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A CLINICAL COMPARATIVE STUDY ON THE EFFICACY OF MANDUKAPARNI AND GUDUCHI ON INTELLIGENCE QUOTIENT IN SCHOOL GOING CHILDREN

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ABSTRACT

Background: Intelligence is a composite of development that can be measured in terms of motor, adaptive, language and social behavior. Classical study gives emphasis to the promotion of *medha, buddhi and smriti*. In *Jnaanotpatti, Buddhi, Medha, Smriti* are helpful to achieve proper knowledge which are the essential components of mental processing also. The present study was conducted to evaluate the efficacy of *Mandukaparni (Centella asiatica)* and *Guduchi (Tinospora cordifolia)* on Intelligence Quotient in children having Borderline IQ. The children of borderline IQ have deficit in functional aspects of *Manas*. **Material and Methods**: Healthy children of 5 years were selected. Screening of the IQ was done using the Seguin Form Board. Attention power and memory power was also assessed in these children It was an open labeled comparative clinical study in which 40 children were allocated in two groups who received *Mandukaparni* and *Guduchi* in syrup form. Total duration of the study was 4 months. **Results:** There was a marked improvement in attention power and memory power of the child during each follow-up. The mean Performance of IQ score has comparatively increased between the first day of the treatment with follow up, showing the effective action of the syrup *Mandukaparni* and *Guduchi*. **Conclusion:** The study showed that *Mandukaparni* syrup and *Guduchi* syrup had significant improvement in the memory power and attention power in children. But comparatively *Mandukaparni* syrup was more effective than *Guduchi* syrup.

Keywords: Intelligence, IQ, *Medha*, Sequin form board, *Mandukaparni* and *Guduchi* syrup

INTRODUCTION

Survival of the fittest was the Darwin's rule in 1869; this is the era of digital Darwinism where survival of the fittest in the 21st century depends on how intelligent one is. Many par-

ents approach Ayurvedic physician to improve their kids who perform low in academics and they prefer to take Ayurvedic medicine. In Ayurveda several plants have been mentioned which have shown potential to improve the mental power and intelligence which are grouped as *Medhyadravyas. AcharyaCharaka* in his first chapter of *Chikitsa Sthana* has mentioned *Medhya Rasayana* drugs among them priority has been given to drugs like, *Mandukparni, Yastimadhu, Guduchi & Shankhapushpi*[1].

Guduchi, even placed under *Medhya Rasayana* has lost its importance as the same,as it is used in various other ailments. *Centella asiatica* has neural dendrite growth stimulating property, which helps in enhancing concentration power, thus improving memory.

Swarasa of *Guduchi* and *Mandukaparni* is highly effective, but it is not easily available for children. This study is intended to make Syrup form of *Guduchi* and *Mandukaparni* for easy availability and to study its efficacy in increasing IQ level of school going children of age 5 years.

The characteristic features of borderline IQ is that they exhibit less positive and less sensitive behavior as compared to other children. But they are not more behaviorally problematic than the children with other behavioral problems.One of the earliest performance tests was the Seguin form board test which was developed by Seguin for use of feeble minded. This test is used for briefly and fairly satisfactory appraisal of the child especially below 10 years and to assess the intelligent quotient of children. Hence in this study this test method is adopted.

The drug *Guduchi* is well explained in the classics for the *Medhya property*[1,2,3]. *Mandukaparni* experimentally has been proved to be effective on intellectual functions. Clinically research works have been carried out on older children, mentally challenged, older age, but on younger children work has not been carried out [4].This study is an effort to re-establish the concept of memory enhancing effect of *Guduchi*. Hence a clinical study was carried out to assess the efficacy *Guduchi* syrup over *Mandukaparni* syrup in school going children on attention power and memory power in borderline IQ children.

Aims and Objectives of the study:

a. To study the effect of *Mandukaparni*syrup and *Guduchi* syrup on IQ of 5 years children.
b. To evaluate the comparative effect of *Mandukaparni* syrup and *Guduchi* syrup.

MATERIALS AND METHODS

Sample size: Total 40 children.

Study Design: This is an open labeled comparative clinical study with a control and a trail group

GROUP A: Group A contained 20 children who received *Mandukaparni* syrup with dose of 8ml thrice daily after the food for duration of 2 months.

GROUP B: Group B contained 20 children who received *Guduchi* syrup with dose of 8ml thrice daily after the food for duration of 2 months.

Assessment of parameter: Parameters was assessed on two groups on day 1, day 60, and day 120.

Selection of cases:

Healthy children within the age group of 5 years – 5 years 11 months were selected after fulfilling the inclusion criteria, from OPD of

S.D.M. College of Ayurveda and Hospital, Udupi as well as schools in and around Udupi.

Inclusion Criteria

- Children of 5 years age group of either sex.
- With an IQ ranging from 70-89.

Exclusion Criteria:

- Children with developmental disorders like ADHD, autism and mental retardation.
- Children suffering from any acute, chronic infectious, systemic disorders and on treatment.
- Congenital abnormalities, genetic disorders, malnutrition.
- During the study if symptoms like itching, loose stools, vomiting, fever is observed in the children such cases will be excluded.

CRITERIA OF ASSESSMENT:

The assessment of the effect of the drug under trial was done based on the subjective and objective criteria.

SUBJECTIVE CRITERIA: Subjective criteria are based on the following parameters:

1**. Memory power:** It was done by using PICTURE RECOGNITION TEST (**FIGURE 2)**

It has two sheets (sheet 1 & sheet 2) containing pictures of many objects. The child was made to see the first sheet attentively (for 30 seconds) after some time (120 seconds interval) second sheet was shown. The child was asked to identify and name the objects seen in first sheet (sheet 1). (The child will not be told about the exact number of objects seen in first sheet and how many things yet to be identified).

Scoring:

- One score will be given for correct identification and correct naming of an item.
- Half score for correct identification but wrong naming of item

2. Attention power: It is done by using Number cancellation Test (**FIGURE 3)**

This test is helpful in assessing the attention and concentration of the child.

Procedure:

For Number Cancellation Test, a sheet containing rows of randomly printed numbers was given. The child is asked to start cancelling a particular number only at the start signal.

Scoring: Number correctly cancelled in one minute was taken as raw score and this score was assessed before & after treatment as well as during the follow up of the study. One score was given for one correctly cancelled number and no score was given for wrongly cancelled number.

OBJECTIVE CRITERIA

The values obtained by "Seguin form board" test were considered for objective assessment.

The "Seguin Form Board (SFB)" was used for assessment of IQ. This board has ten wooden blocks of different shapes. While administering the test the blocks were taken out and stacked in front of the subject who had to put them back as quickly as he could. The task was repeated three times consequently and the score was the time taken on the fastest trial. The score was compared with the SFB table to detect Mental Age **(TABLE 1)**. Depending on the Mental Age IQ was calculated according to the following formula

IQ = (Mental Age / Chronological Age) X 100

Grading of IQ

The IQ test result was distributed according to the following classification given by NIMH. (National Institute of Mental Health, Bangalore**.) (TABLE 2)**.

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Statistical Evaluation

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using Statistical package for social science (SPSS) version 20 Windows software program.

Preparation of Syrup:

Mandukaparni syrup and *Guduchi* Syrup was prepared in GMP certified SDM Pharmacy, Kuthpady, Udupi. Raw drugs were collected from Udupi region.

Paired t-test was applied within the group & unpaired t-test was used for comparison in between groups.

Ethical Evaluation

This trial has been cleared by Institutional Ethical Committee Ref. No.
SDMCAU/ACA-49/EC46/14-15

Standardization[5](TABLE 3) , microbial load analysis[5](TABLE 4), HPTLC[6] documentation(FIGURE 1)of *Mandukaparni* syrup and *Guduchi* Syrup--------SPACING

Was conducted in **S.D.M. CENTRE FOR RESEARCH IN AYURVED AAND ALLIED SCIENCES (AYUSH Centre for Excellence and Recognized SIROs by DSIR), UDUPI [Karnataka].**

Mandukaparni syrup and *Guduchi* Syrup was standardized according to the pharmacopeial methodology. The data obtained in the investigation ensured the quality and safety of drug. Thus it was safe for administration

OBSERVATIONS AND RESULTS

EFFECT OF *MANDUPARNI* SYRUP IN GROUP A(TABLE 5)

IQ- Statistical analysis showed that the mean score which was 82.6 before the treatment was increased to 87.06 after the treatment. When these values were analyzed statistically, the difference was significant at the level of P<0.001.

MEMORY- Statistical analysis showed that the mean score which was 2.9 before the treatment was increased to 4.85 after the treatment. When these values were analyzed statistically, the difference was significant at the level of P<0.001.

ATTENTION- Statistical analysis showed that the mean score which was 3.65 before the treatment was increased to 7 after the treatment. When these values were analyzed statistically, the difference was significant at the level of P<0.001.

EFFECT OF *GUDUCHI* SYRUP IN GROUP-B (TABLE 6)

IQ- Statistical analysis showed that the mean score which was 81.5 before the treatment was increased to 84.47 after the treatment. When these values were analyzed statistically, the difference was significant at the level of P<0.001

MEMORY- Statistical analysis showed that the mean score which was 2.45 before the treatment was increased to 3.45 after the treatment. When these values were analyzed statistically, the difference was significant at the level of P<0.001.

ATTENTION- Statistical analysis showed that the mean score which was 3.6 before the treatment was increased to 6.1 after the treatment. When these values were analysed statis-

tically, the difference was significant at the level of P<0.001.

COMPARISON OF TREATMENT EFFECT ON IQ, MEMORY, AND ATTENTION (TABLE 7)

Comparing in between the groups, AT mean of IQ in group A is 87.06 and in group B is 84.47 having a mean difference of 2.58 and this difference is statistically considered as significant in between the groups with P value <0.05.

Comparing in between the groups, AT mean of memory in group A is 4.85 and in group B is 3.95 having a mean difference of 0.9 and this difference is statistically considered as very significant in between the groups with P value <0.001.

Comparing in between the groups, AT mean of attention group A is 7 and in group B is 6.1 having a mean difference of 0.9 and this difference is statistically considered as significant in between the groups with P value <0.05.

DISCUSSION

Probable mode of action of *Mandukaparni*

Mandukaparni has been described as *Medhya Rasayana* by most of the *Acharyas.Mandukaparni* is *Tridoshahara, Medhya, Vayasthapana, Rasayana, Swarya, Agnivardhaka, Hridya, Raktashodhaka, Amapachaka and Balya.* The modern authors have quoted Centella asiatica as anti stress, anticonvulsant, and anti-inflammatory. Centella asiatica (Urban.) contains the chemical constituents like hydrocotyl, asiaticoside, vellarine, pectic acid, ascorbic acid, centolic and centellic acid, triterpenoidsaponins. The main constituents responsible for its medicinal activities are triterpenoids, saponins, alkaloids and bitter principles. It contains flavonoids, which may offer an explanation concerning its anti-stressactivity. Hence in this study Group A (*Mandukaparni* syrup) has shown marked improvement in IQ along with improvement in attention and memory.

Probable mode of action of *Guduchi*

Guduchi is explained as *medhyarasayana* in the *Rasayana* chapter. The root of *T.cordifolia* is known to be used traditionally for anti-stress activity. The *phalashruti* of *Rasayana* is said as "*Dheergamayusmritimedha*" This concept goes very well with acceptance of *Guduchi* –A *rasayana* drug as *Medhya*. This well accepted concept was proved again with the help of clinical experiment. Significant response has been found in children with borderline IQ along with improvement in attention and memory power.

Discussion on Comparative Effect of Group A and Group B

The mean of non Verbal IQ score for *Mandukaparni* group before treatment (82.604) was increased with mean value of 91.1958 at the 120th day. The mean of non Verbal IQ score for *Guduchi* group before treatment (81.503) was increased with mean value of 88.5332 at the 120th day.

Therefore both *Mandukaparni* and *Guduchi*-have statistically significant improvement in IQ, Attention power and Memory power. But comparatively *Mandukaparni* has shown better results than *Guduchi.*

CONCLUSION

- As there are references regarding *Guduchi* as *medhya*, we have made an attempt to see its *Medhya* properties. It is also proved to be a *Medhya* drug, but in this study we have found that, more than *Medhya* effect, it has shown potential in improving the

immune system by preventing recurrent attacks of cold & cough.

- Therefore both *Mandukaparni* and *Guduchi* have statistically shown significant improvement in IQ, attention power and memory power without any ill effects. But comparatively *Mandukaparni* has shown better results than *Guduchi.*

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LIST OF TABLES AND FIGURES

TABLE 1: Table for calculation of Mental age based on time taken for performing on SFB

Shortest of 3 trials		
Indian Standard	*Western standard*	*Mental age*
58	56	3
48	46	4
36.3	35	5
27.2	27	6
25	23	7
21	20	8
18.9	18.5	9
17.4	16.5	10
16.2	15	11
15.7	14	12
14.5	13	13
14.2	12.5	14
13.8	12	15

TABLE 2: Grading of IQ

PERCENTAGE	IQ
BELOW 70	MENTALLY CHALLENGED

70-89	BODERLINE IQ
90-107	AVERAGE INTELLIGENCE
110-129	ABOVE AVERAGE INTELLIGENCE
ABOVE 130	SUPERIOR INTELLIGENCE

TABLE 3: Results of Standardization Parameters

Parameter	Results n = 3 %w/w	
	Mandukaparni Syrup	*Mandukaparni* Syrup
Total Solids	43.261	21.918
Specific gravity	1.2391	1.3470
Refractive Index	1.43867	1.45917
Reducing sugar	8.449	2.717
Total Sugar	43.758	43.862

TABLE 4a: Microbial Load Analysis of Syrup

Microbial load analysis of *Guduchi* syrup

Sl. No.	Dilutions	Number of Colonies (NOC)		
1	1/10 (10^1)	>300	>300	
2	1/100 (10^2)	37	40	3.85×10^3
3	1/1000 (10^3)	2	2	2.0×10^3

TABLE 4b: Microbial load analysis of *Mandukaparni* syrup

Sl. No.	Dilutions	Number of Colonies (NOC)		CFU/ml
1	1/10 (10^1)	35	36	3.55×10^2
2	1/100 (10^2)	10	3	6.50×10^2
3	1/1000 (10^3)	1	1	-

TABLE 5:Effect of *Manduparni* Syrup in Group A

Sr. No	PARAMETERS	Mean		Mean diff	%	SD	SE	t	P
		BT	AT						
1.	IQ	82.6	87.06	4.45	5.38	1.27	0.28	15.69	<0.001
2.	MEMORY	2.9	4.85	1.95	67.2	0.6	0.13	14.41	<0.001
3.	ATTENTION	3.65	7	3.35	100	1.22	0.27	12.2	<0.001

TABLE 6: Effect of *Guduchi* Syrup in Group-B

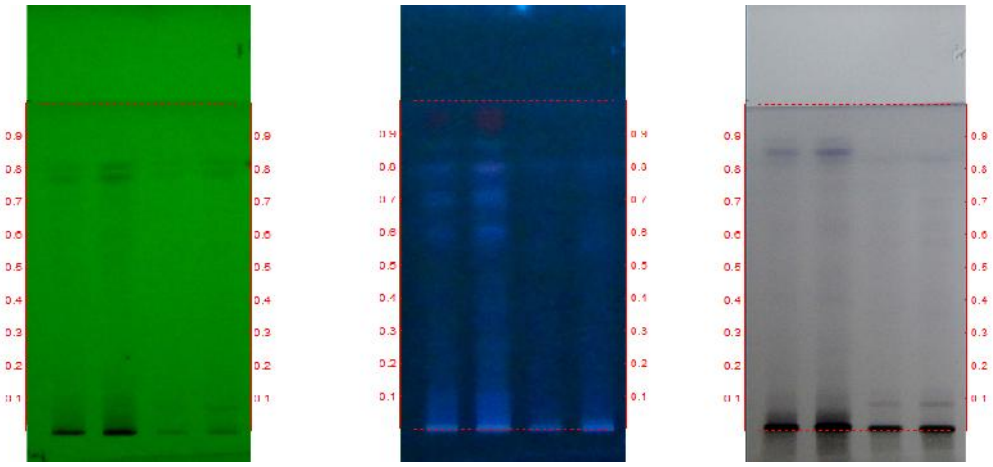
Sr. No	PARAMETERS	Mean		Mean diff	%	SD	SE	t	P
		BT	AT						
1.	IQ	81.5	84.47	2.97	3.6	1.01	0.22	13.09	<0.001
2.	MEMORY	2.45	3.95	1.5	61.2	0.6	0.13	11.05	<0.001
3.	ATTENTION	3.6	6.1	2.5	60.4	0.76	0.17	14.6	<0.001

TABLE 7:Comparison of Treatment Effect on IQ, Memory and Attention

ANALYSIS	GROUP	MEAN	MEAN DIFF	't'TEST			
				SD	SE	t	P

IQ	A	87.06	2.58	2.56	0.57	2.68	<0.011
	B	84.47		3.47	0.77		
MEMORY	A	4.85	0.9	0.48	0.1	3.74	<0.001
	B	3.95		0.94	0.21		
ATTENTION	A	7.0	0.9	1.33	0.29	2.43	<0.020
	B	6.1		0.96	0.21		

Figure 1:HPTLC photo documentation of Ethanol extract of Mandukaparni Syrup &Guduchi Syrup



Track 1- Mandukaparni Syrup– 4 µl
Track 2– Mandukaparni Syrup – 8 µl
Track 3- Guduchi Syrup– 4 µl
Track 4– Guduchi Syrup – 8 µl

PICTURES USED FOR RECOGNITION (FIGURE 2)

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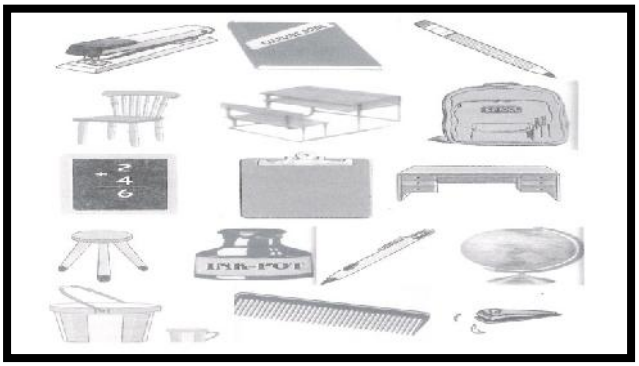
Sheet 1



Sheet 2

Number cancellation (NC) Sheet:(FIGURE3)

1 3 5 4 2 5 3 1 4 2 4 2 1 3 5 4 3 5 2 1 4 4 2 5 3
3 1 2 5 4 1 5 4 3 2 5 4 1 3 4 4 2 1 5 3 5 1 4 2 3
5 1 4 3 2 4 2 5 1 3 3 5 2 1 4 2 1 3 5 4 1 3 5 4 2
2 4 5 1 3 3 1 4 5 2 5 2 3 4 1 1 4 5 2 3 2 4 1 5 3
4 5 3 2 1 2 4 3 1 5 1 4 2 5 3 5 3 2 4 1 3 5 2 4 1
5 1 4 3 2 3 1 4 5 2 2 4 2 1 5 3 4 3 5 3 1 2 1 3 1
4 5 3 2 1 2 4 5 1 3 5 1 4 3 2 3 1 2 5 4 1 3 5 4 2
2 4 3 1 5 3 1 4 5 2 4 2 5 1 3 1 5 4 3 2 5 3 1 2 4
1 4 2 5 3 5 2 3 4 1 3 5 2 1 5 2 5 1 3 4 2 1 3 5 4
4 2 5 3 1 5 1 4 2 3 1 3 5 4 2 2 4 1 5 3 3 5 4 2 1
4 5 3 2 1 2 4 5 1 3 1 4 2 5 3 5 3 2 4 1 3 5 4 2 1
2 4 5 1 3 3 1 4 5 2 5 2 3 4 1 1 4 5 2 3 2 4 1 5 3
3 1 2 5 4 1 5 3 3 2 2 5 1 3 4 4 2 1 5 3 5 1 4 2 3
1 2 5 4 2 5 3 1 2 4 2 1 3 5 4 3 5 2 1 4 4 2 5 3 1
5 1 4 3 2 4 4 5 1 3 3 5 2 1 4 2 1 3 5 4 1 3 5 4 2
2 4 5 1 3 3 1 4 5 2 5 2 3 4 1 1 4 5 2 3 2 4 1 5 3
3 1 2 5 4 1 5 4 3 2 2 5 1 3 4 4 2 1 5 3 5 1 2 4 3
1 3 5 4 2 5 3 1 2 4 2 2 1 3 5 4 2 5 2 1 4 4 2 5 3
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4 5 3 2 1 2 4 5 1 3 1 4 2 5 3 5 3 2 4 1 3 2 5 4 1
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1 3 5 4 2 5 3 1 2 4 4 1 3 5 4 2 5 2 1 4 4 2 5 3 1
5 1 4 3 2 4 2 5 1 3 3 5 2 1 4 2 1 3 5 4 1 3 5 4 2
4 5 3 2 1 2 4 5 1 3 1 4 2 5 3 5 3 2 1 4 3 5 4 2 1
2 4 5 1 3 3 1 4 5 2 5 2 3 1 4 4 1 5 2 3 2 4 1 5 3

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Name: Date:

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