

Randomized Placebo Controlled Clinical Trial on Role of *Shatapushpa Choorna* in Enhancement of Intelligence Quotient in School Going Children

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Abstract

Intelligence is the capacity to acquire knowledge, understanding and using it in different novel situations. Children with high level of intellectual power are inevitable for the present competitive era and a healthy childhood is therefore mandatory for expecting a healthy adult life. *Shatapushpa* (*Anethum sowa* Kurz) is a simple and easily available drug with its action in various diseased and healthy conditions. *Acharya* Kashyapa had well praised the drug by indicating it to increase *Medha* (Intellect), *Smruthi* (Memory) and to boost the individual *Shruthadhara* (one who retains what is heard). However no study has been conducted with respect to its efficacy in children, hence the present study was intended. Assessment of *Medha* and *Smruthi* as *Medham Grahnena* (grasping power) and *Smruthim Smaranena* (retention power) is found in Charaka Samhitha. Based upon this reference Intelligent Quotient (IQ) is taken as the criteria for assessment with the help of Indian adaptation of Wechsler Intelligence Scale for Children 3rd edition. The scale consisted of 5 verbal and 5 performance subtests the entities assessed by them are considered as various functional units of *Buddhi*, *Medha* and *Smruthi*. Study revealed that trial drug *Shatapushpa* increased verbal (14.64%), performance (13.34%) and overall IQ (13.93%) significantly when compared to placebo after one month of treatment.

Key words: Intelligence Quotient, School Going Children, *Shatapushpa Choorna*

Introduction:

The importance of childhood is emphasized from the ancient literature right up to the modern medical science. A healthy childhood is therefore mandatory for expecting a healthy adult life.

Intelligence is the capacity to acquire and apply knowledge. Used in its broadest sense, intelligence is what people use to learn, remember, solve problems and in general deal effectively with the world around them [1]. Higher mental faculty i.e. the instrument of knowledge, the discriminating power, and final decision maker is considered as *Buddhi*. It is comprehended slightly different in different philosophical systems. *Buddhi* may be described as a phenomenon in which after detailed judgment and consideration of pros and cons a specific undoubted knowledge is attained [2]. *Smruthi* is an integral part of *Buddhi* [3]. The functions of *Buddhi* and *Smruthi* go hand in-hand in knowledge perception. *Acharya* Charaka describes *Smruthi* as the normal physiological function of recollecting knowledge stored in mind as and when necessary [4]. *Medha* is a faculty of *Buddhi* [5] and is a type of *Dhi* having the

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power of retention of knowledge.

Shatapushpa is a simple and easily available drug with its action in various diseased and healthy conditions. *Acharya Kashyapa* had well praised the drug by indicating it to increase *Medha*, *Smruthi* and to boost the individual *Shruthadha* [6]. An individual is considered to be *Shruthadhara* when he is endowed with excellent *Grahana*, *Dharana* and *Smarana Shakti*. The normal functioning of *Medha* or *Buddhi* and *Smruthi* in its optimum level is mandatory to entitle the person *Shruthadhara*.

There are number of different methods which contend to measure intelligence, the most famous of which is the IQ, or intelligence quotient test [7]. An intelligence quotient is a score derived from one of several standardized tests designed carefully to assess intelligence.

Assessment of *Medha* and *Smruthi* as '*Medham grahena*' and '*Smruthim smaranena*' is found in Charaka Samhita *Vimana Sthana* [4]. The method of testing *Medha* is explained by "*Grahanenaiti Granthadi Dharanena*" [4] - understanding the ability of the person to understand, grasp, remember and recall the *Granthas* after reading. If one can understand these things easily he will be designated as *Dheeman*[8].

Though *Kashyapa* has considered *Shatapushpa* as one of the *Dravya* possessing *Medhya* (promoting intelligence) no clinical study with respect to its efficacy in children is studied so far. Hence, the present study is intended to assess the efficacy of trial drug in healthy school going children.

Materials and methods

The study was designed as "A Randomized, Single Centre, Single-blind, Fixed Dose, Parallel Group, and Placebo-Controlled Study for The Role of *Shatapushpa Choorna* in Enhancement of IQ in School going Children aged 10-12years." The Clinical study was started after the approval of Institutional ethics committee

A. Source of Data:

Healthy Children aged 10-12yrs were selected from Zilla Panchayat Higher Primary School, Gandhi Nagar, Moodbidri, Karanataka, India.

B. Place of study:

The study was conducted in the department of Kaumarabhritya of Alvas's Ayurveda Medical College,

Moodbidri, Karanataka, India.

C. Screening of Children:

The study was carried-out by a thorough review of the psychological tests and interviewing methods in school going children. For this purpose, the Indian adaptation of WISC IIIrd edition was used.

D. Inclusion criteria:

Children aged 10-12 yrs irrespective of sex, caste, religion, and socio-economic status and whose IQ score ranged from 70 to 139 were selected.

E. Exclusion criteria:

Children suffering from any systemic disorders, whose IQ score ranged below 70 and Children aged below 10yrs and above 12yrs.

F. Method of Preparation of the medicine:

10 kg Fresh seeds of *Shatapushpa* was purchased, dried in an Owen at a temperature of 100 105°c

Then the dried seeds of *Shatapushpa* were made in to *Choorna* form in an pulveriser and sieved through 80 gauge sieve.

After making in to *Choorna* form the drug was packed into 5gm and 6 gm in plastic covers packets of this were kept in each sealed bottles

Fresh honey and ghee was obtained from institutional pharmacy. Which was packed into 100ml plastic bottles.

For the purpose of controlled study a placebo in the form of *Choorna*, was made by using Fired wheat powder.

G. Sampling:

The 44 children selected were randomly divided by applying lottery method into the following two groups of treatment. The children were studied based on pre and post treatment design.

1. Treatment Group (Group A)

This group containing 22 children were Administered *Shatapushpa Choorna* with honey and *Ghritha* in the dosage of 1 *Vidalapada* (10 - 12gms) in 2 divided doses in morning and evening before food for a period of one month. [6]

2. Placebo Group (Group B)

This group of 22 children were given placebo *Choorna* made up of fried wheat in a dose of 10-12mg twice a day along with honey and *Ghritha* for a period one month.

H. Follow up of the study

One month after stoppage of the treatment, the children were again assessed for follow up study.

I. Method of study:

Children were selected for the clinical study according to inclusion & exclusion criteria and assigned into 2 groups. Wilful assent from the children and consent from the parents was obtained for participating in the study after explaining about course of the study in detail.

Complete physical examination, detailed evaluations of children and documentation of findings in a special proforma was done. Trial drug or placebo was administered to the children. Follow up was done on every 15th day during treatment.

IQ Assessment was conducted after completion of the treatment (1 Month). Final review was completed at a gap of 1 month after stopping the treatment for follow up study. Data was analyzed statistically.

J. Assessment Criteria:

Objective criteria:

The Indian adaptation of Wechsler Intelligence Scale for Children i.e. Malin's intelligence scale for Indian children has been used for the present study and scores obtained in each item from the score table was considered as the individual criteria. The test contains verbal and performance scale which further contains 5 sub tests in each of them [9].

Subjective criteria:

No specific subjective criteria have been considered during selection of the children. Any complaints which coincided with the selected children which did not interfere in the course of the study were selected and were noted in the case sheet and graded present or absent. Commonly found complaints were deficit in retention and recall.

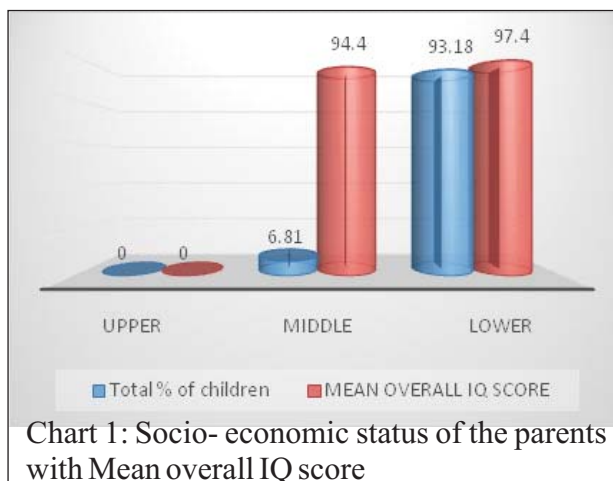
Observations:

Observations made on children before starting the treatment and effects of the therapy are being presented here.

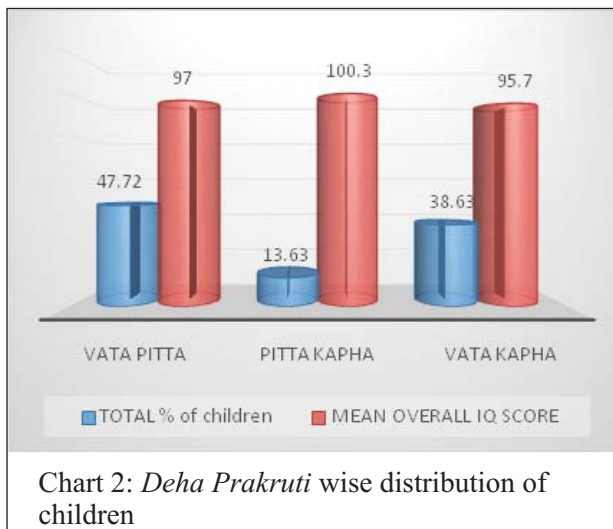
All the children enrolled in the study completed the treatment. Age wise distribution of children in both the groups were equal. 50% of children belonged to 12years of age, 31.8% of children aged 10years and 18.2% of children aged 11 years. In Group

A 54.54% of children were males and 45.54% were females. In Group B 31.81% of children were males and 45.54% were females.

93.18 % of children were from lower socio-economic status with Mean IQ score of 97.4 and 6.81% of children belonged to middle socio-economic status with Mean IQ score of 94.4. There were no children in either of Groups belonging to upper socio-economic status.(Chart 1)



According to the *Deha Prakruti* maximum numbers of children (47.72%) were of *Vatapittaja Prakruti* with Mean IQ Score of 97, followed by *Vatakaphaja Prakruti* (38.63%) with Mean IQ Score of 95.71 and 13.63 % children of *Pittakaphaja Prakruti* with Mean IQ Score 100.35. (Chart 2)



According to *Manasika Prakruti* 93.18% of children were of *Rajasika Prakruti* with Mean Overall IQ score of 99 whereas 6.81% of children were of *Tamasika Prakruti* with Mean Overall IQ score of 95.6. [Chart 3]

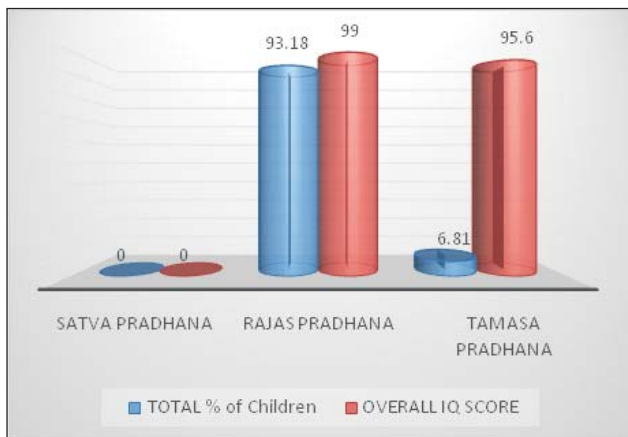


Chart 3: Manasika Prakruti wise distribution of children

Performance in the school of 34.08% children was good with Mean IQ Score of 97.8, 59.08% children had average school performance in school with Mean IQ Score of 91.4 and 6.81% children had poor school performance in school with Mean IQ Score of 89.2. [Chart 4]

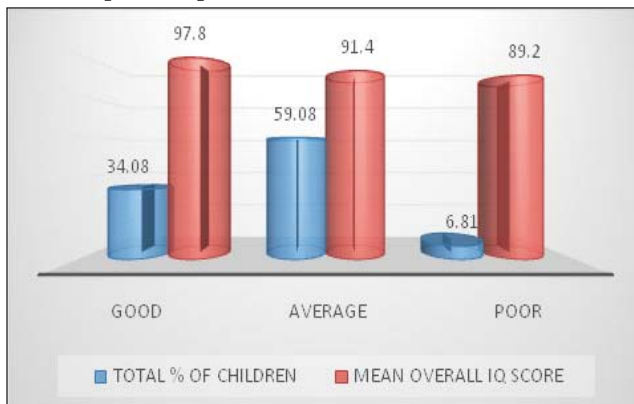


Chart 4: Distribution of children based on their performance in school

11.36% of children had music system (Radio/tape recorder) as a source of entertainment with a mean IQ score of 97.5, 81.81% of children in whom the main source of entertainment was television had a mean IQ score of 97.3 and 9.09% had neither of the above two sources and had a mean IQ score of 96.2.

43.18% of children had normal temperament with Mean Overall IQ Score of 98.9, 22.72% had calm temperament with Mean Overall IQ Score of 97.27 and 34.09% had aggressive temperament with Mean Overall IQ Score of 95.6.

Results:

On Verbal IQ:

Statistical results in Group A (efficacy of *Shatapushpa Choorna*) on verbal IQ showed Highly

Significant test values after completion of treatment & after follow up i.e. $p < 0.0001$. Suggesting the efficacy of the drug was sustained even after stopping the medication. However there was slight decrease in the Mean IQ score after follow up which was not significant statistically.

Statistical results in Group B (efficacy of Placebo) on verbal IQ showed insignificant test values after completion of treatment i.e. $p = 0.681$ and after follow up i.e. $p = 0.7974$.

On Performance IQ:

Statistical results in Group A on performance IQ showed Highly Significant test value ($p < 0.0001$) after treatment & after follow up.

Statistical results in Group B on performance IQ showed Negative probability i.e. there was reduction of performance IQ score ($p = 0.0001$) after completion of treatment & after follow up ($p < 0.0001$) which was statistically significant.

On Overall IQ:

Statistical results in Group A (efficacy of *Shatapushpa Choorna*) on overall IQ showed Highly Significant test value ($p < 0.0001$) after treatment & after follow up ($P < 0.0001$). Suggesting that there was an increase in mean IQ score of children. (Table 1)

Statistical results in Group B (efficacy of Placebo) on overall IQ shows, Negative probability ($P = 0.003$) after completion of treatment & after follow up ($P < 0.0001$) i.e. there was reduction of overall IQ score significantly. (Table 2)

On Comparison:

When comparing the means of verbal IQ of two groups after treatment & follow up it was observed that there is highly significant improvement of verbal IQ in Group A than in Group B

When comparing the means of performance IQ of two groups after treatment & follow up it is observed that there was highly significant improvement of performance IQ in Group A than in Group B.

It is observed that when comparing the means of overall IQ score between Group A & B the results shows Highly Significant effect ($p < 0.0001$) in improving the overall IQ score after completion of treatment & after follow up in Group A (*Trial Drug - Shatapushpa Choorna*) than in Group B (Placebo) (Table 3)

DISCUSSION:

Intelligence is a vital essentiality in day today life in its purest and enriched form, especially in children who have to build up their life in an appropriate manner as individuals with high level of intellectual power are inevitable for the current competitive era [10].

To assess intelligence level of a child many factors come into play like his family, social, cultural, scholastic background, mental status of the child during testing procedure, environment where the test is

conducted, the abilities and disabilities of the child in understanding the commands etc. Therefore one such test was necessary that would give an appropriate measure of IQ overcoming all the above differences and variations. By considering all the above factors Indian adaptation of Wechsler's intelligence scale for children (WISC) Malin's intelligence scale for Indian children (MISIC) was selected which has been constructed carefully suiting the standards of Indian children after scientific standardization of samples test items and establishments of the norms [9].

Table 1: Statistical results on OVERALL IQ in GROUP A (BT, AT & after follow up)

| | BT-AT | BT-AFTER FOLLOW UP |
|-------------------------|--------------------|---------------------------|
| Mean IQ Score BT | 92.7727 | 92.7727 |
| Mean IQ Score AT | 105.7045 | 105.1045 |
| Mean Difference | 12.9318 | 12.3318 |
| SD | 3.0565 | 2.9110 |
| SE | 0.651 | 0.620 |
| df | 21 | 21 |
| t | 19.845 | 19.870 |
| p | p<0.0001 | p<0.001 |

(BT- Before Treatment, AT- After treatment)

Table 2: Statistical results on OVERALL IQ in GROUP B (BT, AT & after follow up)

| | BT-AT | BT-AFTER FOLLOW UP |
|------------------|--------------|---------------------------|
| Mean IQ Score BT | 101.7591 | 101.7591 |
| Mean IQ Score AT | 99.4682 | 99.6591 |
| Mean Difference | -2.2909 | -2.100 |
| SD | 2.4783 | 1.9268 |
| SE | 0.5284 | 0.4108 |
| df | 21 | 21 |
| t | -4.336 | -5.112 |
| p | p<0.005 | p<0.0001 |

(BT- Before Treatment, AT- After treatment)

Table 3 - comparison of means (t-TEST) of two groups on overall IQ score (at & after follow up)

| | Overall IQ (After Treatment) | Overall IQ (After Follow Up) |
|-----------------|------------------------------|------------------------------|
| Mean difference | 15.2227 | 14.3318 |
| SE | 0.83894 | 0.74427 |
| df | 42 | 42 |
| t | 18.145 | 19.391 |
| p value | p<0.0001 | p<0.0001 |
| | Overall IQ (After Treatment) | Overall IQ (After Follow Up) |
| Mean difference | 15.2227 | 14.3318 |
| SE | 0.83894 | 0.74427 |

(BT- Before Treatment, AT- After treatment)

Shatapushpa Choorna was found to be highly effective in improving Verbal IQ (14.64%), Performance IQ (13.34%) and Overall IQ (13.93%) in children of Group A after treatment and the efficacy of medicine was sustained even after follow up period where Verbal IQ showed improvement in 13.39%, Performance IQ in 11.97% and Overall IQ in 13.29% children.

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 amnestic agents and also results in positive effect on higher mental functions without undue stimulation.

Sub-tests in Verbal scale assess general knowledge, factual knowledge, long term memory, social and practical judgment, short term auditory memory, concentration and numerical reasoning, etc. Sub-tests in performance scale assess attention power, alertness to visual details and visual discrimination, visual-motor skills, coordination, short term visual memory, nonverbal intelligence, spatial analysis, grapho-motor planning, fine visual-motor coordination, etc. *In a nut shell* all the above factors can be considered as various functional aspects of *Medha* and *Smruthi* itself. Hence improvement of these functional aspects can be considered as increase of *Medha & Smruthi* in Group A.

The mode of action of the drug may be, up to certain extent, understood on the basis of *Rasa Panchaka* and its effect over the *Agni* and *Manovahasrotas*.

Tikta Rasa [11] by virtue of its *Akasa* and *Vayu Mahabhutas*, *Laghu Guna*, *Dipana*, *Pachana* and *Sroto Visodhana Karma* acts as *Medhya*. *Madhura Rasa* [6] (according to *Kashyapa*) is said to be '*Sadindriya Prasadaniya*' [12] and must therefore have a direct effect over the site of the *Indriyas* i.e. *Sirah*. The drug is *Ushna Virya* [11] predominant and hence probably acts by dispelling the *Tamas* and vitiated *Kapha* from *Hrudaya* and *Manovahasrotas*. It also boosts the *Pachaka Pitta*. Thus the unhampered status of *Agni (Bhutagni)* takes care of nutrition of the *Indriyas*. It may also regulate the functions of *Alochaka and Sadhaka Pitta*, [13] thereby improving the *Grahana Shakti* and *Smruthi*. *Ghrutha* along with honey has been

used as *anupana* which is a lipid media and helps the drug easily cross blood-brain barrier thereby directly affecting various centres of intelligence in brain.

Conclusion & Future Avenue:

By observing the results obtained it can be concluded that *Shatapushpa Choorna* indeed possesses a significant efficacy in improving *Medha* (IQ). No adverse reaction was noted throughout the period of study. The drug by the virtue of its properties might have brought about the increase in IQ. The present study was done on minimum sample size and upon children studying in government schools. The efficacy of trial drug *Shatapushpa* on a larger population across all the private, international and residential schools will be helpful in yielding a significant statistical result. Further study is encouraged to assess the efficacy of *Shatapushpa Choorna* in those children who are falling in mentally retarded category and on children not attending school in future studies can also be suggested.

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