



## A Comparative Clinical Study to Assess the *Medhya* Effect of *Pathadi Ghrita* and *Vacha Rasayana* In School Going Children

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### Abstract

In the present competitive era, enhancement of cognitive functions in children is essential. Ayurveda describes *Medhya Rasayana* drugs that improve intellect through *Dhi*, *Dhriti* and *Smriti*.

**Methods:** A prospective, interventional, randomized, open-label double-arm clinical study was conducted on 40 children (6–12 years), divided into two groups. Group I received *Pathadi Ghrita* and Group II received *Vacha Rasayana* for 30 days with a 30-day follow-up. Assessment was done using subjective parameters and Raven's Progressive Matrices for IQ evaluation

**Results:** Both groups showed improvement in cognitive parameters and IQ scores, with comparatively better results observed in the *Pathadi Ghrita* group.

**Discussion:** The *Medhya* and neuroprotective properties of the drugs may enhance cognitive functions.

**Conclusion:** *Pathadi Ghrita* and *Vacha Rasayana* are effective in improving intellect in children, with *Pathadi Ghrita* showing better than *Vacha Rasayana*.

**Keywords:** *Medhya Rasayana*, *Pathadi Ghrita*, *Vacha Rasayana*, Intelligence Quotient, Cognitive Function, Ayurveda.

### Introduction

In this era of global 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 paediatric population<sup>1</sup>.

While describing Health, WHO Considered Physical, mental and social acceptance of health, and physical health is directly related to mental health, poor health with poor mental state is responsible for poor Intellectual<sup>2</sup>.

'*Medha*' refers to intelligence or retention. *Medha* is mentioned in ayurveda in a wide sense. *Medhya* is made up of the three mental faculties, *Dhee*, *Dhriti* and *Smriti* which are all interconnected. *Medhya* drug is beneficial in two types of situations; healthy and ill. In order to boost general intelligence in healthy person. In neurological and Psychiatric illnesses, memory loss, cognitive deficiencies, poor mental function, and other intelligence-related symptoms are common. *Dhriti*, which has control over the functions of *Manas* is reduced by *Rajas Ahara*. Other causes include an inability to control one's thoughts, excessive pondering, a lack of confidence, failure to attain set goals and a person who falls behind<sup>3</sup>. For the successful survival of man in this competitive world there is a need for promotion of mental health and management of various psychological and psychosomatic problems. In the Era of competitive world, Buddhi/Intelligence is a vital essentiality and this competition spirit is being injected by the society even to the brain of infants and children<sup>3</sup>. The first evidence of mind(*manas*) conceptualized as an inner flame of knowledge is found in Vedic-period i.e. Yajurveda 1200-800BCE, where it is described as a medium for perception and memory. While Atharvaveda mentions consciousness, power, emotion, inspiration is governed by *Manas*. Later in Charak Samhita, Acharya has elaborated about *Manas*, its *Guna* and *Karma*. While describing three *gunas* *satva*, *rajas* and *tamas* he has mentioned that mental illness is the result of an imbalance in *rajas* or *tamas*. *Satva* never leads to mental disorder and that's why *rajas* and *tamas* have been described as *mansika doshas*.

Intelligence has been defined in many different ways including, but not limited to, abstract, understanding, self-awareness, communication, reasoning, learning, having emotional knowledge, retaining, planning and problem solving<sup>4</sup>.

### Aim & Objectives

The study aimed to evaluate *Medhya* (*Dhee*, *Dhriti* and *Smriti*) according to Ayurveda and contemporary science, analyze *Pathadi Ghrita* and *Vacha Rasayana*, assess changes in Intelligence Quotient and evaluate academic stress in school-going children.

## Materials & Methods

An open-label, randomised, double-arm study was conducted on 40 children aged 6-12 years at the Department of Kaumarbhritya, Shri Khudadad Dungaji Government Ayurvedic Hospital, Raipur(C.G.).

### Inclusion Criteria

Children aged between 6–12 years, irrespective of gender and socioeconomic status, who were willing and able to participate in the study and had an Intelligence Quotient (I.Q.) ranging from 70–124, were included in the study.

### Exclusion Criteria

Children below 6 years and above 12 years of age, children with congenital anomalies, CNS disorders, systemic disorders such as T.B. and HIV and metabolic disorders were excluded from the study.

### Withdrawal Criteria

Those who are not regular at follow up & Uncooperative patient.

### Assessment Criteria(Subjective)

The study assessed *Dhi* (power of grasping), *Dhriti* (power of retention), *Smriti* (memory) and *Vigyanyavyasayen* (ability), Stress, Appetite which are considered important components of *Medhya* in Ayurveda.

### Assessment Criteria(Objective): Evaluation Of IQ –

Intellectual assessment - Raven's Progressive Matrices Test (Dr. John C. Raven in 1936 in the UK)<sup>5</sup>

**Table No.01- Material of Pathadi Ghrita**

| S.NO. | Drug                         | Botanical Name                   | Part Use        | Ration         | Quantity |
|-------|------------------------------|----------------------------------|-----------------|----------------|----------|
| 1.    | <i>Patha</i> <sup>6</sup>    | <i>Cissampelos pareira</i> Linn  | <i>Panchang</i> | 1part          | 500g     |
| 2.    | <i>Vacha</i> <sup>6</sup>    | <i>Acorus calamus</i> Linn       | Stem            | 1part          | 500g     |
| 3.    | <i>Shigru</i> <sup>6</sup>   | <i>Moringa oleifera</i> Lam.     | Bark            | 1part          | 500g     |
| 4.    | <i>Haritaki</i> <sup>6</sup> | <i>Terminalia chebula</i> Retz.  | Fruit           | 1part          | 500g     |
| 5.    | <i>Sunthi</i> <sup>6</sup>   | <i>Zingiber officinale</i> Rosc. | Rhizome         | 1part          | 500g     |
| 6.    | <i>Marich</i> <sup>6</sup>   | <i>Piper nigrum</i> Linn         | Fruit           | 1part          | 500g     |
| 7.    | <i>Pippali</i> <sup>6</sup>  | <i>Piper longum</i> Linn         | Fruit           | 1part          | 500g     |
| 8.    | <i>Sandhav</i> <sup>7</sup>  | Rock- Salt                       | -               | 1part          | 500g     |
| 9.    | <i>Navneet</i> <sup>7</sup>  | Butter Milk                      | -               | 4 <i>Guna</i>  | 16kg     |
| 10.   | Water                        | -                                | -               | 16 <i>Guna</i> | 64lit.   |

### Collection Of Drugs:

Raw material i.e. *Patha*(*Panchang*), *Vacha*(Root), *Shigru*(Bark), *Haritaki*(Fruit), *Shunthi*(Rhizome), *Marich*(Fruit), *Pippali*(Fruit), *Sandhav*, Navaneet were purchased from local Ayurvedic raw drug market in Raipur chhattishgarh.

### Preparation Of Pathadi Ghrita:

*Pathadi Ghrita* was prepared in the Department of Rasashastra and Bhaishajya Kalpana, Government Ayurvedic College, Raipur, Chhattisgarh. The ingredients were coarsely powdered, soaked overnight in water and processed with prepared *ghee* obtained from *navneet* (butter). The mixture was cooked with sixteen times water on mild heat, reduced to half, filtered and finally 10 kg of medicated *Pathadi Ghrita* was obtained.

**Table No. 02: Material of Vacha Rasayana**

| S.NO. | DRUG                      | BOTANICAL NAME             | PART USE | QUANTITY |
|-------|---------------------------|----------------------------|----------|----------|
| 1.    | <i>Vacha</i> <sup>6</sup> | <i>Acorus calamus</i> Linn | Stem     | 2.5kg    |

### Preparation Of Vacha Rasayana:

*Vacha* (*Shodhit* rhizome of *Acorus calamus*) was procured from the local Ayurvedic raw drug market and authenticated by a Dravyaguna expert. The rhizomes were cleaned, shade dried, pulverized into fine powder, sieved through an 80# mesh for uniformity and stored in airtight containers for clinical use.

**POSOLOGY**

| Advice                             | Route/Dose/Form/Frequency/<br><i>Anupana</i>                                                                                                                                           | Duration of Treatment | Follow-ups during Treatment | Post Treatment Follow ups                | Instructions                                                                               |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------|------------------------------------------|--------------------------------------------------------------------------------------------|
| GROUP-I                            | Oral/ <i>Ghrita</i> /Dose According to young's formula, twice a day with <i>Madhu</i> (unequal)<br><br>Doses for child = $\text{Adult dose} \times \frac{\text{Age}}{\text{Age} + 12}$ | 30 Days               | Every 15th days             | Every 15 <sup>th</sup> days till 30 days | Routine diet and other food instructions. Avoid junk food Products and parents counseling. |
| <i>Pathadi ghrita</i> <sup>8</sup> |                                                                                                                                                                                        |                       |                             |                                          |                                                                                            |
| GROUP-II                           | Oral/ <i>Churna</i> /Dose According to young's formula,twice a day with <i>Madhu</i><br>Doses for child = $\text{Adult dose} \times \frac{\text{Age}}{\text{Age} + 12}$                |                       |                             |                                          |                                                                                            |
| <i>Vacha Rasayana</i> <sup>9</sup> |                                                                                                                                                                                        |                       |                             |                                          |                                                                                            |

| Age                | Dose of medicine(twice a day)                                                                                    |                       |
|--------------------|------------------------------------------------------------------------------------------------------------------|-----------------------|
|                    | Young's formula <sup>10</sup> –<br>Doses for child = $\text{Adult dose} \times \frac{\text{Age}}{\text{Age}+12}$ |                       |
|                    | <i>Pathadi Ghrita</i>                                                                                            | <i>Vacha Rasayana</i> |
| 6 - 8 year of Age  | 10 ml BD in divided dose                                                                                         | 50 mg BD divided dose |
| 9 - 12 year of Age | 15 ml BD divided dose                                                                                            | 70 mg BD divided dose |

**Observation:**

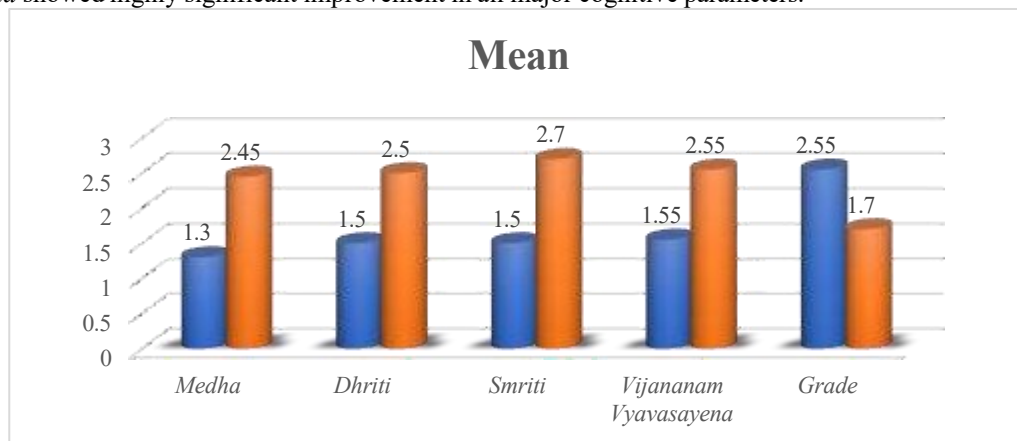
The present study With particular attention to *Dhi* (grasping power), *Dhriti* (retention power), *Smriti* (memory) and Intelligence Quotient (IQ), the current study was carried out to assess the *Medhya* effect of *Pathadi Ghrita* and *Vacha Rasayana* in school-age children. *Medhya Rasayana* is described by Ayurveda as a medication that can enhance intelligence, memory, learning capacity and mental function. The *Medhya, Rasayana*, neuroprotective, antioxidant, adaptogenic and nootropic qualities of the constituents in the formulations may be responsible for the improvements seen in both groups.

**Results****Subjective****Group A – *Pathadi Ghrita***

**Table No.03: Group A – Effect of *Pathadi Ghrita***

| Variable                     | Mean |      | Mean Improvement | % Relief | Z value | p value | Remark |
|------------------------------|------|------|------------------|----------|---------|---------|--------|
|                              | BT   | AT   |                  |          |         |         |        |
| <i>Medha</i>                 | 1.30 | 2.45 | 1.15             | 88.46%   | 4.234   | 0.000   | HS     |
| <i>Dhriti</i>                | 1.50 | 2.50 | 1.00             | 66.67%   | 3.911   | 0.000   | HS     |
| <i>Smriti</i>                | 1.50 | 2.70 | 1.20             | 80.00%   | 4.233   | 0.000   | HS     |
| <i>Vijananam Vyavasayena</i> | 1.55 | 2.55 | 1.00             | 64.52%   | 4.123   | 0.030   | S      |
| Grade                        | 2.55 | 1.70 | 0.85             | 33.33%   | 4.123   | 0.000   | HS     |

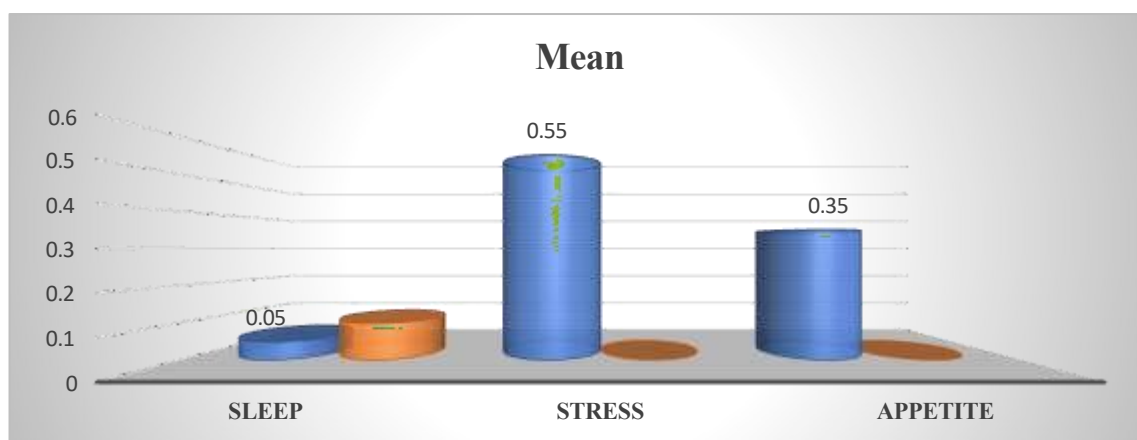
*Pathadi Ghrita* showed highly significant improvement in all major cognitive parameters.

**Graph No.01: Bar chart showing Mean (*Medha*, *Dhriti*, *Smriti*, *Vijananam Vyavasayena*, IQ Grade)**

These results demonstrate that *Pathadi Ghrita* has a **highly significant *Medhya* effect**, improving all domains of cognition.

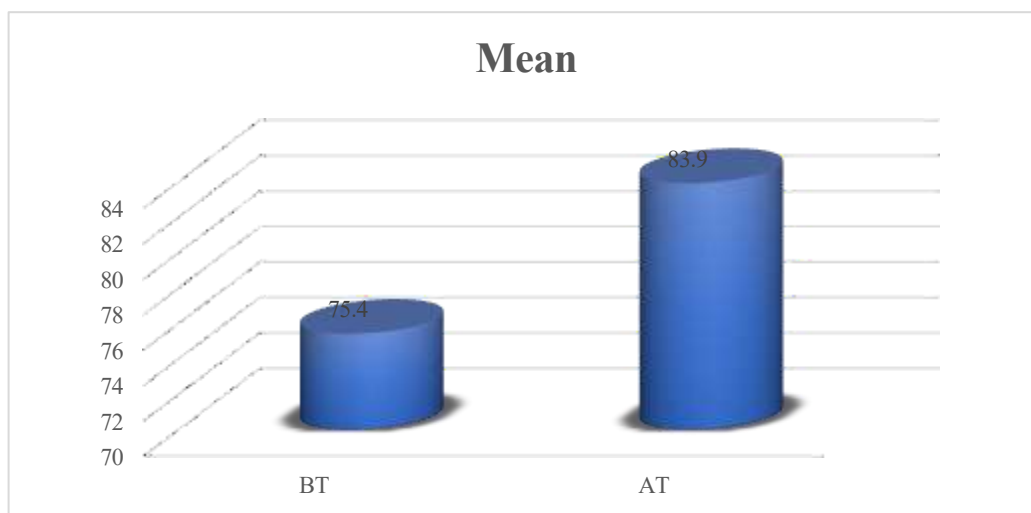
**Table No.04: Associated Parameters (*Sleep*, *Stress*, *Appetite*)**

| Variable | Mean |      | Mean difference | % Improvement | Z value | p value | Remark |
|----------|------|------|-----------------|---------------|---------|---------|--------|
|          | BT   | AT   |                 |               |         |         |        |
| Sleep    | 0.05 | 0.10 | 0.05            | 100.00%       | 2.053   | 0.040   | S      |
| Stress   | 0.55 | 0.00 | 0.55            | 100.00%       | 2.326   | 0.020   | S      |
| Appetite | 0.35 | 0.00 | 0.35            | 100.00%       | 2.170   | 0.030   | S      |

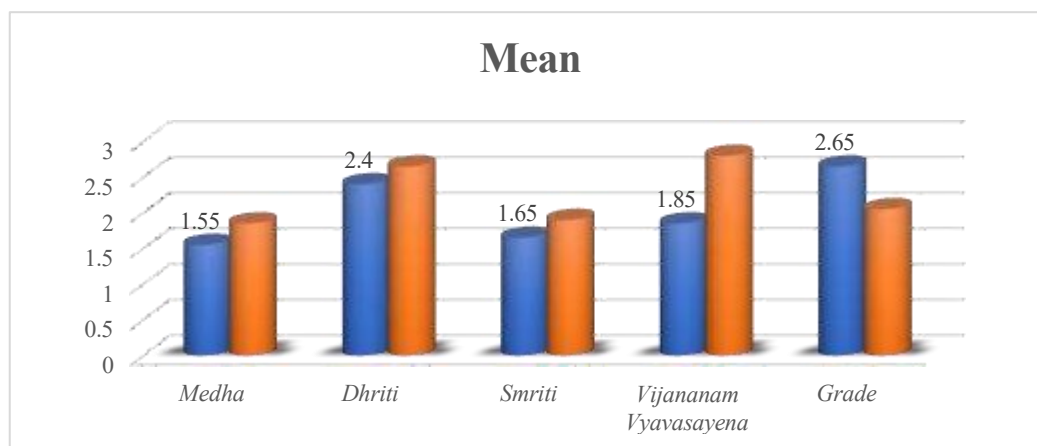
**Graph No.02: Bar chart showing Mean Subjective Parameters BT and AT (Sleep, Stress, Appetite)**

**Objective****Table No.05: Effect on Intelligence Quotient (IQ) Of Pathadi Ghrita**

| Advance Progress Metre test | Mean  | Mean difference | % Relief | SD    | t value | p value | Remark |
|-----------------------------|-------|-----------------|----------|-------|---------|---------|--------|
| BT                          | 75.40 | 8.50            | 11.27    | 5.632 | 9.488   | 0.000   | HS     |
| AT                          | 83.90 |                 |          | 7.504 |         |         |        |

**Graph No.03: Bar chart showing Effect on Intelligence Quotient (IQ)****Group B – Vacha Rasayana****Table No.05: Effect of Vacha Rasayana**

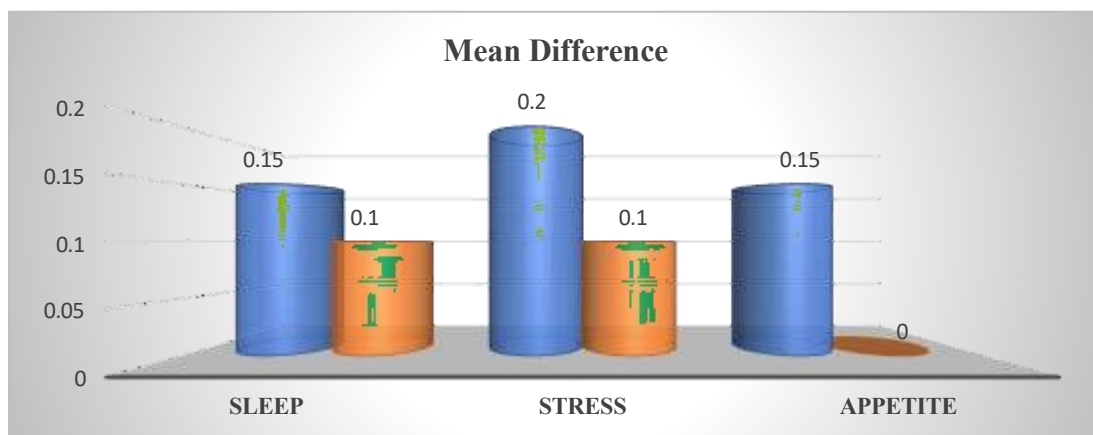
| Variable              | Mean |      | Mean Improvement | % Relief | Z value | p value | Remark |
|-----------------------|------|------|------------------|----------|---------|---------|--------|
|                       | BT   | AT   |                  |          |         |         |        |
| Medha                 | 1.55 | 1.85 | 0.30             | 19.35%   | 2.449   | 0.014   | S      |
| Dhriti                | 2.40 | 2.65 | 0.25             | 10.42%   | 2.236   | 0.025   | S      |
| Smriti                | 1.65 | 1.90 | 0.25             | 15.15%   | 2.236   | 0.025   | S      |
| Vijananam Vyavasayena | 1.85 | 2.80 | 0.95             | 51.35%   | 2.053   | 0.040   | S      |
| Grade                 | 2.65 | 2.05 | 0.60             | 22.64%   | 2.170   | 0.030   | S      |

**Graph No.04: Bar chart showing (Medha,Dhriti,Smriti,Vijanam Vyavasayena,IQ Grade)**

Thus, *Vacha Rasayana* demonstrated statistically significant improvement, but the magnitude of effect was lower compared to *Pathadi Ghrita*.

**Table No.06: Associated Parameters (Sleep, Stress, Appetite) Of *Vacha Rasayana***

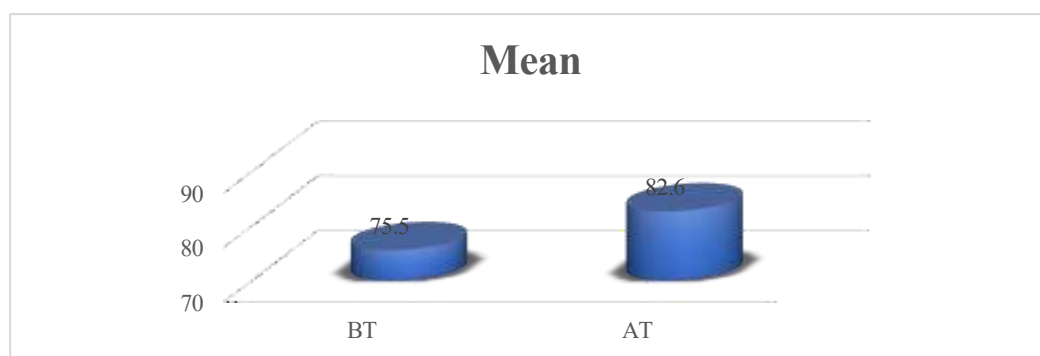
| Variable | Mean |      | Mean difference | % Improvement | Z value | p value | Remark |
|----------|------|------|-----------------|---------------|---------|---------|--------|
|          | BT   | AT   |                 |               |         |         |        |
| Sleep    | 0.15 | 0.10 | 0.05            | 33.33%        | 1.732   | 0.083   | NS     |
| Stress   | 0.20 | 0.10 | 0.10            | 50.00%        | 1.414   | 0.157   | NS     |
| Appetite | 0.15 | 0.00 | 0.15            | 100.00%       | 1.732   | 0.083   | NS     |

**Graph No.05: Bar chart showing Associated Subjective Parameters BT and AT (Sleep, Stress, Appetite)**

### Objective

**Table No.07: Effect on Intelligence Quotient (IQ) Of *Vacha Rasayana***

| Advance Progress Metres test | Mean  | Mean difference | % Relief | SD    | t value | p value | Remark |
|------------------------------|-------|-----------------|----------|-------|---------|---------|--------|
| BT                           | 75.50 | 7.10            | 9.40     | 6.605 | 9.170   | 0.000   | HS     |
| AT                           | 82.60 |                 |          | 6.984 |         |         |        |

**Graph No.06: Bar chart showing Effect on Intelligence Quotient (IQ)**

### Discussion On Result

**Pathadi Ghrita:** *Patha*, *Vacha*, *Shigru*, *Haritaki*, *Shunthi*, *Maricha*, *Pippali*, *Saindhava* and *Ghrita* (Extract from Navneet) are all included in *Pathadi Ghrita*. In Ayurveda, *ghrita* is regarded as a superior *Yogavahi* and *Sukshma Anuvarti* that helps active principles enter subtle channels, such as the central nervous system. *Ghrita* is high in phospholipids and critical fatty acids that promote neurotransmission and the integrity of neuronal membranes<sup>11</sup>. Studies suggest that lipid-based formulations improve bioavailability of phytochemicals and enhance cognition by supporting synaptic plasticity and neuronal signaling<sup>12</sup>. **Patha** (*Cissampelos pareira*) contains alkaloids such as hayatinine and cissamine, which exhibit antioxidant and neuroprotective activity<sup>13</sup>. Antioxidants assist memory and learning processes by improving neuronal survival and reducing oxidative stress-induced neuronal damage.

One of the most significant *Medhya* medications mentioned in Ayurveda is **Vacha** (*Acorus calamus*). It has volatile oils, acorin,  $\alpha$ -asarone and  $\beta$ -asarone. According to reports,  $\beta$ -asarone contains cholinergic, antioxidant, neuroprotective and cognitive-enhancing qualities<sup>14</sup>. Experimental studies demonstrate that  $\beta$ -asarone improves learning and memory through modulation of acetylcholine levels and reduction of oxidative stress in hippocampal neurons<sup>15</sup>. Additionally, *vacha* increases attentiveness and brain circulation, which improves *Dhi* and *Smriti*. Flavonoids, quercetin, kaempferol, vitamin C and polyphenols are all present in **shigru** (*Moringa oleifera*). These phytochemicals have anti-inflammatory and antioxidant properties that shield neurons from damage from free radicals<sup>16</sup>. Quercetin has been shown to improve cognitive performance and memory by reducing neuroinflammation and enhancing synaptic activity<sup>17</sup>.

**Haritaki** (*Terminalia chebula*) contains chebulinic acid, gallic acid, tannins and ellagic acid. These compounds possess strong antioxidant effects and reduce neuronal degeneration caused by oxidative stress<sup>18</sup>. In Ayurveda, *Haritaki* is also

known as *Medhya* and *Rasayana* because it enhances mental clarity and promotes normal nervous system activity. Gingerols and shogaols, which have anti-inflammatory and antioxidant properties, are found in *Shunthi* (*Zingiber Officinale*). Ginger increases neurotransmitter activity and cerebral blood flow, which enhances focus and attention<sup>19</sup>.

*Marich* (*Piper Nigrum*) contains piperine, while *Pippali* (*Piper longum*) contains piperlongumine and piperine. Piperine is known to enhance bioavailability of drugs and phytochemicals through inhibition of hepatic and intestinal glucuronidation<sup>20</sup>. Additionally, piperine enhances cognitive performance via regulating dopamine and serotonin neurotransmission<sup>21</sup>. These activities might have improved the formulation's overall therapeutic efficacy<sup>22</sup>. *Sandhava Lavana* increases the metabolic availability of nutrients and active substances by improving digestion and absorption. According to Ayurveda, optimal brain function depends on proper *Agni* and nutritional assimilation. *Navneet* (fresh butter) acts as a *Medhya*, *Brimhana*, *Balya* and *Ojas*-enhancing substance. Being rich in lipids and fat-soluble nutrients, *Navneet* nourishes nervous tissue and supports higher cognitive functioning. Lipid-based preparations are known to facilitate blood-brain barrier penetration of phytochemicals, thereby potentiating the neuroprotective effects of *Medhya* drugs. The synergistic nootropic impact of these compounds may be the reason for the notable improvement in *Medha* (88.46%), *Smriti* (80%) and *Dhriti* (66.67%) in Group A. Because *ghrita*-based formulations are lipophilic, they can pass across the blood-brain barrier and deliver active phytochemicals straight to neuronal regions<sup>23</sup>. An improvement in *Vijananam Vyavasayena* indicates an improvement in analytical and decision-making skills which could be linked to better cortical processing and neurotransmitter activity. The notable rise in IQ from 75.40 to 83.90 suggests improved cognitive processing and abstract reasoning. The Raven's Progressive Matrices evaluate nonverbal reasoning and problem-solving skills which are primarily linked to frontal brain activation. *Pathadi Ghrita* contains neuroprotective and antioxidant phytochemicals that may enhance synaptic transmission and neural connection, improving cognitive function<sup>24</sup>. *Pathadi Ghrita* may also improve cognitive performance indirectly through enhancement of **appetite** and digestion. In Ayurveda, proper functioning of *Agni* is considered essential for adequate nourishment of *Dhatus* and optimal functioning of the brain. Impaired appetite and digestion can lead to inadequate nutritional assimilation which negatively affects mental development, concentration, and memory in children. Ingredients such as *Shunthi*, *Marich*, *Pippali* and *Sandhava Lavana* possess *Deepana* and *Pachana* properties that stimulate digestive fire, improve appetite and enhance absorption of nutrients and active phytoconstituents. Piperine present in *Marich* and *Pippali* has been reported to increase digestive enzyme activity and improve gastrointestinal absorption and bioavailability of nutrients and drugs<sup>25</sup>. Gingerols present in *Shunthi* stimulate gastric motility and digestive secretions, thereby improving appetite and metabolism<sup>26</sup>. Improved nutritional status and better metabolic assimilation may support neurotransmitter synthesis, neuronal energy metabolism, and overall cognitive functioning in children. The observed improvement in appetite and digestion in Group A might therefore have contributed indirectly to enhancement of *Medha*, *Smriti*, *Dhriti* and IQ scores. Ayurveda explains this effect through proper nourishment of *Majja Dhatu* and balanced functioning of *Manovaha Srotas* resulting from correction of *Agni* and improved *Ahara Rasa* circulation.

Chronic **stress** and academic pressure in school-going children are associated with increased oxidative stress, elevated cortisol levels, impaired attention and reduced memory retention. Oxidative stress adversely affects hippocampal neurons and synaptic plasticity which are essential for learning and memory. The ingredients of *Pathadi Ghrita* possess antioxidant, neuroprotective, adaptogenic and stress-modulating activities that may help in reducing stress-induced cognitive impairment. *Ghrita* acts as a nourishing *Medhya Rasayana* and supports neuronal membrane stability while *Vacha* and other phytoconstituents reduce oxidative neuronal injury and improve neurotransmitter balance. Experimental studies have shown that  $\alpha$ - and  $\beta$ -asarone protect hippocampal neurons against oxidative and endoplasmic reticulum stress by reducing reactive oxygen species and activating neuroprotective signaling pathways such as PI3K/Akt/Nrf2/HO-1<sup>27</sup>. *Shunthi*, *Haritaki* and *Shigru* contain potent antioxidant phytochemicals that may counter stress-mediated neuroinflammation and neuronal degeneration. Piperine present in *Marich* and *Pippali* enhances bioavailability of active compounds and may improve dopaminergic and serotonergic neurotransmission, thereby supporting emotional stability, concentration, and mental performance during stress conditions. The observed improvement in *Medha*, *Smriti*, *Dhriti* and IQ in Group A may therefore be attributed not only to cognitive enhancement but also to reduction of stress-induced neuronal dysfunction and improvement in adaptive mental responses. In Ayurveda, this effect can be understood as stabilization of *Satva*, proper functioning of *Manovaha Srotas* and normalization of *Vata* which collectively contribute to better intellectual and psychological performance.



Fig.No.01:Effect Of *Pathadi Ghrita*

### Effect on *Pathadi Ghrita*

In the present study, *Pathadi Ghrita* showed highly significant improvement in various parameters related to cognitive function and intellectual performance in school-going children. *Medha* improved by 88.46% ( $p < 0.001$ ), indicating marked enhancement in grasping and comprehension ability. *Dhriti* showed 66.67% improvement ( $p < 0.001$ ), reflecting better retention and sustaining capacity of the mind. *Smriti* improved by 80.00% ( $p < 0.001$ ), suggesting considerable enhancement in memory and recall functions. *Vijananam Vyavasayena* demonstrated 64.52% improvement ( $p < 0.05$ ), indicating better analytical thinking, discrimination and decision-making ability. IQ Grade also improved significantly

by 33.33% ( $p < 0.001$ ), reflecting an overall rise in intellectual capacity.

Assessment of Intelligence Quotient (IQ) revealed that the mean IQ score increased from 75.40 before treatment to 83.90 after treatment with a mean difference of 8.50 and percentage improvement of 11.27% which was statistically highly significant ( $p < 0.001$ ). These findings suggest that *Pathadi Ghrita* possesses substantial *Medhya* and cognitive-enhancing effects, possibly due to its neuroprotective, antioxidant and nootropic properties along with improved nourishment of the nervous system through Ghrita-based delivery.

**Vacha Rasayana:** Purified *Vacha* (*Acorus calamus*) is the main component of *Vacha Rasayana*. In Ayurvedic classics, *Vacha* is categorized as *Medhya*, *Vatakaphahara* and *Smritiprada*. The primary active component,  $\beta$ -asarone, has cholinergic, anti-inflammatory, neuroprotective and antioxidant properties<sup>28</sup>. Experimental studies have demonstrated that  $\beta$ -asarone improves spatial memory and cognitive function through enhancement of hippocampal neuronal activity<sup>29</sup>. Additionally, *vacha* has a stimulant effect on the central nervous system, which may increase processing speed, alertness, and attention span. *Vacha*'s volatile oils boost the oxygen supply to neurons and increase cerebral circulation<sup>30</sup>. Antioxidant qualities also aid maintain cognitive function by reducing oxidative damage to neural cells. *Vacha Rasayana* significantly improved her *Medha*, *Dhriti*, *Smriti* and IQ scores in this study. The stimulating impact of *Vacha* on higher cortical functioning and mental alertness may be the reason for the somewhat greater improvement in *Vijananam Vyavasayena* (51.35%). However, the overall improvement was comparatively lesser than that observed with *Pathadi Ghrita*, possibly due to the presence of *Ghrita* as a potent carrier medium along with multiple synergistic *Medhya* and *Rasayana* drugs in the formulation.. *Vacha* alone can greatly enhance intellectual performance, as evidenced by the rise in IQ from 75.50 to

82.60. Because acetylcholine is essential for cognition and memory processing, its cholinergic activity may improve learning and memory<sup>31</sup>.



Fig.No.02:Effect Of *Vacha Rasayana*

*Vacha Rasayana* also demonstrated significant improvement in cognitive and intellectual parameters in school-going children, although the overall effect was comparatively lesser than that observed with *Pathadi Ghrita*. *Medha* improved by 19.35% ( $p < 0.05$ ), indicating improvement in grasping and comprehension ability. *Dhriti* showed 10.42% improvement ( $p < 0.05$ ), reflecting better retention capacity while *Smriti* improved by 15.15% ( $p < 0.05$ ), suggesting enhancement in memory and recall functions. *Vijananam Vyavasayena* demonstrated comparatively higher improvement of 51.35% ( $p < 0.05$ ), indicating better analytical thinking, mental alertness and decision-making ability. IQ Grade improved by 22.64% ( $p < 0.05$ ), reflecting enhancement in intellectual functioning.

Assessment of Intelligence Quotient (IQ) revealed that the mean IQ score increased from 75.50 before treatment to 82.60 after treatment with a mean difference of 7.10 and percentage improvement of 9.40% which was statistically highly significant ( $p < 0.001$ ). These findings suggest that *Vacha Rasayana* possesses significant *Medhya* and nootropic activity, probably due to the cholinergic, neuroprotective, antioxidant and central nervous system stimulant properties of *Vacha* (*Acorus calamus*). Although both groups showed highly significant improvement in IQ scores and cognitive performance, *Pathadi Ghrita* demonstrated slightly superior overall enhancement compared to *Vacha Rasayana*, possibly due to the synergistic action of multiple *Medhya* drugs along with the *Yogavahi* property of *Ghrita*.

### On Comparing Both Groups:

Comparative evaluation showed that both *Pathadi Ghrita* and *Vacha Rasayana* improved cognitive and intellectual functions; however, *Pathadi Ghrita* demonstrated comparatively superior results. *Medha*, *Dhriti* and *Smriti* showed highly significant improvement in the *Pathadi Ghrita* group ( $p < 0.001$ ). *Vijananam Vyavasayena* improved significantly in both groups with slightly better performance in the *Vacha Rasayana* group ( $p < 0.05$ ). Stress reduction was significantly greater in the *Pathadi Ghrita* group ( $p < 0.05$ ), while sleep and appetite showed non-significant differences between the groups. Improvement in IQ Grade was also significantly higher in the *Pathadi Ghrita* group ( $p < 0.001$ ), indicating better overall cognitive enhancement.

### Conclusion

Through improvements in *Dhi* (grasping strength), *Dhriti* (retention), *Smriti* (memory) and Intelligence Quotient (IQ), the current study showed that both *Pathadi Ghrita* and *Vacha Rasayana* have significant *Medhya* effects in school-age children. Both therapies demonstrated statistically significant gains in both objective evaluation using Raven's Progressive

Matrices and subjective cognitive measures. However, as compared to *Vacha Rasayana*, *Pathadi Ghritha* yielded much better outcomes in *Medha*, *Dhriti*, *Smriti*, stress reduction and IQ enhancement. The synergistic impact of several *Medhya* and *Rasayana* medications in addition to *Ghritha* which functions as a powerful *Yogavahi* and improves the delivery of active phytoconstituents to the central nervous system, may be responsible for *Pathadi Ghritha's* superior efficacy. Antioxidant, neuroprotective, adaptogenic, cholinergic and bioavailability-enhancing properties of the ingredients may have contributed to improved neuronal function and cognitive performance.

*Vacha Rasayana's* position as an effective *Medhya Rasayana* was demonstrated by its notable improvement, especially in analytical ability and mental alertness. The study backs up the traditional Ayurvedic theory that *Medhya Rasayana* treatments help improve children's intellectual and cognitive development. Therefore, both formulations may be regarded as safe and helpful for improving academic performance and cognition with *Pathadi Ghritha* demonstrating a generally higher level of efficacy.

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