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Clinical study to evaluate the effect of *Suvarnaprashan Yoga* on growth and development in children

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ABSTRACT

Suvarnaprashan Yoga, an ancient *Ayurvedic* practice, is a unique combination of *Suvarna* and herbal formulations, primarily used to enhance mental, physical, and immune health in children. This practice has been a part of traditional medicine for centuries, especially in the context of preventive healthcare and cognitive development. *Suvarnaprashan* is typically administered in the form of a liquid preparation, which contains *Suvarna Bhasma* (colloidal gold), along with various herbal ingredients like *Brahmi, Vacha,* and *Shankhapushpi,* known for their neuroprotective and cognitive-enhancing properties. The main aim of *Suvarnaprashan Yoga* is to stimulate the mind, enhance intelligence, improve memory, and promote overall vitality in children. This research article explores the scientific basis, therapeutic benefits, and clinical applications of *Suvarnaprashan Yoga*, with a focus on its pharmacological mechanisms, safety, and effectiveness. Through a comprehensive review of existing literature, this study seeks to evaluate the contemporary relevance of *Suvarnaprashan* as an alternative or adjunct to modern medical treatments for cognitive and developmental disorders. Further clinical trials are recommended to validate its efficacy in pediatric healthcare, with a particular emphasis on long-term outcomes.

Key words: *Suvarnaprashan Yoga, Neuroprotective, Cognitive, Children.*

INTRODUCTION

Childhood is a critical period of growth and development. This period also presents challenges regarding low immunity, with a greater risk of illness due to poor cleanliness and inadequate nutrition. A nurturing environment is essential for children's growth and development, providing safety and stimulation for learning. Encourage regular outdoor play to promote physical and mental well-being.

In *Ayurveda*, there are sixteen essential *Samskara* for children; *Suvarnaprashan* is one of them. It is a process in which *Suvarna Bhasma* is administered with pure *Ghrita* and *Madhu* in liquid and paste form. In *Ayurveda*, there are sixteen essential *Samskara* for children; *Suvarnaprashan* is one of them. It is a process in which *Suvarna Bhasma* is administered with pure *Ghrita* and *Madhu* in liquid and paste form. *Suvarnaprashan* in children can be mainly implicated in two contexts of *Ayurveda*: *Lehana* (Supplementary feeds) and *Jatakarma Samskara* (Newborn care). The literary meaning of *Lehana* is licking. So, the process of licking and gulping is called *Lehana*. The substance subjected to *Lehana* is called *Lehya.* In *Kashyapa Samhita*, a separate chapter called *Lehadhyaya* is

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dedicated to *Lehana Karma* explaining various forms of *Lehana.* The purpose of *Lehana karma* is to promote physical and mental well-being and prevent diseases by establishing immunity. *Jatakarma* is the birth ceremony that helps the baby transcend from intrauterine life to extra-uterine life. According to *Charaka Samhita*, after the initial stabilization of the baby (*Prana Pratyagamana*) and cord cutting, *Jatakarma* should be performed. First of all, the child should be given *Madhu* and *Ghrita*. Thereafter, milk from the right breast should be given to the child.[1] *Sushruta Samhita* has opined *Jatakarma* as cleaning the vernix on the newborn's body, clearing the newborn's mouth by *Saindhava* and *Sarpi* and placing a ghee-soaked cotton on the baby's head. This is followed by cutting the umbilical cord at a distance of eight *Angula* from the baby's skin and tying it by a thread that is tied to the baby's neck.[2] After this baby is made to lick *Suvarna Bhasma* mixed with *Madhu* and *Ghrita.*

There are various formulations of gold along with herbal drugs explained by different *Acharyas* for prolonged usage in children. *Sushruta Samhita* explains *Suvarnaprashan Yoga,* which contains *Brahmi, Shankhapushpi, Madhu, Ghrita* and *Suvarna Bhasma* in it. This *Suvarnaprashan Yoga* enhances the child's body, memory power *(Smaranshakti),* strength *(Bala)* and wisdom (*Buddhi).*[3]

Ayurveda has a broader vision than modern immunization. It was preferred to boost immunity and thus avoid many ailments, along with gaining physical, mental, social and spiritual strength to lead a healthy and happy life. The effects of *Suvarnaprashan* mentioned in *Samhitas* are owing to the quick absorption and assimilation of gold nanoparticles contained in *Suvarnaprashan.* In recent years, there has been a renewed interest in drug discovery strategies where natural products and traditional medicines are re-emerging as attractive options[4] and hence, renewed interest in agents like *Suvarna Bhasma*. Recent research has revealed that gold nanoparticles exhibit size-dependent absorption through rat skin and intestine, with smaller particles (~15 nm) absorbed more than larger particles (>100 nm).[5] Nanoparticles can also be absorbed through a sublingual route directly into the bloodstream.[6]

Growth and development begin from conception and ends at maturity. Early childhood is a time of tremendous growth and development. When compared with the first year of life, a decreased growth rate is seen in toddlers. It is the age group, where parents express concern about poor growth. "*Suvarnaprashan*", has been used in clinical practice for thousands of years but still there is a lack of scientific evidence to support its beneficial effects, particularly regarding its impact on height, weight, cognitive abilities, and immunity. Today, substantial scientific evidence is needed to support the beneficial effects of *Suvarnaprashan*. Therefore, the present study has been planned to provide reliable data to determine if *Suvarnaprashan* has a positive impact on these factors and establish its safety and efficacy on growth and development in children with following aims and objectives.

Aim and Objectives

1. To study the effect of *Suvarnaprashan Yoga* on growth and development in children.
2. To evaluate the clinical safety of *Suvarnaprashan Yoga* in children.

Materials and Methods

Selection of study subjects

The study subjects were randomly selected from OPD and IPD of P.G. Department of *Kaumarbhritya,* Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Distt. Kangra (H.P.). A total of 218 study subjects between 0 to 2 years of age were registered for the clinical trial, out of them 18 did not turn up for follow-up. These 18 study subjects were dropped out from the study and the trial was completed in the remaining 200 study subjects.

Intervention

A total of 218 selected study subjects were randomly divided into two groups. In Group A, 105 study subjects were managed with *Suvarnaprashan Yoga* at a dose of one drop/kg/day orally. In Group B, 113 study subjects

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were managed with a placebo drug, i.e., *Madhu* and *Ghrita,* at a dose of three drops/kg/day orally (one drop of *Ghrita* and two drops of *Madhu*).

Duration of trial: 12 weeks.

Follow ups: Follow up at 4thweek, 8th week and at the time of completion, and last follow up after 15th day and 30th day of completion of study.

Inclusion Criteria

- Healthy children of age up to two years, irrespective of gender, religion, socio-economic status, etc.
- Parents of study subjects willing to participate in the trial.

Exclusion Criteria

- Children above two years of age.
- Children with any congenital disorder, syndrome, etc.
- Children with acute illness.
- Children who are malnourished.
- Parents of the study subjects not willing to participate in the trial.

Withdrawal Criteria

- Study subject showing any feature of adverse drug reaction.
- Parents of the study subjects not willing to continue with treatment.

Assessment Criteria

Objective Criteria of Assessment

Anthropometry

The following Anthropometric measurements were recorded:

- Weight in kg.
- Height in cm.
- Chest circumference (CC).
- Mid-upper arm circumference (MUAC).
- Mid-thigh circumference (MTC).

Subjective Criteria of Assessment

- Developmental milestone achievement: Trivandrum Developmental Screening Chart (TDSC) is used for assessment of Development before and after trial.
- Reduction in the frequency of episodes of common illnesses.

To assess the improvement in milestones, a scoring system was adopted based on the Trivandrum Developmental Screening Chart (TDSC) The scoring ranges from not attained to attained at lower limit as described below:

Milestones	Grade
Not Attained	3
Attained at Upper Limit	1
Attained between Upper and lower limit	2
Attained at Lower limit	0

Items used in TDSC (Age range: 0-2yrs)

SN	Test items	3%	97%
1.	Social smile	1 day	2 months
2.	Eyes follow pen/ pencil	1 mo 3 days	3 months
3.	Holds head steady	1 mo 3 days	3 mo 24 days
4.	Rolls from back to stomach	2 mo 21 days	4 mo 24 days
5.	Turns head to sound of bell/ rattle	3 months	5 mo 24 days
6.	Transfer objects hand to hand	4 mo 3 days	7 months
7.	Raises self to sitting position	5 mo 24 days	11 months
8.	Standing up by furniture	6 mo 9 days	11 months

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9.	Fine prehension pellet	6 mo 24 days	11 months
10.	Pat a cake	6 mo 24 days	12 mo 21 days
11.	Walks with help	7 mo 24 days	13 months
12.	Throws ball	9 mo 15 days	16 mo 24 days
13.	Walks alone	9 mo 27 days	17 mo 12days
14.	Says two words	11 mo 6 days	19 months
15.	Walk backwards	11 mo 6 days	19 mo 15 days
16.	Walk upstairs with help	12 mo 6 days	24 mo 15 days
17.	Points to parts of doll (3parts)	15 mo 9 days	24 mo 15 days

**This table shows the upper and lower limits of items used for the evaluation.

Statistical Analysis

Data was statistically analysed by using appropriate tests. For non-parametric data "The Wilcoxon Signed Rank Test" was used for individual groups and "Mann Whitney 'U' statistical test" was used for intergroup comparison.

RESULTS

Effect of therapy on anthropometric parameters

Anthropometry	Groups	Mean score			%	SD ±	SE ±	W value	P value
		BT	AT	Diff.					
Body weight	Group A	11.00	11.90	0.90	8.18	0.29	0.03	2485	< 0.001
	Group B	10.00	10.30	0.30	3.00	3.59	0.36	1093	0.056
Height	Group A	80.00	80.20	0.20	0.25	13.55	1.35	1034	0.023
	Group B	80.20	80.35	0.15	0.18	11.99	1.20	734	0.207
Chest Circumference	Group A	46.83	47.10	0.27	0.57	6.70	0.67	1352	0.002
	Group B	46.60	46.90	0.30	0.64	4.55	0.46	1608	0.005
Mid upper arm circumference	Group A	12.40	12.60	0.20	1.61	1.70	0.17	2318	< 0.05
	Group B	12.30	12.40	0.10	0.83	1.28	0.13	1303	< 0.05
Mid-thigh Circumference	Group A	13.01	13.20	0.19	1.46	0.06	0.01	5050	< 0.05
	Group B	13.00	12.15	0.15	1.15	0.05	0.01	5050	< 0.05

Intergroup Comparison of anthropometric parameters between Group A and Group B

Anthropometry Group A and Group B	Mean Difference	T value	P value
Body weight	11.18	8156	< 0.001
Height	0.43	8999.500	0.010
Chest Circumference	1.21	9805.500	0.551
Mid upper arm circumference	2.44	9292.500	> 0.05
Mid-thigh Circumference	2.61	5152	< 0.001

Effect of therapy on developmental milestones

Milestones	Groups	Mean score			%	SD ±	SE ±	W value	p value
		BT	AT	Diff.					
Holds head steady	Group A	1.81	0.19	0.99	54.69	0.61	0.06	3321.000	< 0.001
	Group B	1.17	0.92	0.18	15.38	0.39	0.04	325.000	< 0.001

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Rolls from back to stomach	Group A	1.09	0.15	0.96	88.07	0.60	0.06	3081.00	< 0.001
	Group B	1.19	1.06	0.11	9.24	0.31	0.03	91.00	< 0.001
Raises self to sitting position	Group A	1.07	0.12	0.95	88.78	0.52	0.05	3570.00	< 0.001
	Group B	1.1	1.02	0.06	5.45	0.24	0.02	36.00	0.008
Standing up by Furniture	Group A	1.14	0.12	1.04	91.22	0.51	0.05	3828.00	< 0.001
	Group B	1.12	1.03	0.09	8.03	0.29	0.03	45.00	0.004
Walks with help	Group A	1.23	0.11	1.12	91.01	0.57	0.06	4005.00	< 0.001
	Group B	1.15	1.09	0.06	5.21	0.24	0.02	21.00	0.031
Walks alone	Group A	1.07	0.09	0.99	92.52	0.52	0.05	3655.00	< 0.001
	Group B	1.07	1.00	0.07	6.54	0.26	0.03	28.00	0.016
Walks backward	Group A	1.19	0.12	1.07	89.91	0.69	0.07	3240.00	< 0.001
	Group B	1.13	1.05	0.08	7.07	0.31	0.03	28.00	0.016
Walks upstairs with help	Group A	1.14	0.12	1.01	88.59	0.63	0.06	3321.00	< 0.001
	Group B	1.20	1.12	0.07	5.83	0.26	0.03	36.00	0.008
Transfer object	Group A	1.20	0.10	1.11	92.5	0.58	0.06	3828.00	< 0.001
s hand to hand	Group B	1.11	1.03	0.08	7.20	0.27	0.03	36.00	0.008
Fine prehension Pellet	Group A	1.13	0.12	1.03	91.15	0.46	0.05	4005.00	< 0.001
	Group B	1.25	1.17	0.08	6.4	0.31	0.03	28.00	0.016
Pat a cake	Group A	1.13	0.12	1.01	89.38	0.58	0.06	3486.00	< 0.001
	Group B	1.16	1.06	0.10	8.62	0.33	0.03	45.00	0.004
Points to part of doll (3 parts)	Group A	1.10	0.15	0.96	87.27	0.45	0.05	3741.00	< 0.001
	Group B	1.10	1.02	0.08	7.27	0.27	0.03	36.00	0.008
Social smile	Group A	1.14	0.13	1.01	88.59	0.54	0.05	3741.00	< 0.001
	Group B	1.18	1.11	0.07	5.93	0.26	0.03	28.00	0.016
Eyes follow pen/pencil	Group A	1.08	0.13	0.97	89.81	0.48	0.05	3655.00	< 0.001
	Group B	1.08	1.01	0.07	6.48	0.29	0.03	21.00	0.031
Throws ball	Group A	1.15	0.10	1.06	92.17	0.40	0.04	4371.00	< 0.001
	Group B	1.11	1.03	0.08	7.20	0.31	0.03	28.00	0.016
Turns head to the sound of bell/rattle	Group A	1.18	0.14	1.03	87.28	0.54	0.05	3828.00	< 0.001
	Group B	1.15	1.05	0.10	8.69	0.33	0.03	45.00	0.004

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Says two words	Group A	1.12	0.21	0.92	82.14	0.49	0.05	3486.00	< 0.001
	Group B	1.20	1.10	0.10	8.33	0.33	0.03	45.00	0.004

Intergroup comparison of developmental milestones between Group A and Group B

Milestones (Group A vs Group B)	Mean Difference	T value	p value
Holds head steady	39.31%	13362.00	< 0.001
Rolls from back to stomach	78.83	13588.00	< 0.001
Raises self to sitting position	83.32	13983.00	< 0.001
Standing up by Furniture	83.19	14117.500	< 0.001
Walks with help	85.8	14269.00	< 0.001
Walks alone	85.98	14045.500	< 0.001
Walks backward	82.84	13754.00	< 0.001
Walks upstairs with help	88.59	13820.00	< 0.001
Transfer objects hand to hand	85.3	14142.00	< 0.001
Fine prehension Pellet	84.75	14246.500	< 0.001
Pat a cake	80.75	13834.500	< 0.001
Points to part of doll (3 parts)	80.00	14036.00	< 0.001
Social smile	82.65	14052.500	< 0.001
Eyes follow pen/pencil	83.21	14086.500	< 0.001
Throws ball	84.96	14395.00	< 0.001
Turns head to the sound of bell/rattle	78.59	13978.500	< 0.001
Says two words	73.80	13794.00	< 0.001

Effect of therapy on hematological and biochemical parameters

Milestones	Groups	Mean score			%	SD ±	SE ±	W value	P value
		BT	AT	Diff.					
Hb gram%	Group A	11.47	11.49	0.02	0.17	0.08	0.02	1738	> 0.05
	Group B	11.89	11.90	0.01	0.08	0.09	0.03	1057	> 0.05
TLC	Group A	9.05	8.99	0.06	0.7	3.06	0.35	1208	> 0.05
	Group B	6.54	6.51	0.04	0.6	2.08	0.21	616	> 0.05
ESR	Group A	15.33	15.04	0.29	1.89	4.35	0.44	1340	> 0.05
	Group B	6.54	6.50	0.04	0.61	2.08	0.21	602	> 0.05
SGOT	Group A	41.03	39.00	2.03	4.94	15.26	0.15	1648	> 0.05
	Group B	31.19	30	1.19	3.81	8.18	0.83	633	> 0.05
SGPT	Group A	29.47	23.94	5.53	18.76	15.89	1.59	1707	> 0.05
	Group B	27.95	25.00	2.95	10.55	10.89	1.09	1020	> 0.05
Serum Creatinine	Group A	0.58	0.57	0.01	1.72	0.19	0.02	36	> 0.05
	Group B	0.75	0.76	0.01	1.33	0.11	0.01	1115	> 0.05

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Blood urea	Group A	26.13	26.79	0.66	2.52	8.22	0.82	636	> 0.05
	Group B	27.60	27.50	0.10	0.36	4.25	0.43	123	> 0.05

Intergroup comparison of hematological and biochemical parameters between Group A and Group B

Lab investigations (Group A vs Group B)	Mean Difference	T value	P value
Hb gram%	0.03	8396	> 0.05
TLC	1.3	10879	> 0.05
ESR	2.5	11001	> 0.05
SGOT	6.13	10715	> 0.05
SGPT	8.21	10515	> 0.05
Serum Creatinine	3.05	9104	> 0.05
Blood urea	2.88	9762	> 0.05

Effect of therapy on frequency of common illness

Common illnesses	Groups	Mean score			%	SD±	SE±	W value	P value
		BT	AT	Diff.					
Cough	Group A	0.35	0.13	0.22	62.85	0.54	0.05	136	< 0.001
	Group B	0.31	0.22	0.09	29.03	0.29	0.03	45	0.004
Running nose	Group A	0.32	0.16	0.16	50	0.39	0.04	120	< 0.001
	Group B	0.33	0.28	0.05	15	0.22	0.02	15	> 0.05
Nasal blockage	Group A	0.41	0.24	0.17	41.46	0.38	0.04	153	< 0.001
	Group B	0.32	0.25	0.07	21.87	0.26	0.03	20	< 0.05
Constipation	Group A	0.47	0.32	0.15	31.91	0.36	0.04	120	< 0.001
	Group B	0.30	0.25	0.05	16.66	0.22	0.02	15	> 0.05
Loose stools	Group A	0.33	0.20	0.13	39.39	0.34	0.03	91	< 0.001
	Group B	0.41	0.37	0.04	9.75	0.20	0.02	10	> 0.05
Abdominal Colic	Group A	0.30	0.21	0.08	26.66	0.27	0.03	45	0.004
	Group B	0.31	0.24	0.07	22.58	0.26	0.03	28	< 0.05
Vomiting	Group A	0.32	0.20	0.12	37.5	0.33	0.03	78	< 0.001
	Group B	0.41	0.35	0.06	14.63	0.22	0.02	15	> 0.05
Fever	Group A	0.30	0.21	0.08	26.66	0.27	0.03	45	< 0.05
	Group B	0.30	0.24	0.06	20.00	0.24	0.02	21	< 0.05
Physiological Jaundice	Group A	0.41	0.35	0.06	14.63	0.24	0.02	21	0.031
	Group B	0.41	0.37	0.04	9.75	0.20	0.20	10	0.125

Intergroup comparison of frequency of common illness between Group A and Group B

Common illnesses (Group A vs Group B)	Mean Difference	T value	P value
Cough	33.82	10427	> 0.05
Running nose	35	10552	> 0.05
Nasal blockage	19.59	10550	> 0.05
Constipation	15.25	10550	> 0.05
Loose stools	29.64	10500	> 0.05
Abdominal Colic	4.08	10100	0.904

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Vomiting	22.87	10400	< 0.05
Fever	6.66	10150	> 0.05
Physiological Jaundice	4.88	10150	0.808

DISCUSSION

Pharmacodynamic Properties and Pharmacological Action

Drug	Pharmacodynamic properties		Action on *Dosha*	Other Properties	Pharmacological properties
Brahmi	*Rasa*	*Tikta, Kashaya Madhura*	*Vata-kapha shamana* and *Sarvadoshahara*	*Hridya, Rasayana, Deepanam, Medhya rasayanam, Swarya, Smritiprada, Buddhi, Prajashakti, Medhashaktivardhana, Unmada vinashini.*	Antidepressant, Memory enhancing effect, Gastroprotective activity, Antioxidant activity, Anti-inflammatory, Cognitive enhancement.
	Guna	*Hima, Sara, Laghu*			
	Veerya	*Sheeta*			
	Vipaka	*Swadu*			
	Prabhava	*Medhya*			
Shankha Pushpin	*Rasa*	*Katu, Tikta, Kashaya*	*Tridoshashamaka* and *Vata-pitta shamaka*	*Medhya, Rasayana, Manasrogahrit, Unmadanashaka, Nadibalya, Swarya.*	Learning, Memory and behaviour, Antioxidant activity, Antidepressant, Antistress, Brain nourishment.
	Guna	*Sara, Ushna*			
	Veerya	*Ushna*			
	Vipaka	*Katu*			
	Prabhava	*Medhya*			
Suvarna Bhasma	*Rasa*	*Madhura*	*Tridoshashamak*	*Rasayana, Deepana, Medhasmritiprada, Brimhana, Ojovarddhaka, Garaharam, Kantivardhaka, Vagshuddhikara, Vishanashaka, Kshayanashaka, Unmadanashaka, Jwarahara, Shoshahara.*	Anti-inflammatory and Immunomodulatory effect, Increased brain function, Antioxidant property, Cognition and learning, Anti-stress and depression.
	Guna	*Snigdha, Laghu*			
	Veerya	*Sheeta*			
	Vipaka	*Madhura*			
Madhu	*Rasa*	*Madhura, Kashaya*	*Tridoshashamak*	*Atisara, Chhardi, Visha vikara.*	Antioxidant property, Anti-inflammatory effect, Antibacterial activity.
	Guna	*Ruksha, Sheeta, Guru, Picchila, Sukshmamargagnusari, Yogavahi*			
	Veerya	*Sheeta*			
	Vipaka	*Madhura*			

- Most of the ingredients of *Suvarnaprashan Yoga* are predominantly *Madhura* and *Tikta Rasa*, with *Laghu, Sara*, *Guru* and *Snigdha Guna, Sheeta Veerya* and *Madhura Vipaka*. *Madhura Rasa* contains predominantly *Jala Mahabhuta* which plays a significant role in enhancing the ability of mind. It may be the reason *Madhura Rasa* contribute to the proper functioning of senses. *Ojovarddhaka* property of *Madhura Rasa* plays an important role in enhancing the child's immune system.
- The *Laghu*, *Sara Guna* promote the proper functioning of sensory activities, mind and acquisition of knowledge. *Snigdha Guna* also enhances the nourishment of the functional brain and reinforces the sensory activities.
- Most of the ingredients have *Madhura* and *Katu Vipaka,* which contributes to overall enhancement of body's metabolism and facilitates proper enzymatic secretions whereas, *Madhura Vipaka* has *Saindriyaprasadaka* properties which promotes the nourishment of sensory organs and other body tissues.

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- *Brahmi* and *Shankhapushpi,* both of which are *Medhya* drugs, are recognized for their specific impact on the cognitive performance achieved by inducing a neuro-nutrient effect and enhancing cerebral metabolism. Evidence-based studies also support these findings. Thus, by analyzing the benefits of *Suvarnaprashan Yoga,* it is evident that it aims to achieve comprehensive growth and development in children through its *Rasayana* effect. This includes addressing *Yuktikrita Bala* (balanced strength), *Brimhana Karma* (nourishment and growth) and *Medhya Karma* (cognitive enhancement).
- *Suvarna Bhasma*, with its micronized gold particles, enhances vitality and immune function, supports cognitive and physical development, and aids in detoxification. Together, these substances synergistically promote comprehensive physical and cognitive growth, ensuring balanced development and overall well-being.
- No untoward effect of trial drug was observed during entire study period.

Conclusion

Group-A study subjects who were administered *Suvarnaprashan Yoga* showed better performance in growth and development parameters in comparison to the control group, specifically in terms of fine motor milestones and cognitive functions. Trial Group study subjects who were managed with *Suvarnaprashan Yoga* showed fewer episodes of illness during the study period in comparison to the control group. This may have been because of better optimization of immune system in response to the trial drug i.e., *Suvarnaprashan Yoga.* Hematological and biological parameters remained within the normal range in both the groups before and after the trial. Thus, based on improvement in subjective and objective criteria in terms of growth and development, and fewer episodes of illness during the study period in comparison to the control group, it can be concluded that *Suvarnaprashan Yoga* may be given to the children to augment growth and development, especially during the rapid growth phase of early life.

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