

**A DOUBLE BLIND STUDY FOR IMPROVING I.Q. OF SCHOOL GOING CHILDREN WITH GUDUCHI****Dr. Kirti Rathod<sup>\*1</sup>, Dr. Virendra Kori<sup>2</sup>, Dr. Kalpna Patel<sup>3</sup> and Dr. Nilesh Jethava<sup>4</sup>**<sup>1</sup>Associate Professor, Department of Kaumarbhrutya, Dhanvantari Ayurved College, Koydam, Gujarat, India.<sup>2</sup>Associate Professor, Department of Kaumarbhrutya, IPGT and RA, Jamnagar, Gujarat, India.<sup>3</sup>Professor and HOD, Department of Kaumarbhrutya, IPGT and RA, Jamnagar, Gujarat, India.<sup>4</sup>Associate Professor, Department of Shalya Tantra, Parul Institute of Ayurved, Parul University, Limda, Vadodara, Gujarat, India.**\*Corresponding Author: Dr. Kirti Rathod**

Associate Professor, Department of Kaumarbhrutya, Dhanvantari Ayurved College, Koydam, Gujarat, India.

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**ABSTRACT**

**Background:** In this era of global competition, the competition spirit starts from the very beginning of the childhood of every individual. Even to get admission in a reputed school, the child has to go through various examinations. The early childhood is the phase in which the child perceives and retains unknown words, skilled processes etc. If any drug can enhance this process of grasping, retention and recalling, it will provide a great help to the paediatric population. In Ayurveda a class of drugs is mentioned as '*Medhya Rasayana*' for this purpose, *Guduchi* (*Tinospora cordifolia* Willd. Miers) is one such drug. **Material and Methods:** A double blind randomized placebo controlled Clinical study was conducted on 71 students to evaluate the effect of *Guduchi Ghana* in improving Intelligence Quotient (I.Q.) of school going children. Indian Adaptation of Wechsler's Intelligence Scale for Children (IAWISC-IV) modified by Dr. Arthur J. Malin was used as an I.Q. assessment tool. Twenty nine students in group 'A' and Twenty Seven students in group 'B' completed the course of intervention. Paired 't' test and unpaired 't' test were used for statistical analysis. **Results:** *Guduchi Ghana* capsules showed statistically highly significant increase in Verbal I.Q. score, Performance I.Q. score and Full scale I.Q. scores and Placebo-Wheat flour Capsules showed statistically significant increase in Full scale I.Q. score. When compared placebo *Guduchi Ghana* capsules showed statistically highly significant increase in Verbal I.Q. score, Performance I.Q. score and Full scale I.Q. scores.

**KEYWORDS:** *Guduchi Ghana*, I.Q., *Medhya Rasayana*, Placebo.**INTRODUCTION**

Mind and intellect are among the phenomena on which man always failed to reach a definite conclusion. Human being has conquered the peaks in all aspects of life because of unlimited thoughts as well as ambitions. It is the discriminative capacity which makes him different from animals. Language, observations, analytical mind, research aptitude and many more things have contributed for human intellect.

The changes in the life styles and circumstances have changed the face of the modern man. The pace of life got increased and human beings have become accustomed to a competitive world. The competition spirit is being injected by the society even to the brain of children. Once a child is born the parents start designing his or her future in order to build him up as a doctor or engineer. Many parents are ready to purchase supplements for their children to "enhance memory" or as "I.Q. Booster" to prepare them for the exams. The scientists as well as

businessmen have come forward to take the advantage of this situation and the idea is utilized by the multinational companies for monetary benefits. This certainly has caused changes in marketing strategies, including TV channel strategies. This resulted in the formation of a group of people who are ready to accept any such medicines labelled as herbals. On other hand ample of *Medhya* drugs are mentioned in Ayurveda. So the effect of Ayurvedic drugs in improving intellectual capacity should be subjected to thorough analysis which is the need of the day.

**AIMS AND OBJECTIVES**

1. To study the concept of *Medha* and Intellect.
2. To assess the I.Q. of school going children of 8<sup>th</sup> and 9<sup>th</sup> standard.(Age: 12-15 years)
3. To evaluate the effect of *Guduchi* (*Tinospora cordifolia* Willd. Miers) extract in improving I.Q. of school children.

## MATERIALS AND METHODS

Healthy students of 8<sup>th</sup> and 9<sup>th</sup> Standard (Age: 12-15 yrs) were selected from the O.P.D. of Dept. of Kaumarabhritya, I.P.G.T. & R.A., Jamnagar and R. R. Shah School, Jamnagar.

### Inclusion criteria

Normal healthy school going children of 8<sup>th</sup> and 9<sup>th</sup> standard (Age: 12-15years), having I.Q. 89-109.

### Exclusion criteria

- Chronic debilitating illnesses
- Children with mental retardation, Attention deficit hyper active disorder
- I.Q. below 89 and above 109.

### Research Design

This study was designated as a randomized, single centre, double blind, fixed Dose, parallel Group, and placebo-controlled study. The study was approved by Institutional Ethics Committee by vide letter no.PGT/7-A/Ethics/2010-2011/1858-33; dated: 01-09-2010.

**Randomization:** In the present study the participants were assigned by chance to separate groups that compared different treatments. Using chance to assign subjects to group means that the groups will be similar and that the treatments they receive can be compared objectively. Hence to compare the efficacy of trial drug and placebo, randomized study was selected.

### Selection of drug dosages form

Acharya Charaka has mentioned *Guduchi Swarasa* (expressed juice of Fresh stem of *Tinospora cordifolia* Willd. Miers) as one of the four '*Medhya Rasayan*'<sup>1</sup> *Swarasa* of the drug due to its non-compliance in taste is not palatable for children. As quoted by Acharya Charaka that the drugs to be administered in *Baala* (children) should have more palatability<sup>2</sup>. It is seen commonly that *Tikta Choorna* (bitter powder), *Vatee* (tablet), *Gutee* (pills) and *Kwatha* (decoction), etc. are not palatable in children. The *Guduchi* when prepared in extract form becomes very *Tikta*. Thus the biggest challenge was preparation of the drug to make it palatable. The capsule dosage form was found to be more acceptable as children of age group: 12-15 yrs can take capsule easily. Hence capsule preparation of *Guduchi Ghana* powder was selected in the present study. Further, in capsule form, blinding technique can be applied easily.

**Placebo-controlled study:** The present study was designed in such a way that inactive substance (Placebo-Wheat flour) was given to one group of participants; while the active drug to be tested (*Guduchi Ghana*) was given to other group.

**Grouping and Posology:** Healthy school children fulfilling inclusion criteria were randomly divided into two groups coded as A and B. When disclosing the

blinding of the drug, it is found that, in Group A, two capsules of Placebo (1gm each) were given in morning with Luke warm water for three months and follow up was done after two months. In Group B, *Guduchi Ghana* capsules (1gm each) were given similarly.

**Investigations:** Haematogram-routine and Urine-routine and microscopic were carried out to exclude any pathology.

### Criteria of assessment

The assessment criterion in this study was I.Q. The performance in each component of I.Q. test was put as an assessment criterion.

Component of I.Q. tests (Table-1) was tested by Indian Adaptation of Wechsler's Intelligence scale for School Children (IAWISC-IV).<sup>[3]</sup> Total ten test-5 tests from each group- are required for complete scoring. To avoid regional bias Vocabulary from the Verbal group and Picture arrangement from the Performance group were omitted, as these two tests are proved too culturally biased. The I.Q. scale was purchased from Indian Psychological Corporation, Agra. IAWISC-IV has been constructed carefully suiting the standards of Indian children after scientific standardization of samples test items and establishments of the norms. I.Q. test was taken before treatment (Day 0) and after treatment (Day 90).

### Computation of Scores

Respective subtests (Table-1) raw scores; were converted into Test Quotients (TQ's) by tee table accompanying the manual provided in scale. After the conversion of raw scores into TQ's, add and find the average of each group (Verbal and Performance) separately. This gives Verbal I.Q. score and Performance I.Q. score, respectively.

Finally to obtain the Full Scaled I.Q., added both Verbal I.Q. score and Performance I.Q. score and divided for the average.

**Statistical Analysis:** The values were expressed as mean test score for each test of IAWISC-IV (Indian Adaptation of Wechsler's Intelligence scale for School Children), percentage of increase in test score, mean difference and SD. Data were analyzed by Students Paired 't' test for separate group and Unpaired 't' test for comparative effect.

## OBSERVATIONS

Clinical study was conducted on seventy one healthy school going children (Table-2).

### General observations

In this study, 45 (63.38%) students were from age group of 14-15 years-9<sup>th</sup> standard, 38 (53.52%) were females, 71 (100%) were Hindu, 55 (77.46%) were from Lower middle class, 28 (39.44%) of father of students were

educated to the level of higher secondary, 26 (37.62%) of Mother of students were educated to the level of higher secondary, 25 (35.21%) fathers of students were in service of either government or private sector, 60 (84.51%) mothers of students were housewives, 19 (27.76%) students had history of Recurrent Respiratory Tract Infections, 45 (63.38%) students were delivered by full term delivery at hospital, 40 (57.34%) students weighed between 2.5 to 3 kg at birth and 66 (92.96%) students were immunized as per National Schedule of Immunization.

Average height, weight and BMI of students aged 12-13 yrs, were 152.95 cm, 47.18 kg and 19.7 kg/m<sup>2</sup> respectively. Students aged 14-15 yrs were having average height 155.41 cm, weight 51.12 kg and BMI 20.86 kg/m<sup>2</sup>.

41 (57.75%) students were average in their academic career, 28 (39.44%) were having *Vaata Kapha Prakriti*, 60 (84.51%) students were having *Madhyama Saara* and *Samhanana*, 61 (85.92%) students were having *Madhyama Pramana*, 65 (91.55%) students were having *Madhyama Saatmya*, 56 (78.87%) students were having *Madhyama Abhyavaharana Shakti* and 51 (71.83%) were having *Madhyama Vyayama Shakti*.

## RESULTS

### Effect of *Guduchi Ghana* capsules on Verbal I.Q. scores

Trial drug *Guduchi Ghana* capsules show statistically highly significant ( $P < 0.001$ ) increase in Verbal I.Q. score. Verbal I.Q. score is increased 7.91%. In subtests of Verbal I.Q., there is statistically highly significant increase in General Information, Arithmetic and digit Span test score ( $P < 0.001$ ). Change in similarities test score is statistically significant ( $P < 0.05$ ), while change in General Comprehension test score is statistically insignificant ( $P > 0.05$ ). (Table-3).

### Effect of Placebo-Wheat flour capsules on Verbal I.Q. scores

Control drug Placebo capsules show statistically insignificant ( $P > 0.05$ ) increase in Verbal I.Q. score. Verbal I.Q. score is increased 1.21%. In subtests of Verbal I.Q., there is statistically highly significant increase in digit Span test score ( $P < 0.001$ ). Digit span is a sensitive test of working memory, which is necessary for holding and manipulating information. To assess an individual's functional processing of language, speech and sub-vocal domains as well as the ability to store, transform and manipulate information. The highly significant improvement in the digit span score may be due to clinical impact of placebo on child as the child thinks that he/she is receiving some I.Q. enhancer and manipulate the information more consciously. Changes in General Information, General Comprehension, Arithmetic and Similarities test score are statistically insignificant ( $P > 0.05$ ). (Table-4)

### Effect of *Guduchi Ghana* capsules on Performance I.Q. scores

Trial drug *Guduchi Ghana* capsules show statistically highly significant ( $P < 0.001$ ) increase in Performance I.Q. score. Performance I.Q. score is increased 5.51%. In subtests of Performance I.Q., there is statistically significant increase in Picture Completion, Coding and Object Assembly test score ( $P < 0.05$ ). Change in Mazes test score is statistically highly significant ( $P < 0.001$ ), while change in Block Design test score is statistically insignificant. ( $P > 0.05$ ) (Table-3).

### Effect of Placebo-Wheat flour capsules on Performance I.Q. scores

Control drug Placebo-Wheat Flour capsules show statistically insignificant ( $P > 0.05$ ) increase in Performance I.Q. score. Performance I.Q. score was increased 0.52%. In subtests of Performance I.Q., there is statistically significant increase in Mazes test score ( $P < 0.05$ ). Changes in Picture Completion, Coding, Object Assembly and Block Design test score are statistically insignificant ( $P > 0.05$ ). (Table-4)

### Effect of *Guduchi Ghana* capsules on Full scaled I.Q. scores

Trial drug *Guduchi Ghana* capsules show statistically highly significant ( $P < 0.001$ ) increase in Full scaled I.Q. score. Full scaled I.Q. score was increased 6.58%. (Table-3).

### Effect of Placebo-Wheat flour capsules on Full scaled I.Q. scores

Control drug Placebo-Wheat flour capsules show statistically significant ( $P < 0.05$ ) increase in Full scaled I.Q. score. Full scaled I.Q. score was increased 1.42%. (Table-4).

### Comparative effect of therapy on I.Q. scores Effect on Verbal I.Q. Score

Trial drug *Guduchi Ghana* capsule show statistically highly significant ( $P < 0.001$ ) increase in Verbal I.Q. score when compared to placebo. (Table-5).

### Effect on Verbal Subtests Score

Trial drug *Guduchi Ghana* capsule shows statistically significant ( $P < 0.05$ ) increase in General Information test score when compared to placebo. *Guduchi Ghana* capsule show statistically highly significant ( $P < 0.001$ ) increase in Arithmetic test score when compared to placebo. When comparing Changes in General comprehension, Similarities and Digit span the difference between two groups is statistically insignificant. (Table-5).

### Effect on Performance I.Q. Score

Trial drug *Guduchi Ghana* capsule show statistically highly significant ( $P < 0.001$ ) increase in Performance I.Q. score when compared to placebo. (Table-5).

**Effect on Performance Subtests Score**

Trial drug *Guduchi Ghana* capsule shows statistically highly significant ( $P < 0.001$ ) increase in Mazes test score when compared to placebo. *Guduchi Ghana* capsule shows statistically significant ( $P < 0.05$ ) increase in object assembly test score when compared to placebo. When comparing changes in picture completion, coding and block design tests scores changes in test scores between two groups are statistically insignificant. (Table-5).

**Effect on full scale score**

When compared to Placebo, Trial drug *Guduchi Ghana* capsule shows statistically highly significant ( $P < 0.001$ ) increase in full scaled I.Q. (Table-5).

**Table 1: Subtests of IAWISC-IV.**

Verbal	Performance
General information	Picture completion
General comprehension	Picture arrangement
Arithmetic	Object assembly
Vocabulary	Mazes
Similarities	Coding
Digit span	Block design

**IAWISC:** Indian Adaptation of Wechsler's Intelligence scale for School Children.

**Table 2: Status of Clinical Study.**

STATUS	Group A	Group B	Total	%
Registered	37	34	71	100.00
Completed	29	27	56	78.87

**Table 3: Effect of *Guduchi Ghana* capsule administration on I.Q. test score (n=27).**

Test Parameters	Mean score			S.E. ±	't'	'P'
	A.T	B.T.	D			
General Information	118.63	109.63	9	2.36	3.81	<0.001
General Comprehension	99.07	91.52	7.55	3.74	2.02	>0.05
Arithmetic	90.48	83.74	7.74	1.09	7.20	<0.001
Similarities	115.92	109.44	7.48	2.72	2.38	<0.05
Digit Span	95.92	91.44	4.48	1.03	4.34	<0.001
Picture Completion	123.92	117.25	7.67	2.39	2.78	<0.05
Coding	131.52	125.52	7.00	2.87	2.09	<0.05
Mazes	115.18	103.37	11.81	2.96	3.98	<0.001
Block Design	93.66	92.88	0.78	0.59	1.31	>0.05
Object Assembly	82.78	79.22	3.56	1.48	2.40	<0.05
Verbal I.Q.	104.60	97.93	7.67	1.18	7.46	<0.001
Performance I.Q.	109.89	104.15	5.74	0.77	7.42	<0.001
Full Scaled I.Q.	107.10	100.48	7.61	0.71	9.25	<0.001

**Table 4: Effect of Placebo administration on I.Q. test score (n=29).**

Test Parameters	Mean score			S.E. ±	't'	'P'
	A.T	B.T.	D			
General Information	105.86	105.21	0.65	2.26	0.29	>0.05
General Comprehension	90.31	89.97	0.34	1.95	0.17	>0.05
Arithmetic	87.21	85.93	0.28	1.46	0.19	>0.05
Similarities	107.62	107.07	0.55	1.96	0.28	>0.05
Digit Span	99.55	95.03	4.52	1.07	4.23	<0.001
Picture Completion	115.31	112.48	2.83	2.67	1.07	>0.05
Coding	127.55	127.10	0.45	1.15	0.39	>0.05
Mazes	109.72	114.52	-4.83	2.35	-2.05	<0.05
Block Design	89.86	89.65	0.21	0.14	1.44	>0.05
Object Assembly	84.03	83.82	0.21	0.34	0.60	>0.05
Verbal I.Q.	97.93	97.76	1.17	1.15	1.01	>0.05
Performance I.Q.	104.18	103.64	0.54	0.92	0.58	>0.05
Full Scaled I.Q.	101.39	99.97	1.42	0.54	2.60	<0.05



**Table 5: Comparative Efficacy of Capsule ‘B’ with Capsule ‘A’ on the I.Q. test items.**

I.Q. Test Parameters	% of Score Increase		Mean Difference(d)	‘t’	‘P’
	Group B	Group A			
General Information	8.21	0.62	8.34	2.55	<0.05
General Comprehension	8.25	0.38	7.21	1.74	>0.05
Arithmetic	8.05	0.32	7.46	3.52	<0.001
Similarities	5.92	0.51	5.93	1.79	>0.05
Digit Span	4.90	4.75	-0.03	-0.02	>0.05
Picture Completion	5.68	2.54	3.80	1.05	>0.05
Coding	4.78	0.35	5.55	1.84	>0.05
Mazes	11.25	-4.21	17.64	4.43	<0.001
Block Design	-7.42	0.23	0.57	0.97	>0.05
Object Assembly	4.49	0.25	3.35	2.27	<0.05
Verbal I.Q.	7.91	1.21	7.50	3.92	<0.001
Performance I.Q.	5.51	0.52	5.20	4.30	<0.001
Full Scaled I.Q.	7.58	1.42	5.19	5.82	<0.001

## DISCUSSION

### Probable mode of action of *Guduchi Ghana*

*Guduchi* is *Ushna* (hot)<sup>[4]</sup> in *Virya* (potency) and hence probably acts by dispelling the *Tamas* and vitiated *Kapha* from *Manovahasrotas*. It also boosts *Pachaka Pitta*. Thus the unhampered status of *Agni (Bhutagni)* takes care of nutrition of the *Indriya* (sense organs). *Pachaka Pitta* also regulates the functions of *Alochaka* and *Sadhaka Pitta*, thereby improving the *Buddhi* (intellect) and *Medha* (Grasping power). *Acharya Charaka* has mentioned *Guduchi Swarasa* (expressed juice of Fresh stem of *Tinospora cordifolia* Willd. Miers) as a ‘*Medhya Rasayana*’.<sup>[2]</sup> ‘*Rasayana*’ is defined as ‘*Dirghmayu Smriti Medha Aarogyam Tarunam Vayam....Labho Payo Hi Shastanam Rasadinam Rasayana* means ‘*Rasayana*’ (rejuvenation) is the therapy, which is helpful to obtain optimum quality or the best quality of ‘*Rasadi Dhatus*’ and hence it is having *Medhya* effect.

Research reveals that *Guduchi Ghana (T. cordifolia* water soluble extract) preserves normal process of learning by preserving the Hippocampal neurons. As Hippocampus is main centre for learning and memory, preservation of this centre against damage, results in preservation of process of cognition.<sup>[6]</sup>

### Probable of mode of action of placebo

An inactive substance or preparation used as a control in an experiment or test to determine the effectiveness of a medicinal drug is known as a placebo.

### Factors influencing the placebo effect

**1. Characteristics of placebo-** If the drug looks genuine and is pleasant, the person taking it is more likely to believe that it contains active ingredients.

**2. Trust towards the intervention-**The doctor himself can be a powerful placebo. If the patients trust their health care practitioner, they are more likely to believe that the drug given by doctor will work.

**3. Positive Attitude of the patient-**If the person expects the therapy to work, the chances of a placebo effect are higher. The power of suggestion is probably at work here.

## CONCLUSIONS

*Guduchi Ghana* capsule showed statistically highly significant increase in Verbal I.Q. score.

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