AYU

Access this article online

Website: www.ayujournal.org

DOI: 10.4103/0974-8520.169011

Quick Response Code:

Clinical Research

Randomized placebo-controlled clinical study on enhancement of *Medha* (intelligence quotient) in school going children with *Yahstimadhu* granules

Srihari Sheshagiri, Kalpana S. Patel[1], Rajagopala S.[1]

Department of Kaumarabhritya, Mahatma Gandhi Ayurved College, Hospital and Research Centre, Wardha, Maharashtra, [1]Department of Kaumarabhritya, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, Gujarat, India

Abstract

Introduction: Optimal intelligence is a vital essentiality in day-to-day life, especially in children who have to build up their life in an apt manner. *Yashtimadhu* (*Glycyrrhiza glabra* Linn) is a time tested classical drug indicated for promotion of mental health mentioned in Ayurveda which may also help children to attain optimal intelligence. **Aim:** To evaluate the role of *Yashtimadhu* (*Glycyrrhiza glabra* Linn.) granules in enhancement of *Medha* (intelligence quotient [IQ]). **Materials and Methods:** The study was conducted on healthy school going children aged 14–16 years. Total 94 children were registered and divided into two groups. *Yashtimadhu* granules was administered in Group A and Wheat flour in the form of granules in Group B, the duration of treatment was 12 weeks with follow up of additional 12 weeks. Objective parameters included assessment of functional aspects of *Buddhi* (psychological faculty for reasoning and logic) along with the assessment of IQ, Quality of life parameters and general health condition. **Results:** *Yashtimadhu* granules showed statistically highly significant results in improving functional aspects of *Buddhi,* IQ, several aspects of quality of life parameters and health. The number needed to treat (NNT) with *Yashtimadhu* granules for children achieving an IQ score of 90 and above was 3.38, suggesting one in every 3.38 patients had achieved this target and for children achieving an IQ score of 110 and above the NNT was 6.66. **Conclusion:** *Yashtimadhu* granules was safe throughout the course of study and indeed possessed a significant efficacy in improving *Medha* (IQ).

Key words: Children, intelligence quotient, *Medha*, *Yashtimadhu* granules

Introduction

The memory demands for school age children are much greater than they are for adults and are continuously fed with new knowledge in various areas, which might be interesting or not to them. Moreover, children are expected to learn and remember them and repeat it during exams. Except when there is a marked deviation from the normal, young children are not aware of what their intellectual level is. The bright, for example, do not realize how bright they are, the dull are unaware of their dullness, and the average take their intelligence for granted. After they enter the school, children measure their level of intellectual power by the kind of adjustment they make to school work.[1]

Intelligence may be narrowly defined as the capacity to acquire knowledge and understanding, and used in different novel situations. It is this ability, or capacity, which enables the individual to deal with real situations and profit intellectually

Address for correspondence: Dr. Srihari Sheshagiri, Asst. Professor, Dept. of Kaumarabhritya, Mahatma Gandhi Ayurved College, Hospital and Research Centre, Wardha - 442 001, Maharashtra, India.
E-mail: dr.srihari@rediffmail.com

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Sheshagiri S, Patel KS, Rajagopala S. Randomized placebo-controlled clinical study on enhancement of *Medha* (intelligence quotient) in school going children with *Yahstimadhu* granules. Ayu 2015;36:56-62.

from sensory experience. Although it is difficult to define intelligence, indeed it appears to have no formal definition, there is, nevertheless, at least one particularly apposite definition: The capacity to learn and understand.[2]

In the Ayurvedic classics, the word "*Buddhi*" is used in many contexts. On studying it's literally meaning, (*Nirukti* and *Vyutpatti*) it can be understood as the psychological faculty for reasoning and logic. However, after critical analysis of classics, it is evident that at many places it has been used as an advance stage or as a process leading to a true knowledge. *Buddhi* is described as *Jnana* (knowledge).[3] The word "*Medha*" has been used mainly in two ways viz. *Grahana Shakti* (grasping power) and *Dharana Shakti* (retention power).[4] Besides this, *Buddhi*, *Smriti*, *Dhi*, etc., words have been used in a similar sense at many places.

Concept of improving cognitive functions like intelligence and memory is relatively very new to current modern system of medicine. The first drug discovered to enhance cognitive functions known as "Nootropics" were in 1972.[5] Knowledge of natural herbal drugs possessing cognitive enhancing activity dates back to thousands of century back. "*Medhya Rasayana*" is a specific group of four, time-tested classical preparations for promotion of mental health and well-being.[6] *Yashtimadhu* (*Glycyrrhiza glabra* Linn.) is one among them mentioned for these purpose by *Acharya* Charaka.[6]

Abundant works have been carried out on varied systemic actions of *Yashtimadhu* in different disorders. Despite its mentioning as a potent *Medhya Dravya* by ancient scholars, only a fewer works have been carried out on the same until date. In this regard, Ayurveda has a potential to make a significant contribution with a potent and cost-effective *Medhya Dravya*.

There are a number of different methods, which contend to measure intelligence, the most famous of which is the intelligence quotient (IQ), or IQ test.[1] The IQ is a score derived from one of several standardized tests designed carefully to assess intelligence. The method of testing *Medha* is explained as "*Grahanenaiti Granthadi Dharanena*"[4] that is, understanding the ability of the person to understand, grasp, remember, and recall the *Granthas* (books) after reading.

By considering the above facts, this study has been undertaken to assess the efficacy of *Yashtimadhu* in enhancement of IQ in school going children.

Materials and Methods

Healthy school going children of 9th and 10th standard (aged 14–16 years) of either sex irrespective caste, religion, and socioeconomic status were duly registered in the outpatient department of *Kaumarabhritya* Department. The study was started after obtaining the consent of the patients. The written consent was detailed in the local language and explained orally too regarding the type and course of study. The clinical study was started after the approval of Institutional Ethics Committee (No. PGT/7-A/Ethics/2010–2011/3381) and the research work has been registered in Clinical Trial Registry of India (CTRI)-CTRI/2011/11/002136 (Registered on: 16/11/2011)-retrospectively. It is a randomized (random number table method), placebo-controlled clinical study.

Inclusion criteria

Children of 9th and 10th standard (aged 14–16 years) with IQ score ranging 70–109 (Scores obtained after conducting verbal and performance subtests) were included.

Exclusion criteria

Children suffering from any systemic disorders, which may turn out to be hindrance in the study

Grouping and posology

The subjects included in the clinical trial were be divided into two groups namely,

- Group A (Trial group) – *Yashtimadhu* granules in the dose of 12g per day with luke warm milk[6,7]
- Group B (Placebo controlled group) –Wheat flour in the form of granules in the dose of 12g per day with luke warm milk.

In both the groups drugs were administered in *Apana Kala* (before breakfast) for 12 weeks. Follow up study was conducted after 12 weeks of completion of treatment. Test drugs were prepared and procured from - Pharmacy, Gujarat Ayurved University, Jamnagar.

Laboratory investigation

Routine hematological, biochemical, urine, stool (routine and microscopic) investigations were carried to rule out any other pathological condition.

Assessment criteria

Effect of therapy was assessed by using following parameters-

A. Functional aspects of Buddhi

		Score
1.	***Medham Grahanena***	
	a. Can grasp the event at an instance, no confusional status	3
	b. Can grasp the event at an instance but gets confused	2
	c. Delayed grasping with frequent confusion	1
	d. Grasping and understanding is difficult with lack of confusion	0
2.	***Smritim Smaranena***	
	a. Both remote and recent memory are clear with easy retention and recall	3
	b. Both remote and recent memory clear but retention and recall are not seen	2
	c. Remote memory is impaired but recent memory is intact. Power of retention and recall not seen	1
	d. Both remote and recent memory are impaired With difficult retention and recall	0
3.	***Dhriti Alaulyena***	
	a. Courageous on all occasions	3
	b. Courageous if supports are there	2
	c. Occasionally courageous if strong support is there	1
	d. No change at all	0
4.	***Vijnana Vyavasayena***	
	a. Self efficient and sufficient to direct and do various activities himself	3
	b. Self efficient and sufficient to direct and do various activities with help of others	2

c. Not self efficient and sufficient, guidance required in each and every work 1
d. Cannot do or direct any activity with loss of insight 0

B. WHO quality of life parameters

Quality of life was assessed as per WHO guidelines.[8]

C. Rogi Bala (general health condition)

I. Agnibala

1. ***Abhyavaharana Shakti (capacity to ingest):***

	Score
a. Having food in good quantity twice/ thrice	6
b. Having food in normal quantity twice a day	5
c. Having food in moderate quantity twice a day	4
d. Having food in less quantity twice a day	3
e. Having food in less quantity once in a day	2
f. Not at all having food	1

2. ***Jarana Shakti*** **(capacity to digest):**

Scoring according to *Jeerna Ahara Lakshaana* present after 6-8 hrs after having food; *Utsaha, Laghuta, Udgarashuddhi, Kshut Trishna Pravritti, Yathochita Malotsarga.*

Jarana Shakti:	Score
a. Absence of any symptom	1
b. Presence of one symptom	2
c. Presence of any two symptoms	3
d. Presence of any three symptoms	4
e. Presence of any four symptoms	5
f. Presence of five symptoms	6

3. ***Ruchi Aharakale*** **(capacity to relish taste while eating):**
   a. Totally unwilling for meals 1
   b. Unwilling towards food but could take the meal 2
   c. Willing towards only most liking foods and not others 3
   d. Willing towards only one among *Katu/ Amla/ Madhura* foodstuffs 4
   e. Willing towards some specific *Ahara/ Rasavishesha* 5
   f. Equally willing towards all the *Bhojya Padartha* 6

4. ***Vata Mutra Retasam Mukti*** **(frequency of bowel and urine evacuation):**
   a. Passes stool after 3-4 days with *Grathitha, Sakashta Malapravritti* and having gaseous distension with Udgarapravritti 1
   b. Passes stool after 2-3 days having gaseous distension 2
   c. Can't pass stool daily and feeling heaviness in abdomen 3
   d. Difficulty in defecation, but daily with discomfort in abdomen 4
   e. Occurs easily in normal routine times 5

II. Dehabala

1. ***Balavriddhi*** **(capacity for work):**
   a. No weakness 1
   b. Slight weakness 2
   c. Feeling weakness but ability to work unaffected 3
   d. Ability to work affected 4
   e. Can't do any type of work 5

2. ***Swara Varna Yoga*** **(accession of voice and complexion):**
   a. Patient looks cheerful 1
   b. Lethargic and tired 2
   c. Looks gloomy 3

3. ***Sharira Upachaya*** **(accession of body weight):**
   a. No change 1
   b. Increase in weight by 2 kg 2
   c. Increase in weight by more than 2 kg 3

III. Satva / Chetas Bala

1. ***Nidra Labho Yathakalam*** **(status of sleep):**
   a. No sleep in day or night 1
   b. Disturbed sleep in night and tries to compensate in day 2
   c. Sleeps with disturbed intervals and remains unsatisfied 3
   d. Sleep gets disturbed in early morning 4
   e. Sound sleep 5

2. ***Sukhena Cha Pratibodhanam*** **(feeling of well being):**
   a. Not feeling well and not interested in any work 1
   b. Improved in physical and mental level 2
   c. Improved in physical comfort level 3
   d. Total relief and feeling of well being at physical and mental level 4

3. ***Vaikarikanam Cha Swapnanam Adarshanam*** (absence of discomforting dreams):
   a. Daily 1
   b. Occasionally 2
   c. Absent 3

4. ***Mano Buddhi Indriya Avyapatti*** **(clarity of mind, intellect and sense organs):**
   a. Loss of enthusiasm, concentration and vigour 1
   b. Less enthusiastic and not interested in routine work 2
   c. Less enthusiastic and not concentrating but interested in routine work 3
   d. Enthusiastic, vigorous, having concentration and interest in routine work 4

D. Intelligence quotient

Clinical response to medication was assessed based upon the objective parameter IQ (IQ test performance which was done before and after treatment). Scores obtained in each item from the score table of IQ subtests that is, verbal and performance scales were considered as the individual criteria.[8]

Assessment of total effect of therapy

The improvement in functional aspects of *Buddhi*, IQ scores, quality of life (QoL) parameters was considered in the final assessment along with the improvement in the general health condition viz. *Dosha, Agni* and *Bala* of the children.

Statistical analysis

Student '*t*' - test was the statistical tool used to assess and compare the efficacy of treatment.

Observations

In this study, a total of 94 children were registered based on inclusion criteria. Fifty-one in Group A and forty three in Group B. Out of them forty in Group A and thirty five in Group B completed the treatment.

Males represented 43.15%, and females were 56.85% with a mean IQ score of 88.04 and 89.8 respectively. About 28.33% of children in the trial were aged between 15 and 16 years and had a comparatively higher mean of IQ score of 91.57 then other aged children. There were 4.35% of children belonging to upper socioeconomic status with a comparatively higher mean of IQ score 99.5 than their compatriots. About 10.5% of children were studying in private English medium school with a comparatively higher mean IQ score of 95.93%. Among these, 3.1% of children's father and mother were educated till master degree and had a higher mean IQ score of 102.4 and 95.27 respectively.

Results

Efficacy on functional aspects of *Buddhi*

On comparing, the efficacy of trial drug and placebo drug over the functional aspects of *Buddhi*, trial drug *Yashtimadhu* granules showed statistically highly significant changes in increasing *Medha* ($P < 0.0001$), *Smriti* ($P < 0.0005$), *Dhriti* ($P < 0.05$) and *Vijnana* ($P < 0.05$) [Table 1].

Efficacy on WHO quality of life parameter

On comparing, the efficacy of trial drug and placebo drug over the WHO QOL parameter, *Yashtimadhu* granules showed statistically significant changes in improving physical health ($P < 0.05$) and highly significant results in improving psychological health ($P < 0.001$) on all other parameters, there were no significant changes between the two groups [Table 2].

Table 1: Comparative efficacy of *Yashtimadhu* and placebo granules on functional aspects of *Buddhi*

Parameters	df	Mean difference		Mean difference	*t*	*P*
		Group A	Group B			
Medha	73	0.775	0.228	0.7679	5.596	<0.0001
Smruti	73	0.650	0.314	0.5179	3.774	<0.0005
Dhruti	73	0.225	0.1429	0.2679	2.779	<0.05
Vijnana	73	0.200	0.1429	0.1786	2.321	<0.05

Table 2: Comparative efficacy of *Yashtimadhu* and placebo granules on WHO QoL parameter

Parameters	df	Mean difference		Mean difference	*t*	*P*
		Group A	Group B			
General health	73	0.7	0.457	0.2821	0.849	>0.0.5
Physical	73	0.95	0.085	1.4357	2.772	<0.05
Psychological	73	1.02	0.285	0.7393	3.463	<0.001
Social	73	0.37	0.200	0.4429	1.320	>0.0.5
Environmental	73	1.00	0.400	1.0929	1.729	>0.0.5

QoL: Quality of life, WHO: World Health Organization

Efficacy on general health condition

On comparing, the efficacy of trial drug and placebo drug on parameters of general health condition, trial drug provided statistically significant improvement by increasing *Bala*, *Swara*, *Varna* (complexion), *Nidra*, *Sukhena Cha Pratibodhanam*, and *Mano Buddhi Indriya Avyapatti* ($P < 0.05$). On all other parameters, there were no significant changes noted between the drugs [Table 3].

Efficacy on intelligence quotient

On comparing the efficacy of trial drug and placebo drug over IQ, the trial drug *Yashtimadhu* granules provided statistically significant results in improving verbal IQ ($P < 0.05$) and statistically highly significant results in improving performance and full score IQ ($P < 0.0005$) [Table 4].

Overall outcome of therapy on intelligence quotient

In Group A, before treatment 42.5% and 57.5% of children belonged to dull IQ (70–89) and average IQ (90–109) category respectively, whereas after treatment 2.5% and 77.5% of children belonged to dull and average IQ category respectively. There were no children with superior IQ (110–124) category before treatment, whereas after treatment 20% of children belonged to superior IQ category [Figure 1].

In Group B, before treatment 62.8% and 37.2% of children belonged to dull IQ and average IQ category respectively, whereas after treatment 31.4% and 62.8% of children belonged to dull and average IQ category respectively. There were no children with superior IQ category before treatment, whereas after treatment 5.8% of children belonged to superior IQ category [Figure 2].

Evidence-based analysis

The number needed to treat (NNT) to achieve the target of IQ score minimum 90 and above was 3.38, which suggested that 1 out of every 3.38 children who were administered with *Yashtimadhu* granules achieved IQ score of 90 and above, which was statistically highly significant ($P < 0.005$). The odd's ratio for achieving this target was 17.88.

The NNT to achieve the target of IQ score minimum 110 and above was 6.66. This suggests that one out of every 6.66 children achieved IQ score of 110 and above after administering *Yashtimadhu* granules which was statistically insignificant ($P > 0.05$). The odd's ratio for achieving this target was 4.16 [Table 5].

Discussion

Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning and to overcome obstacles by their thoughts. Although these individual differences can be substantial, they are never entirely consistent: A given person's intellectual performance will vary in different occasions, and in different domains, as judged by different criteria. Concepts of "intelligence" are attempts to clarify and organize this complex set of phenomena. Although

Table 3: Comparative efficacy of *Yashtimadhu* and placebo granules on general health parameters

Parameters	df	Mean difference		Mean difference	*t*	*P*
		Group A	Group B			
Abhyavaharana Shakti (capacity to ingest)	73	0.45	0.23	0.2786	1.617	>0.0.5
Jarana Shakti (capacity to digest)	73	0.50	0.17	0.1929	1.425	>0.0.5
Ruchi Aharakale (capacity to relish taste while eating)	73	0.50	0.14	0.1107	0.735	>0.0.5
Vata Mutra Retasam Mukti (frequency of bowel and urine evacuation)	73	0.27	0.17	0.0179	0.133	>0.0.5
Balavriddhi (capacity for work)	73	0.52	0.11	0.6214	2.948	<0.05
Swara Varna Yoga (accession of voice and complexion)	73	0.15	0.08	0.1464	2.216	<0.05
Sharira Upachayam (accession of body weight)	73	1.57	1.54	0.0321	0.170	>0.0.5
Nidra Yoga (Status of sleep)	73	0.32	0.17	0.3107	2.678	<0.05
Sukhena Cha Pratibodhanam (felling of well being)	73	2.55	2.05	0.4929	3.452	<0.05
Vikaranam Cha Swapnam Adarshanam (absence of discomforting dreams)	73	0.12	0.17	0.1571	1.534	>0.0.5
Mano Buddhi Indriya Avyapatti (clarity of mind, intellect and sense organs)	73	0.32	0.14	0.2714	2.772	<0.05

Table 4: Comparative efficacy of *Yashtimadhu* and placebo granules on intelligence quotient (IQ)

Parameters	df	Mean difference		Mean difference	*t*	*P*
		Group A	Group B			
Verbal IQ	73	7.09	3.93	5.1686	2.190	<0.05
Performance IQ	73	12.19	8.41	10.926	3.968	<0.0005
Full score IQ	73	9.67	6.22	8.0083	3.739	<0.0005

IQ: Intelligence quotient

Table 5: Number need to treat (NNT)

Target	NNT	Significance (*P*)
IQ score of 90 and above	3.38	<0.005
IQ score of 110 and above	6.66	>0.05

IQ: Intelligence quotient, NNT: Number needed to treat

considerable clarity has been achieved in some areas, no such conceptualization has yet answered all the important questions and none commands universal assent.[9]

To assess intelligence level of a child, many factors come into play such as his family background, social background, cultural background, scholastic background, mental status of the child during the testing procedure, environment where the test is conducted, the abilities and disabilities of the child in understanding the commands, etc.[10] 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 – Malin's intelligence scale for Indian children 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.[8]

Medha is understood by *Grahana* and *Dharana Shakti* (grasping and retention power), *Smriti* by *Smarana Shakti* (recalling power), *Dhriti* by *Aloulyata* (absence of distraction) and *Vijnana* (nature and capacity to perform task alone).[4] Hence, improvement in these functional aspects of *Buddhi* suggests improvement in the factors analyzed by them.

The factors used to analyze them where IQ test used in the study, which consisted of five verbal and five performance subtests. Verbal IQ tests measured general knowledge, factual knowledge, long-term memory, social – practical judgment, short-term auditory memory, concentration, and numerical reasoning.[8] Whereas performance IQ measured attention power, alertness to visual details and visual discrimination, visual-motor skills, coordination, short-term visual memory, nonverbal intelligence, spatial analysis, graphomotor planning, fine visual-motor coordination.[8]

Based on the entities measured by IQ test and improvement in IQ score, it was understood that improvement in general knowledge, factual knowledge, and numerical reasoning as improvement in *Grahana* and *Dharana Shakti*, improvement in long-term memory, short term auditory memory and short term visual memory as improvement in *Smriti*, improvement in concentration, attention power, alertness to visual details and visual discrimination and fine visual-motor coordination as improvement in *Dhriti*, improvement in nonverbal intelligence, spatial analysis, graphomotor planning, along with general knowledge, factual knowledge as improvement in *Vijnana*.

The factors measured by these IQ subtests can be related with assessment of *Medha*, *Smriti*, *Dhriti* and *Vijnana* mentioned by Acharya Charaka[4] in many ways, hence improvement in these factors was considered as functional increase of *Medha*, *Smriti*, *Dhriti* and *Vijnana*.

Improvements in physical ($P < 0.05$) and psychological health ($P < 0.001$) parameters of World Health Organization-QOL BREF suggest that the trial drug by the virtue of its *Balya* (promoters of strength), *Bruhmana* (roborant) and *Rasayana Karma* (rejuvenation) might have brought in these changes.

The improvement in the parameters of general health parameters can be attributed to the properties of the drug itself.[11]

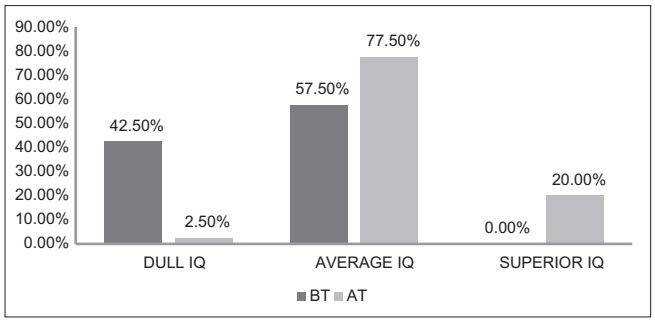

Figure 1: Overall effect of therapy on intelligent quotient in Group A

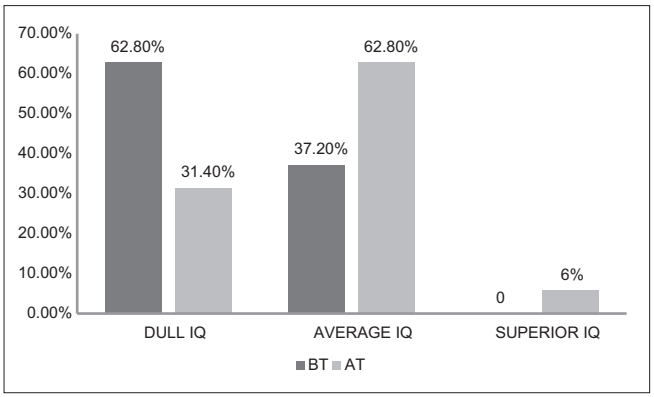

Figure 2: Overall effect of therapy on intelligent quotient in Group B

The mode of action of *Yashtimadhu* in improving *Medha* and IQ can be explained through pharmacodynamic properties and chemical constituents present in it. *Prabhava* (un explainable action) of *Yashtimadhu* brings about *Medhya* actions. "*Sadindriya Prasadaniya*" *Karma* of *Madhura Rasa* (sweet taste)[11] present in *Yashtimadhu* nourishes *Manas* and *Buddhi*. *Snigdha Guna* (unctuous property) *Madhura Rasa* and *Madhura Vipaka* properties of *Yashtimadhu*[11] regulate the *Chala Guna* (moveable property) of *Vata* and thereby influence the functions of *Manas* and *Buddhi*. Glycyrrhizin is generally regarded as the active principle of *G. glabra* and is responsible for its sweetness, which is 50 times that of sucrose,[12] it thereby increases the bioavailability of glucose at brain level and thereby enhancing the activity of brain.[13] Presence of flavonoids which are potent antioxidants plays a vital role in preventing oxidative damage to the brain and thereby enhancing the functions of brain.[14] It also possesses acetyl cholinesterase inhibitory activity, which enhances the action and duration of neurotransmitter acetylcholine in central cholinergic pathways, which plays a prominent role in the learning and memory processes.[15]

Conclusion

Intelligence is a vital essentiality in day-to-day life, especially in children. *Medha*, *Smriti*, *Dhriti* and *Vijnana* can be considered as the functional aspects of *Buddhi*, and are interrelated with each other and are responsible for acquiring, storing and recalling knowledge. Entities measured by verbal and performance IQ scale had similarity to those mentioned for assessing *Medha*, *Smriti*, *Dhriti* and *Vijnana* by Acharya Charaka, hence improvement in IQ score suggested improvement in above functional aspects of *Buddhi*. No adverse reaction was found during the course of study and follow-up. By observing the results obtained, it can be concluded that *Yashtimadhu* Granules at given dose and duration indeed possesses a significant efficacy in improving *Medha* (IQ).

Acknowledgments

The authors would like to acknowledge scholars of Dept. of Kaumarabhritya, IPGT and RA, Jamnagar for providing their help during conduction of this study. They are in debt to all those school going children in and around Jamnagar who happily volunteered to be part of this research work. The authors would also like to render their gratitude to Dr. Jyothy K B, Asst. Prof. Dept. of Kaumarabhritya, Mahatma Gandhi Ayurved College, Hospital and Research Centre, Wardha, Maharashtra for her valuable contribution throughout the study.

Financial support and sponsorship

IPGT and RA, Gujarat Ayurved University, Jamnagar, Gujarat, India.

Conflicts of interest

There are no conflicts of interest.

References

1. Thorne G. Strategies to enhance student's memory. CDL's on-line library. Available from: http://www.cdl.org/resourcelibrary/articles/memory_strategies_May06.php. [Last accessed on 2012 Oct 10].
2. Carter P. The Complete Book of Intelligence Tests. The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, England: Published by John Wiley and Sons Ltd.; 2005
3. Acharya YT, editor. Charaka Samhitha of Agnivesha, Sutra Sthana, Ch. 1, Ver. 54. Reprint ed. Varanasi: Chaukamba Orientalia; 2011. p. 14.
4. Acharya YT, editor. Charaka Samhitha of Agnivesha, Vimana Sthana, Ch. 4, Ver 8. Reprint ed. Varanasi: Chaukamba Orientalia; 2011. p. 247.
5. Giurgea C. Pharmacology of integrative activity of the brain. Attempt at nootropic concept in psychopharmacology. Actual Pharmacol (Paris) 1972;25:115-56.
6. Acharya YT, editor. Charaka Samhitha of Agnivesha, Chikitsa Sthana, Ch. 1/3, Ver. 30. Reprint ed. Varanasi: Chaukamba Orientalia; 2011. p. 385.
7. Moorthy KR. Sharangadhara Samhitha of Sharangadhara, Purva Khanda. 6th ed. Varanasi: Chaukhambha Orientalia; 2006. p. 84.
8. Malin AJ. Malin's Intelligence Scale for Indian Children. Agra: National Psychological Corporation; 1969. p. 1-4.
9. Ulrich N, Boodoo G, Bouchard TJ, Wade Boykin A, Brody N, Cecy SJ, *et al.* Intelligence: Knowns and unknowns. Am Psychol 1996;51:77-101.
10. Shyam R, Khan A. Clinical Child Psychology. Ch. 14. New Delhi: Kalpaz Publication; 2009. p. 276-7.
11. Pandey G. Dravyaguna *Vijnana* Part II. Varanasi: Chaukambha Krishnadas Acadamy; 2004. p. 462-8.
12. Hikino H. Recent research on oriental medicinal plants. In: Wagner H, Hikino H, Farnsworth NR, editors. Economic and Medicinal Plant Research. Vol. 1. London: Academic Press; 1985. p. 53.
13. Gold PE. Role of glucose in regulating the brain and cognition. Am J Clin Nutr 1995;61 Suppl: 987-95.
14. Dhingra D, Parle M, Kulkarni SK. Memory enhancing activity of *Glycyrrhiza glabra* in mice. J Ethnopharmacol 2004;91:361-5.
15. Pohanka M. Acetylcholinesterase inhibitors: A patent review (2008-present). Expert Opin Ther Pat 2012;22:871-86.

हिन्दी सारांश

पाठशाला अध्ययनरत बच्चों में मेधा वृद्धि पर यष्टिमधु कणिकाओं का चिकित्सकीय अध्ययन

श्रीहरि शेषागिरी, कल्पना एस.पटेल, राजगोपाल एस.

दिन प्रतिदिन जीवन में सर्वोत्तम बुद्धि एक महत्वपूर्ण इकाई है, विशेष रूप से बच्चों में उपयुक्त तरीके से अपने जीवन का निर्माण करने के लिए है, वर्तमान अध्ययन मेधा बढ़ाने में यष्टिमधु की भूमिका का मूल्यांकन करने के लिए किया गया है। वर्तमान कार्य १४–१६ वर्ष आयु वर्ग के स्कूल जा रहे स्वस्थ बच्चों पर एक यादृच्छिक, एक केन्द्र निर्धारित खुराक, समानांतर समूह, प्लेसिबो नियंत्रित अध्ययन के रूप में डिज़ाइन किया था। उद्देश्य मापदंडों में बुद्धिलब्धि (आईक्यू), जीवन मापदंडों और आधार रेखा पर रोगी बाल की गुणवत्ता और बाद में १२ सप्ताह के आंकलन के साथ बुद्धि अर्थात मेधा, स्मृति, धृति और विज्ञान के कार्यात्मक पहलुओं का आंकलन शामिल थे। उपयुक्त सांख्यिकीय उपकरण, साक्ष्य आधारित नैदानिक अध्ययन में उन नैदानिक व्यवहार का इस्तेमाल किया गया, जो बेहतर विश्लेषण और परिणाम की व्याख्या में सीधा प्रभाव करता है। यष्टिमधु कणिकाओं, बुद्धि के कार्यात्मक पहलुओं में सुधार लाने के साथ जीवन मापदंडों और रोगी बल की गुणवत्ता के कई पहलुओं में सांख्यिकीय अत्यधिक महत्वपूर्ण परिणाम मिले। यष्टिमधु कणिकायें लेने के बाद ३.३८ बच्चों को ९० (औसत श्रेणी) से ऊपर का आईक्यू स्कोर हासिल हुआ। मतलब हर ३.३८ रोगियों में से एक इस लक्ष्य को हासिल किया था जो सांख्यिकीय द्रष्टि से अत्यधिक महत्वपूर्ण था (पी<0.००५)। ११० का आईक्यू स्कोर(सुपीरियर श्रेणी) को प्राप्त करने के लिए, ६.६६ एन.एन.टी. था जो सांख्यिकीय द्रष्टि से तुच्छ था। यष्टिमधु कणिकायें वास्तव में मेधा और बुद्धि परीक्षण के माध्यम से मूल्यांकन विभिन्न घटकों में सुधार लाने में एक महत्वपूर्ण प्रभाव था।