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# Impact of Ayurvedic Interventions to improve the Nutritional Status among Adolescent Girls and Children under-five years in Devbhumi Dwarka district of Gujarat

Jimeet Soni<sup>1</sup>, Deepak Saxena<sup>2</sup>, Somen Saha<sup>3</sup>, Abid Qureshi<sup>4</sup>, Bhavna Patel<sup>5</sup>, Falgun Patel<sup>6</sup>, Shital Bhagiya<sup>7</sup>, Vivek Shukla<sup>8</sup>, Pooja Yadav<sup>9</sup>

<sup>1,4,9</sup>Research, <sup>2,3</sup>Faculty, Indian Institute of Public Health, Gandhinagar, Gujarat, India.

<sup>5</sup>Director, <sup>6</sup>I/C Deputy Director, Department of AYUSH, Government of Gujarat, Gujarat, India.

<sup>7</sup>Lecturer, State Model Institute of Ayurveda Sciences, Gandhinagar, Gujarat, India.

<sup>8</sup>District Ayush Officer, Jilla Panchayat, Devbhumi, Dwarka, Gujarat, India.

## ABSTRACT

**Introduction:** Anaemia is the global public health crisis, so also in India. The most direct connection between Pandu Roga and nutritional deficiency anaemia can be found in Ayurveda. Ayurvedic remedy was put through a clinical study on anaemic adolescent girls because anaemia is commonly prevalent that affects the society and the side effects of oral allopathic iron preparations are highly common. The present study assesses the impact of ayurvedic medicines in improving the nutritional status among anemic adolescent girls and severely underweight children under five years of age in Devbhumi Dwarka district of Gujarat. **Method:** The pre-post study was registered with Clinical Trial Registry of India conducted at Devbhumi Dwarka district of Gujarat. A total of 450 anaemic adolescent girls and 179 severely underweight children were screened respectively. Adolescent girls were provided with *Faltrikadhi Kavath*, *Purnanavardi Mandur*, and *Amalaki Rasayan*. Under-five children was given *Shishubhaishaj granules* in powder form. The study was conducted in three phases (Baseline, Intervention and Endline Assessment). **Results:** A total of 219 adolescent girls and 120 under-five children was evaluated during endline assessment. The mean improvement in Hb was +0.36 gm/dL for 219 subjects, however subjects (n=99) with better compliance shows significant improvement (+1.07 gm/dL, P=0.005). Under five children shows improvement in their anthropometric measurements (WAZ). **Conclusion:** The present study revealed that Ayurvedic intervention can improve Hb status of adolescent girls only with better compliance. The study also reports the reason of non-compliance and ways to address it.

**Key words:** Anaemia, Ayurveda, Iron-deficiency anaemia, Malnutrition, Underweight.

## INTRODUCTION

Pandu Roga (Anaemia) remains an important public health concern worldwide, more so in India.<sup>[1]</sup> Anaemia affects over half of the adolescent girls particularly from low socio-economic groups.<sup>[2]</sup> However, one in

every two women who enters into pregnancy is anaemic.<sup>[3]</sup> Anaemia during adolescent period affects the growth and development with increasing risk of infections leading to adverse outcomes. As per National Family Health Survey (NFHS-5) conducted in 2019-2020 in India, the prevalence of anaemia among non-pregnant women was 65.1 percent and 69 percent among women age 15-19 years, a higher proportion of women were anaemic, compared to the previous survey round.<sup>[4]</sup> Ayurveda offers the most direct link between Pandu Roga and iron deficiency anaemia (IDA).

Half of the adolescent girls (50.9 percent) are anaemic in Devbhumi Dwarka district.<sup>[4]</sup> Undernutrition among children under five years is major public health concern in India. Children under five-years with underweight (weight for age; WAZ <-3SD score) is 36.2 percent in

### Address for correspondence:

Dr. Jimeet Soni

Research, Indian Institute of Public Health, Gandhinagar, Gujarat, India.

E-mail: jimeetsoni9@gmail.com

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Devbhumi Dwarka district which is above national average.<sup>[4]</sup>

*Pandu Roga* is characterized as pallor of body resembles anaemia wherein reduction in red blood cell (RBC) count and decrease Hb concentration in RBC resulting in symptoms like paleness (yellow skin and eyes), tiredness, dizziness, weakness, vertigo etc. Numerous side effects are produced by modern medicines while treating it. To tackle such burden of malnutrition there is compelling need to adopt and promote various approach to achieve better nutrition outcome.

The correcting agents for anaemia are found to be practiced in Ayurvedic since centuries.<sup>[5]</sup> Bhaishajya Ratnavali, a classic ayurvedic compendium has compiled different formulations for treatment of various diseases.<sup>[6]</sup> It has been stated the use of Shishubhaisajh in children can increase the weight, Hb and improve overall health. Charaka Samhita described Punarnava Mandura's use in treating Anaemia.<sup>[7]</sup> *Amalaki (Phyllanthus emblica L.)*, which contains *Tridosahara* characteristics, particularly *Pittashamaka* (which calms *Pitta*) and *Rasayana* (which rejuvenates), nourishes the dhatus and is also known to improve iron absorption.<sup>[8]</sup> *Phalatrikadi Kwatha* pharmacodynamically reveals that it is an apt formulation for anaemia management.<sup>[9]</sup> An Ayurvedic remedies was put through a clinical study on anaemic adolescent girls because anaemia is a commonly prevalent in society and the side effects of oral allopathic iron preparations are highly common.

The study aimed to assess the impact of ayurvedic intervention *Faltrikadhi Kavath, Purnanavardi Mandur and Amalaki Rasayan* tablets to improve the nutritional status of anaemic adolescent girls and *Shishubhaisaj granules* powder for severely underweight under five children in Devbhumi Dwarka district of Gujarat.

## MATERIALS AND METHODS

### Study design and settings

A pre-post study was conducted in anaemic adolescent girls and underweight children under five years of age.

This study was carried out in two blocks of Devbhumi Dwarka district, Gujarat. The villages from respective blocks were selected based on the availability of the Ayurvedic dispensaries in that region. Intervention was supported by the Office of Director AYUSH, Gujarat and field intervention was coordinated by the District AYUSH Officer, Devbhumi Dwarka.

### Study Duration

The study was conducted from April 2021 to March 2022 in three phases. The baseline assessment was done prior to initiating the interventional phase. The duration of interventional trial was 180 days. Two consecutive mid-term follow-ups were conducted during interventional phase. First follow-up was done after one month and second follow-up after three months of baseline respectively. Endline assessment was conducted after six months of interventional phase.

### Sample Size

The sample was distributed across two blocks. Almost 60% participants were from Okha Mandal block and remaining 40% from Bhanvad block based on the population size. A total of 450 adolescent girls and 179 under five children were considered.

### Selection of Cases

For the study, adolescent girls of 11 to 19 years with haemoglobin level <12 gm/dL and under five children who were underweight WFH <-3SD, <-2SD and <-1SD scores were selected. Pregnant and lactating adolescent, participant having any acute illness within last 7 days, having any co-morbidity or serious illness were excluded. Participants were included into the study after obtaining written informed consent from their parents.

### Ayurvedic Medicine

*Punarnava Mandur* is an Ayurvedic medicine quoted in *Bhaishajya Ratnavali*<sup>[6]</sup> and *Charaka Samhita*.<sup>[7]</sup> *Faltrikadhi Kavath* and *Amalaki Rasayan* were other two Ayurvedic medicine used for treatment of *Pandu Roga* stated ayurvedic literature.<sup>[8],[9]</sup> All three remedies were given in tablet form. Shishubhaisaj

granules in powder form were prescribed for under five children. For trial; *Faltrikadhi Kavath* (500 mg) 2 tablets twice a day, *Punarnava Mandur* (250 mg) 1 tablet twice a day and *Amalaki Rasayan* (500 mg) 1 tablet twice a day was given. Whereas *Shishubhaisaj* granules powder 10-20 grams per day for under-five children was given. The contents of ayurvedic medicines are presented in Table-1.

**Table 1: Contents of Ayurvedic Medicines**

Ayurvedic Medicine	Contents (mg)
<i>Phaltrikadhi Kavath</i> tablet	<i>Haritaki 50 mg, Bibhitak 50 mg, Amla 50 mg, Guduchi 50 mg, Vasa 50 mg, Kalmegh 50 mg, Katuki 50 mg, Nimb 50 mg (each 500 mg uncoated tablet contains)</i>
<i>Purnanavardi Mandur</i> tablet	<i>Punarnava 4.25 mg, Nasotar 4.25 mg, Sunthi 4.25 mg, Marich 4.25 mg, Pippa 4.25 mg, Vavding 4.25 mg, Devdar 4.25 mg, Chitrak 4.25 mg, Pokhar mul 4.25 mg, Haridra 4.25 mg, Daru haridra 4.25 mg, Danti mul 4.25 mg, Baheda 4.25 mg, Amala 4.25 mg, Chavak 4.25 mg, Indrajav 4.25 mg, Kutki 4.25 mg, Pippari mul 4.25 mg, Nagarmoth 4.25 mg, Mandur bhasma 169.25 mg, Process in Gomutra QS (each 250 mg tablet contains)</i>
<i>Amalaki Rasayan</i> tablet	<i>Amalaki Rasayan 500 mg (each 500 mg uncoated tablet contains)</i>
<i>Shishubhaisaj Granules</i> Powder	<i>Nagali 20 mg, Brahmi 20 mg, Amalaki 20 mg, Sunthi 12.5 mg, Yastimadhu 10 mg, Ashvagandha 10 mg, Vidarikand 10 mg, Shatavari 10 mg, Palash 10 mg, Bhallatak Beej Maja 10 mg, Gokshur 10 mg, Pippali 2.5 mg, Karkatshringi 2.5 mg, Nagarmoth 2.5 mg, Chocolate Flavor 50 mg, Sharkara 800 mg (each gram granules contains)</i>

#### Procurement and administration of medicine

The trial drug was prepared in the Government Ayurvedic Pharmacy, Rajpipla, Gujarat. For adolescent girls, it was made in tablet form, while for children under five, it was manufactured in powder form for simple administration. All drugs were administered under supervision of Vaidhyas (Ayurvedic Medical Officers) of public AYUSH dispensary.

#### Tools

Enrolment of adolescent girls were done after evaluating their capillary blood via finger-prick method using Hemocue Hb 201+ Analyzer machine with Hb status <12 gm/dL. Under-weight children were screened based on weight for age criteria. (WAZ score). The data were collected using a pre-tested questionnaire via the 'KoBo Collect' Application which was then extracted into excel for further analysis.

#### Study parameters

Demographic details, dietary patterns, knowledge of anaemia, past medical history and anthropometric measurements were carried out in adolescent girls. In under-five children, demographic details, feeding practices, past medical history and their anthropometric measurements were taken during baseline. The data on the regularity of medicine consumption, any improvement or side-effects following medications was taken on mid-term follow-ups and endline evaluations respectively.

#### Ethical Consideration

Institutional Ethics committee's (IEC) approval was taken with Registration No. TRC/2021-22/03 from Indian Institute of Public Health, Gandhinagar. The study was also registered with clinical trial registry of India (CTRI) with Registration No. REF/2021/08/046471. Participant's consent was taken as per IEC and CTRI guidelines.

## OBSERVATIONS AND RESULTS

#### Population characteristics

In this study, 450 adolescent girls and 179 under-five children were registered. Out of which, 219 (48.67%) adolescent girls and 120 (67.03%) under-five children completed their course of interventional trial; while others dropped out.

Among the 219 anaemic adolescent girls, 11.87% girls were between 11-13 years, 49.77% between 14-16 years and 38.36% were between 17-19 years of age. 63% of them were school going girls; of which 27.85% were from higher secondary, 29.68% secondary and 5.5% pursuing their primary education. However,

35.6% girls were non-school going and 1.4% girls were never been to school. Most parents were having secondary education, whereas 19.6% of fathers and 35.6% of mothers were illiterate. Most of the mothers were housewives (77.2%) whereas fathers were labour 42%, farmer 16.4% and self-employed 35.2%. The majority of adolescents have taken food groups in their regular diet were 100% cereals, 93.2% pulses, 88.1% green leafy vegetables, 63.9% fruits, 60.3% milk and milk products and 26% were non-vegetarians. The food apart from home meal includes 53.4% packaged junk foods, 42.5% biscuits, 25.1% chocolate, and 24.2% locally availed junk food.

Almost 76.3% of adolescent girls were aware about anaemia, 17.4% got to know from anganwadi workers and 5.94% from school. On asking about the symptoms, 20.1% narrated paleness of skin, 7.3% fatigue, 5.9 vertigo, 5.5% weakness and 2.3% loss of appetite. Almost two-thirds (63.5%) adolescent girls received iron-folic acid tablets, and 96.4% of adolescent consumed it. During the baseline, 13.2% of girls were observed with sign of pale skin/eye/tongue by research team, 8.2% were having weakness, 7.8% fatigue, 6.8% vertigo, 3.7% loss of symptoms and 76.3% having no any symptoms. The socio-demographic, dietary patterns and knowledge on anaemia details is given in Table-2.

**Table 2: Demographic details, dietary patterns and knowledge of anaemia among adolescent girls**

Adolescent girls (N=219)			
Variable	Type	(N)	(%)
Age	11-13 years	26	11.87
	14-16 years	109	49.77
	17-19 years	84	38.36
Schooling	School going	138	63
	Non-school going	78	36.6
	Never been to school	3	1.4

Education	Primary	12	5.5
	Secondary	65	29.68
	Higher Secondary	61	27.85
Religion	Hindu	175	79.9
	Muslim	43	19.6
	Christian	1	0.45
Father's Education	Illiterate	43	19.6
	Primary	69	31.5
	Secondary	87	39.7
	Higher Secondary	7	3.2
	Graduate	6	2.7
Mother's Education	Illiterate	78	35.6
	Primary	75	34.2
	Secondary	56	25.6
	Higher Secondary	5	2.3
	Graduate	2	0.9
Parents Not-alive	Father	7	3.2
	Mother	3	1.4
Father's Occupation	Agriculture	36	16.4
	Labour work	92	42
	Self-employed	77	35.2
	Others	6	2.7
	NA	8	3.7
Mother's Occupation	Agriculture	23	10.5
	Labour work	13	5.9
	Self-employed	7	3.2
	Housewife	169	77.2

	Others	3	1.4
	NA	4	1.8
Food Groups consumed at Home	Cereals	219	100
	Pulses	204	93.2
	Green leafy vegetables	193	88.1
	Fruits	140	63.9
	Nuts & oils	104	47.5
	Milk and milk products	132	60.3
	Eggs	50	22.8
	Non-vegetarians	57	26
	Food apart from home	Packaged junk food	117
Biscuits		93	42.5
Cold-drinks		45	20.5
Ice-cream		56	25.6
Chocolate		55	25.1
Locally availed junk food		53	24.2
Betel Nut		2	0.9
WASH	After Defecation	171	78.1
	Before Eating	219	100
	After Eating	217	99.1
	After Playing	134	61.2
Awareness about anaemia	Aware	52	23.7
	Not-aware	167	76.3
Knowledge of anaemia from	AWW	38	17.4
	School	13	5.94

Symptoms of anaemia narrated by subjects	Paleness of Skin	44	20.1
	Fatigue/Tiredness	16	7.3
	Vertigo	13	5.9
	Weakness	12	5.5
	Loss of appetite	5	2.3
	Low Concentration	1	0.5
IFA tablets	Received IFA tablets	139	63.5
	Consumed IFA tablets	134	96.4

Among 120 under five children, 55.8% were female and 44.2% were male children. Half of the fathers were labourer and 39.2% were self-employed. The 75.6% of children between 6-24 months were exclusively breastfed. At home, 94.3% children consume cereals, 76.7% pulses, 67.5% milk and milk products, 63.3% green vegetables and 44.2% were having fruits in their diet. Food apart from home meal among children comprise 68.3% biscuits, 54.2% fancy food packages, 26.7% ice-cream, 23.3% chocolate, 17.5% cold-drinks and 13.3% junk food in their diet. The socio-demographic details and dietary patterns of under-five children is given in Table-3.

**Table 3: Demographic details and dietary patterns among under five children**

Under five children (N=120)			
Variable	Type	(N)	(%)
Gender	Female	67	55.8
	Male	53	44.2
Age	8-12 months	11	9.17
	13-24 months	30	25
	25-36 months	29	24.17
	37-48 months	31	25.83

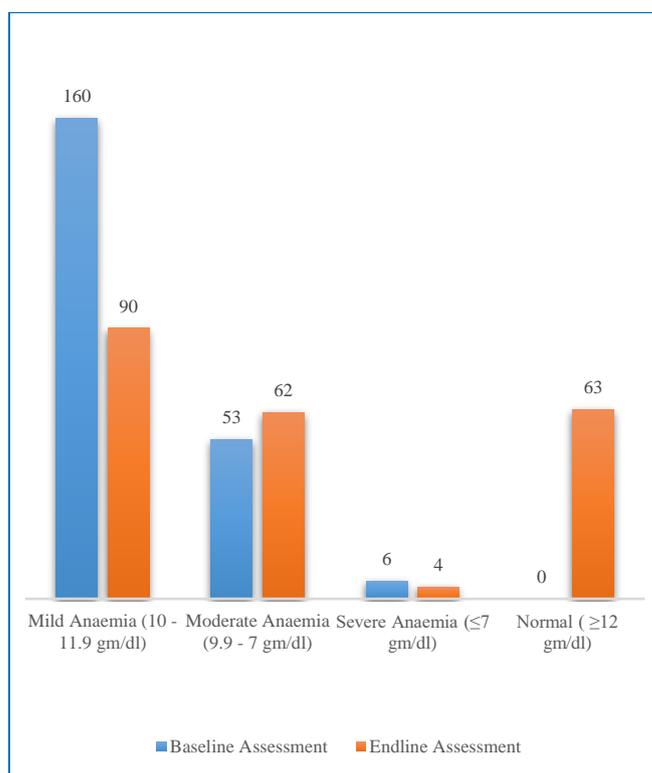
	48-60 months	19	15.83
Caste	ST	46	38.3
	SC	11	9.2
	OBC	58	48.3
	General	5	4.2
Religion	Hindu	111	92.5
	Muslim	9	7.5
Father's Education	Illiterate	18	15
	Primary	40	33.3
	Secondary	49	40.8
	Higher Secondary	3	2.5
	Graduate	9	7.5
	Diploma	1	0.8
Mother's Education	Illiterate	19	15.8
	Primary	52	43.3
	Secondary	34	28.3
	Higher Secondary	2	1.7
	Graduate	12	10
	Diploma	-	-
Parents Not-alive	Father	2	1.7
	Mother	1	0.8
Father's Occupation	Agriculture	6	5
	Labourer	60	50
	Self-employed	47	39.2
	Others	5	4.2
Food Groups consumed at Home	Breastfeed	31	25.8
	Cereals/grains	113	94.2
	Pulses	92	76.7
	Green leafy vegetables	76	63.3
	Fruits	53	44.2

	Milk and milk products	81	67.5
Food apart from home	Fancy food packages	65	54.2
	Biscuits	82	68.3
	Chocolate	28	23.3
	Locally availed junk food	16	13.3
	Ice-cream	32	26.7
	Cold-drinks	21	17.5

### Effect on Haemoglobin

During endline evaluation, 219 adolescent girls were followed up during the end-line assessment. It has been observed that, total of 63 (28.77%) adolescent girls have become normal. The mean hemoglobin estimation of 219 subjects was +0.37 gm/dL from 10.44 gm/dL to 10.81 gm/dL. However, 90 (41.09%) were mild anaemic, 62 (28.31%) were moderately anaemic and only 4 (1.83%) were severe anaemic as seen in Figure-1. A total of 28.77% adolescents have become normal.

Figure 1: Anaemic status of adolescent girls (N=219)

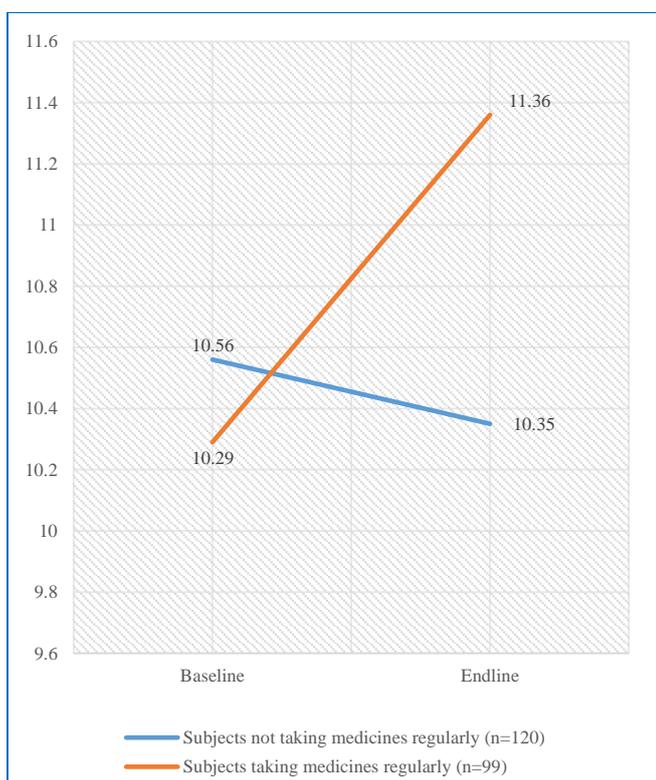


**Table 4: Anaemic Status of subjects who have taken medicine regularly (N=99)**

Range	Baseline	Endline
Normal ( $\geq 12$ gm/dL)	-	41 (41.41%)
Mild Anemia (10 - 11.9 gm/dL)	68 (68.69%)	39 (39.40%)
Moderate Anemia (9.9 - 7 gm/dL)	26 (26.26%)	18 (18.18%)
Severe Anemia ( $\leq 7$ gm/dL)	5 (5.05%)	1 (1.01%)

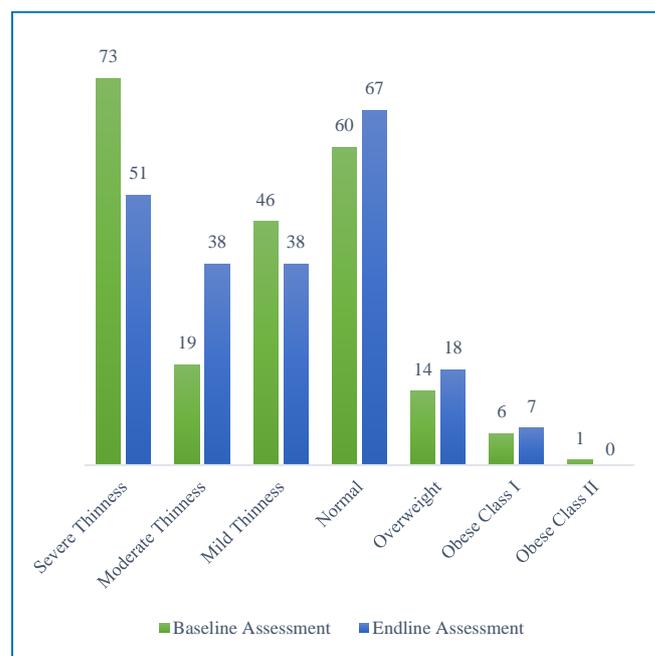
Among the adolescent girls 99 (45.20%) of them who consistently used ayurvedic medications had shown significant improvement (p-value = 0.005) as seen in Table-4. It has been observed that 68 (68.69%) subjects who were mild anaemic were reduced to 39 (39.40%). 26 (26.26%) moderate anaemic reduced to 18 (18.18%). 5 (5.05%) severe anaemic reduced to 1 (1.01%). However, it shows the positive outcome as a total of 41 (41.41%) subject have become free from anaemia.

**Figure 2: Comparison of mean Hb of adolescent girls based on regularity of medicine consumption**



Adolescent girls were observed on their body mass index (BMI) range presented in Figure-3. Severe thinness i.e. (BMI <16) changed from 33.33% to 23.29%, moderate thinness (BMI 16-17) from 8.67% to 17.35%, mild thinness (BMI 17-18.5) from 21% to 17.35%. Normal range (BMI 18-25) increased from 27.4% to 67 30.59%, Overweight (BMI 25-30) from 6.4% to 8.22%, Obese class I (BMI 30-35) from 2.74% to 3.2% and no one remained in Obese class II (BMI 30-35).

**Figure 3: Comparison of BMI range of Baseline and Endline Assessment of Adolescent Girls (n=219)**



**Effect on malnutrition**

The *Shishubhaisaj* granules powder shows improvement in weight for age (WAZ score) of under-five children. The mean weight gain among children was +0.86 kg. There were 22.5% children between <-5.5 to -3 SD score i.e., severely underweight which then reduced to 15.83% in endline. 29.16% were between <-3 to -2 SD score i.e., moderately underweight which improved to 35%. 29.16% were between <-2 to -1 SD i.e., mild underweight which reduced to 26.67% and 16.67% children having <-1 SD improved to 18.33% whereas 4.17% children became normal during endline as in Table-5. Moreover, Mid Upper Arm Circumference (MUAC) was increased to +0.73 cm during endline.

**Table 5: Weight for Age (WAZ) score of under-five children**

Variable	Type	Baseline	Endline
Weight for Age (WAZ) N=120	Normal	3 (2.5%)	5 (4.17%)
	<-1SD - 0 Median	20 (16.67%)	22 (18.33%)
	<-2SD to -1SD Mild	35 (29.16%)	32 (26.67%)
	<-3SD to -2SD Moderate	35 (29.16%)	42 (35%)
	<-5.5SD to -3SD Severe	27 (22.5%)	19 (15.83%)

**Improvement following intervention**

The Ayurvedic medicines - *Faltrikadhi Kavath*, *Purnanavardi Mandur* and *Amalaki Rasayan* were effective among adolescent girls. During endline, 57.53% reported increased appetite, 56.16% felt energetic, 62.56% felt better and 3.20% reported their vertigo went away whereas 28.77% girls reported no any changes. *Shishubhaisaj* granules powder proves effective as 86.67% children reported increased appetite and 85% were playful. The changes felt after consumption of ayurvedic medicines among adolescent girls and under five children is presented in Table-6.

**Table 6: Changes felt by subjects after intervention**

Variable	Type	Adolescent girls		Under five children	
		n=219	%	n=120	%
Changes felt after intervention	No Any	63	28.77%	1	0.83%
	Appetite Increased	126	57.53%	104	86.67%
	Feeling Energetic	123	56.16%	-	-
	Feeling Better	137	62.56%	-	-

Vertigo went away	7	3.20%	-	-
Felt weight increased	1	0.46%	-	-
Playful	-	-	102	85%

**Compliance to medication**

The study suggests that 54.80% of adolescent girls have shown irregularity in consumption of medicines and 45.20% girls taken it regularly. The compliance was good among children under five years as 85.83% have regular consumption of ayurvedic medicine. The participants who have consumed the ayurvedic medicine regularly shows strong association in improving their nutritional status. The frequency of consumption of ayurvedic medicines and its association in improving the nutritional status is presented in Table-7.

**Table 7: Frequency of consumption of medicines by study participants**

Variable	Type	Adolescent girls			Under five children			
		N=219	%	P value	N=120	%	P value	
Frequency of consumption of medicines	Received Regularly	99	45.20%	0.005*	103	85.83%	0.644	
	Not taken for	1 week	6	2.74%	0.590	1	0.83%	-
		2 weeks	1	0.46%	-	2	1.67%	-
		3 weeks	-	-	-	2	1.67%	-
		1 month	18	8.22%	0.409	1	0.83%	-

	1.5 months	10	4.57 %	0.94 6	2	1.67 %	-
	2 months	13	5.94 %	0.11 5	2	1.67 %	-
	2.5 months	1	0.46 %	-	-	-	-
	3 months	22	10.0 4%	0.77 1	3	2.5%	0.4 22
	>3 months	49	22.3 7%	0.12 1	4	3.33 %	0.0 53
*strong association: p-value < 0.05							

A 14.17% of children under five and 54.80 percent of adolescent girls did not consistently use ayurvedic medications for the reasons listed in Table-6. Only 10 (4.57%) of the girls experienced minor adverse effects like nausea and vomiting, but overall the medication was well accepted. The majority of adolescent girls affirm non-compliance with medications due to higher pill count and strange flavour and taste, forgetting to take them, and experiencing negative drug reactions such nausea, vomiting, and abdominal pain. Children exhibited better compliance, and just 1.67% of those reported experiencing abdominal discomfort. While 5.83% of children under the age of five disliked the flavour and 4.17% neglected to take them narrated by parents as in Table-8.

**Table 8: Reasons for non-compliance among participants**

Variable	Type	Adolescent girls		Under five children	
		n = 120	%	n = 17	%
	More Pill count	64	29.22%	-	-
	Forgot to take	62	28.31%	5	4.17%

Reasons of non-compliance	Didn't like the taste	43	19.63%	7	5.83%
	Due to adverse drug reaction	10	4.57%	2	1.67%
	Fever, Cough & Cold	5	2.28%	-	-
	Taking another medication	3	1.37%	-	-
	Went out of station	2	0.91%	-	-
	Headache	2	0.91%	-	-
	Other Medical Illnesses	2	0.91%	1	0.83%
	Miscellaneous Reason	2	0.91%	1	0.83%
	Didn't felt any changes	1	0.45%	-	-
	Refusal from family/friends	1	0.45%	1	0.83%

**DISCUSSION**

Ayurveda adopts a holistic way in understanding a disease. *Pandu* disease resembles very similar to anaemia. The present study was planned to assess the efficacy of ayurvedic medicines - *Faltrikadhi Kavath*, *Purnanavardi Mandur* and *Amalaki Rasayan* tablets to improve the nutritional status of anaemic adolescent girls (*Pandu Roga*) and *Shishubhaishaj* granules powder for underweight children under five years of age. The trial drugs chosen here strikes at the etio-pathogenesis of the diseases. Most of the previous study used single remedy in either group whereas in this study we use three ayurvedic medicines for anaemia among adolescents.<sup>[8],[9]</sup> This study presented the prevalence of anaemia in adolescent girls was due to inadequate dietary habits, lack of knowledge about anaemia, unawareness for receiving extra iron-folic acid tablets. Low socioeconomic families have not consumed proper diet resulting their children develop malnutrition leads to several diseases.<sup>[1],[2]</sup>

We found good outcome and improvement in the anaemic status of adolescent girls among those with good compliance. It is obvious that the multiple ayurvedic preparation prove effective in tackling anaemia but the frequency of consumption and compliance needs to improve. Adolescent girls claim that they don't take their prescriptions as prescribed because of the greater pill count, unusual flavour and taste. They forget to take them, because few have side effects like nausea, vomiting, and abdominal discomfort. Because some adolescent did not take the ayurvedic medications regularly, they do not exhibit any improvement following intervention. Adolescent girls who take the ayurvedic medications often reported improvements in their overall health, an increase in appetite, and relief from their symptoms.

Our study suggested good compliance of the ayurvedic medicines among children under five years of age. Children who have an enhanced appetite and have become more playful or animated respond well to the powdered *Shishubhaisaj* granules. Even children, according to parents, like to consume the *shishubhaisaj* powder in with milk, or just dry. The result suggests that *Shishubhaisaj* is significantly effective in improving underweight child. Both the subjective and haematological measures in this investigation have statistically significant findings.

Apart from the medicines used in the trial for anaemia, many drugs are bestowed with the properties of being *Rasayan* which aids the body in synthesizing best of the *Dhatu*s (blood components). There are many preparations in modern medicine to improve anaemia, but majority of these include undesirable side-effects like nausea, vomiting, constipation, etc. Therefore, one must take an ayurvedic medicine which is extremely successful in treating aforementioned disease, quick to act, long lasting, more tolerable, and economical in order to overcome anaemia. The study shows adverse drug reactions among adolescent girls and under five children which is less and can be addressed clinically.

The study's overall findings point to the need to increase ayurvedic intervention compliance, raise community awareness of anaemia, and encourage

faith in Ayurveda among the general public. Henceforth, there is a need to improve characteristics of the Ayurvedic composition in order to upsurge the acceptance of ayurvedic medicines. Polypills or combination pills can be created to decrease the quantity of pills while simultaneously changing their formulations or composition and flavour, which may improve compliance.

## CONCLUSION

The trial drugs are effective in ameliorating the signs and symptoms of anaemia. The results of this study make it abundantly clear that consistent medication use significantly improved the anaemia status of adolescent girls. The study shows good compliance among under five children. Results could have been more effective if compliance would increase. Adolescent girls show non-compliance of ayurvedic medicines due to more pill count and dislike to taste.

Our study shows that medication compliance is extremely important, so measures to improve compliance must be addressed. However, to improve the adherence of Ayurvedic medicines and getting the required results we must: reduce the pill count by forming one capsule or combination pill, enhance the taste by changing formation into *Chyawanprash* form, granules form, palatable syrup form, periodic counselling of beneficiaries which can maximize the compliance, promoting role of Ayush Medicine in treating Anaemia. The study on the improvement in non-iron deficiency anaemia should be most useful in the future since this study considered the iron-deficient anaemic participants. If correct administration and compliance are observed, Ayurvedic medications may manage anaemia more effectively than modern western treatments. Adopting AYUSH dietary regimen can also play a pivotal role in management of the disease.

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### AUTHORS CONTRIBUTION

All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

### CONFLICT OF INTEREST

Authors declare no conflict of interests with regards to the submitted work. The medications were provided by Government Ayurvedic Pharmacy, Rajpipla, Gujarat. Besides providing the medications, Government Ayurvedic Pharmacy Rajpipla was not involved in any aspect of the clinical trial reported in this study. This clinical trial was conducted under the guidance of District Ayurvedic Officer, Devbhumi Dwarka, Gujarat.

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