobacterium*, *Bacteroides*, *Blautia*, and *Ruminococcus*, suggesting that modulation of the microbiota-gut-brain axis may contribute to behavioural improvement(22). In Ayurveda too various researches have been done so far like Sirodhara, Nasya and Vasti and various medhya ghrithas and they have shown some satisfactory improvements in symptom reductions of ADHD.

The *Deepa Ghrita* is fat rich and low carb source like ketogenic diet, and *ghrita* along with the nootropic (*medhya*) drugs like *yastimadhu*, *pippalimula*, *shankapushpi*, *manjista*, *salaparni*, *shatavari* etc might fulfilled nutritional requirement as well as showed its effect in CNS.

The gastrointestinal tract has a nervous system all of its own called the "Enteric nervous system" or the "Gut brain". The number of neurons in this enteric system is almost equal to the number in the entire spinal cord. Enteric nervous system normally communicates with central nervous system through the parasympathetic system (via vagus nerve) and sympathetic (eg; via pre vertebral ganglia) nervous system and the gastrointestinal tract also receives a plentiful supply of afferent nerve fibres, through the vagus nerves and spinal afferent pathways. Thus, there is a rich interaction, in both directions, between the enteric nervous system, sympathetic prevertebral ganglia and the CNS ENS system as the capacity to alter its response depending on factors such as bulk and nutrient composition. Thus, *Deepa Ghrita* when administered may stimulate the sensory system due to the chemical composition. As the total nervous system is interrelated so this regular stimulation on ENS has positive effect over CNS also.

GUT MICROBE These are known as Gastro entero pancreatic (GEP) endocrine system composed of specialized enteroendocrine and enterochromaffin cells that produces numerous peptide hormones and biogenic amines. These cells function as sensory transducers and communicate with the enteric and central nervous systems, leading to their description as paraneurons or neuroendocrine cells(23)

When medicated Ghrita are passed through the GIT tract probably stimulate the cells and act as Secretagogues thus compensating neurological deficit and improving the functions(24). Although this mechanism is strongly supported by gut-brain axis research, direct experimental evidence demonstrating this pathway

specifically for Medhya Ghrita is currently lacking and warrants further investigation.

Conclusion

ADHD is one of the most prevalent neurodevelopmental disorders of childhood, affecting approximately 5-11% of children worldwide, with reported prevalence ranging from 2-17% in India. The disorder significantly impairs attention, executive functioning, academic performance, behaviour and social interactions, thereby imposing a considerable burden for the affected children, and even on their families and health care systems. Although current conventional pharmacotherapy remains mainstay of treatment, concern regarding adverse effects, long term medication adherence, and the need for holistic management have increased interest in evidence based ayurvedic interventions along with existing occupational therapies and behavioural therapies. The clinical features mentioned in *vataja unmada* of Ayurvedic literature are more or less similar to that of ADHD. In Ayurvedic classics various treatments mentioned in the management of *unmada*. Among them *Snehapana* is the main stay of treatment in the management of *vataja unmada*. *Deepaghritha* in *Harita samhita* - *mrigadirogaadhyaya* mentioned as *unmada* and *apasamra hara* having properties of *Deepana*, *pachana*, *vata pitta hara*, *rasayana*, *Medhya*.

Asthamangalaghritha mentioned in *Bhaisajya Ratnavali* in *Balarogaadhikar* contains various properties like *kshipra-medhakarak*, *druddha-smritikarak*, and *graham-badanasa*.

The present study was undertaken to evaluate the efficacy of *Deepa Ghrita* in comparison with the established formulation *Asthamangala Ghrita* in the management of ADHD (*Vataja Unmada*) in children. In the present study 40 clinically diagnosed children of ADHD were allocated randomly in two groups and treated for 30 days, with assessment performed using the SWAN rating Scale before treatment, after treatment and following a 30 days follow up. The primary objective was to understand that whether *Deepa Ghrita* would provide superior or equalling improvement in the core symptoms of ADHD. The findings demonstrated that both treatment groups produced significant improvements in symptoms scores compared with baseline, confirming (baseline (Wilcoxon signed-rank test, $p < 0.001$). However *Deepa Ghrita* exhibited greater clinical response than *Asthamangala Ghrita*. Group A achieved a 70% reduction in inattention and a 63% reduction in hyperactivity and impulsivity during follow-up, whereas Group B demonstrated corresponding reductions of 58% and 50%, respectively. Furthermore, intergroup analysis showed statistically significant superiority of *Deepa Ghrita* during follow-up for both inattention ($p = 0.02$) and hyperactivity/impulsivity ($p = 0.024$), indicating better sustained therapeutic efficacy. Further reiterate that absence of adverse drug events or reactions throughout the study period with well tolerability. The findings demonstrated that both treatment groups produced highly significant

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