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Study on the efficacy of *Centella asiatica* Linn. on borderline intelligence of 5th standard students of a rural area in Southern India

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ABSTRACT

Borderline intellectual functioning is a cognitive impairment that applies to people who have lower than average intelligence but do not have intellectual developmental disorder or mental retardation. Borderline intellectual functioning is diagnosed by IQ test scores that are between 63 to 74. This classification describes a group comprising about 7% of the general population that falls into an area of delayed intellectual, emotional, and/or adaptive functioning that teeters on the edge of intellectual disability but does not actually qualify for that specific diagnosis using DSM-IV-TR strict IQ criteria. Mandukaparni (*Centella asiatica* Linn.) is one among the four medhya (nootropic) drugs as per Ayurvedic literature. These drugs are collectively called as 'Medhya Dravyas'. Hence the present study entitled "study on the efficacy of *Centella asiatica* Linn. on borderline intelligence of 5th standard students of a rural area in Southern India" was carried-out by a thorough review of the psychological tests and interviewing methods.

Keywords: Mandukaparni, *Centella asiatica* Linn., Borderline Intelligence, Cognitive Impairment, Intellectual Disability, Medhya Drugs, Nootropic Drugs.

1. Introduction

Borderline intellectual functioning, also called borderline mental retardation, is a categorization of intelligence wherein a person has below average cognitive ability (generally an IQ of 70-85), but the deficit is not as severe as intellectual disability (70 or below)^[1]. During school years, individuals with borderline intellectual functioning are often "slow learners"^[2]. The range is called borderline because it is on the borderline of the criteria for diagnosis of intellectual disabilities (previously referred to as mental retardation) in the Diagnostic and Statistical Manual of Mental Disorders (DSM)^[3]. People who fall into this category have a moderately normal expression of affect for their age, despite the fact that their capability to think abstractly is rather limited. Reasoning displays an inclination for real thinking. Others may portray such a person as 'simple' or 'a little slow'. They are habitually able to do their day to day activities without any assistance, which includes holding down a simple job. A large number of drugs have been mentioned in Ayurvedic classics which can increase the memory power and also the immunity^[4-8]. Mandukaparni (*Centella asiatica* Linn.) is one among the four medhya (nootropic) drugs as per Ayurvedic literature. These drugs are collectively called as 'Medhya Dravyas'.

1.1 Aims and objectives:

To evaluate the effect of Mandukaparni (*Centella asiatica* Linn.) tablet in improving the IQ of children with borderline intelligence (Binet-Kamath scale).

2. Materials and Methods

2.1 Source of data:

5th standard students from State government schools of Hassan district, Karnataka state, India who comes under borderline intelligence, were taken for the study.

2.2 Method of collection of data:

- IQ-BKT^[9]
- Socioeconomic Status- Kupuswamy scale^[10]
- Concentration –Number Cancellation Test (NCT)^[11]
- Academic performance- School records.
- Students who fulfil the inclusion criteria were taken with a sample size of 40.

2.3 Diagnostic Criteria:

- IQ of 63-74 assessed by using Binet-Kamath Scale.
- Performance in the school academics (<40%).
- Number Cancellation Test – Concentration.

2.4 Inclusion criteria:

5th standard students with IQ 63-74.

2.5 Exclusion criteria:

- 1) Children with mild to severe mental retardation.
- 2) Children with IQ above 74.
- 3) Children with other systemic disorders.

2.5.1 Study drug - Mandukaparni (*Centella asiatica* Linn.) tablet

2.5.2 Source of collection: Mandukaparni powder was collected from Gadgil Vanaoushadi – Belugum while the wet drug was collected from Hassan.

2.6 Method of Preparation:

4 kg of Mandukaparni powder was taken. First day bhavana (impregnation) was given with 12 liters of Mandukaparni swarasa (juice). Second bhavana was given with 5 litres of Mandukaparni swarasa. Third bhavana was given with 3.5 liters of Mandukaparni swarasa. It was made into tablet of 500mg each.

2.6.1 Placebo: 500 mg of capsule was prepared by filling wheat powder.

2.7 Study design: A single blind clinical study.

2.7.1 Sample size: 40 students who come under borderline intelligence were selected and randomly divided into two groups-study and control group, consisting 20 children in each group.

2.7.2 Study group (group 1): The students of this group were given 2 Mandukaparni tablets of 500mg twice a day, before food with water for 90 days.

2.7.3 Placebo group (group 2): Students of this group were given 2 capsules filled with wheat powder of 500mg twice a day, before food with water for 90 days.

Children were reviewed monthly once, during the treatment up to 3 months.

2.8 Assessment criteria:

Effect of therapy was assessed on the basis of IQ and performance in school academics and concentration.

2.9 Statistical analysis: SPSS version 16 was used. As there were two groups, Paired t test was applied to know the result within the group and unpaired t test was used to know the result in between the group.

3. Observations

In the present clinical study, 44 subjects of Borderline intelligence were treated with Mandukaparni tablet and Placebo out of which 2 subjects from study group and 2 from placebo group were drop out

and total 40 patients completed the study plan. Sex wise distribution showed that 65% (n=25) were female and 35% (n=14) were male. Socio-economic status wise distribution showed that 75% (n=30) belonged to upper-lower class and 25% (n=10) subjects were from lower class family. Religion wise distribution showed that 35% (n=14) were from Hindu religion and 65% (n=26) subjects belonged to Muslim religion. Diet wise distribution showed that 80% (n=32) were consuming mixed diet and 20% (n=8) subjects were taking vegetarian diet. Observation on the history of consanguinity showed that only parents of 10% (n=4) had an history of consanguineous marriage and 90% (n=36) subject's did not have an history of consanguineous marriage. Observation on the literacy of the mother showed that 32.5% (n=13) were illiterate, 55.0% (n=22) completed primary education, 7.5% (n=3) completed secondary education and 5.0% (n=2) completed higher secondary education. Observation on the literacy of the father showed that 22.5% (n=9) were illiterate, 52.5% (n=21) were with primary education, 17.5% (n=7) were with secondary education and 7.5% (n=3) with higher secondary education was observed. Prakruthi wise distribution showed that 50% (n=20) were of vatapitta prakruthi, 35% (n=14) were of vatakapha prakruthi and 15% (n=6) were of pittakapha prakruthi. Agni wise distribution showed 65% (n=26) had mandagni, 20% (n=8) had Tikshnagni and 15% (n=6) had samagni. Observation on nourishment of the subjects showed that 65% (n=26) were moderately nourished, 30% (n=12) were well nourished and 5% (n=2) were poorly nourished.

4. Results

The effects of the Mandukaparni tablet on various parameters in study group were as follows: Effect of treatment on IQ level showed 8.18% of improvement was seen with P value < 0.001, In subjects – Kannada 27.7% of improvement with P value < 0.001, English 11.11% of improvement with P value < 0.05, social science 12% of improvement with P value < 0.001, Maths 21.2% of improvement with P value < 0.001, science 17.2% of improvement with P value < 0.001. In concentration level it showed improvement of 21.9 % of improvement with P value < 0.001.

The effects of the Placebo on various parameters in Control group were as follows: IQ showed 6.05 % of improvement was seen with P value < 0.001, In subjects – Kannada 13.8 % of improvement with P value < 0.001, English 6.79% of improvement with P value < 0.1, social science 6.33% of improvement with P value < 0.1, Math's 12.6% of improvement with P value < 0.001, science 13.2 % of improvement with P value < 0.001. In concentration level it showed improvement of 21.9 % of improvement with P value < 0.001.

Group 1 showed improvement in IQ by 8.18%, In Kannada 27.7% of improvement English 11.11% of improvement, social science 12% of improvement, Mathematics 21.2% of improvement, science 17.2% of improvement. In concentration level it showed improvement of 21.9 % and Group 2 showed improvement in IQ by 6.06%, In Kannada 13.8 % of improvement, English 6.79% of improvement, social science 6.33% of improvement, Mathematics 12.6% of improvement, science 13.2 % of improvement. In concentration level it showed improvement of 21.9 % But Difference in the effect of treatment in between Trail and Control group were not statistically significant. The overall results shows that Mandukaparni tablet is effective (17.14%) in improving IQ, academic performance and concentration. Control group also showed effectiveness (8.02%) in improving IQ, academic performance and concentration.

5. Discussion

5.1 Discussion on the Binet-Kamth Scale used for the assessment of IQ:

The Binet-Kamath test is one of the widely used tests of intelligence in clinical and educational set up. In the clinical setup it is used for the assessment of mentally challenged, learning disabled children with speech and language problems, slow learners, etc. It can also be used to assess intellectual level and functioning on different areas like language, reasoning, memory, social competence.

In the educational set up, Binet Kamath test is used to assess general intellectual level of students to compare it with their academic performance and achievements. Based on the functioning level of the students, educational training of students with learning disabilities can be under taken. The test has also been widely applied in educational and psychological researches. Keeping all things in mind Binet-Kamath Scale was selected which is a standard tool for IQ assessment.

5.2 Discussion on Number Cancellation Test:

It consists of a sheet with number arranged in rows. The numbers are arranged equidistant from each other in a random order. The subject is given one digit and instructed to cross it out from the list of numbers in the sheet. The subject is given one minute for the task.

IQ showed 8.18% of improvement was seen with P value < 0.001. Improvement in IQ in both the group may be a part of physiological process as per increase in the chronological age by 3 months. But improvement in IQ in the test group was better than placebo which may be the action of Mandukaparni. Mandukaparni comprises of Tiktha rasa, sita virya, madhura vipaka and kapha-pitta hara. Tikta rasa by virtue of its akasa and vayu mahabhutas, laghu guna, dipana, pacana and sroto visodhana karma acts as medhya. The drug is sita in virya and is thus manah prasadaniya and increases the tarpaka and avalambaka kapha thus improving the dharana sakti. Acharya Badanta Nagarjuna in 'Rasavaikesika' states that medhya drugs have acintya - virya prabhava- the action of which is unpredictable. Brahmoside and Braminoside are responsible for CNS stimulant action. Mainly they act by improving Dendritic arborization of Hippocampus CA3 neurons. Brahmoside- constituent of the drug found to be possessed sedative and CNS depressant action. Hence the drug dosage was fixed to 2gms/day. Centella asiatica is one of the chief herbs for revitalizing the nerves and brain cells, hence primarily known as a "Brain food" in India.

6. Conclusion

As the study was single blind, students in both the group were not knowing about study drug and placebo, they might have positively motivated as they are taking some treatment for improving their intelligence. Hence improvement in academic performance and IQ was observed in present study, even in placebo group. In both groups, satwavajaya chikitsa was given, where the subjects were advised on the do's and don'ts regarding diet, life-style modifications.

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