Invited Article

An evaluation of the ICDS food fortification in Uttarakhand

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ABSTRACT

Objective: To assess the impact of consuming fortified blended food on the reduction of anemia and vitamin A deficiency in the beneficiary children 12-59 months, under the routine 'programmatic conditions' of ICDS implementation.

Study Design: End line evaluation study with Probability Proportion to population Size (PPS) Sampling.

Setting: Study covered 30 villages from each of two blocks of uttarakhand state.

Subjects: 750 pre school children (0-6 years) were studied.

Method: Thirty villages were selected by Probability Proportion to population Size (PPS), from each of the two blocks (intervention and control). From each selected village, 25 children were selected for the anthropometric measurement and dietary intake and of these, 10 children were selected for clinical and bio-chemical examination.

Results: Severe anemia in the intervention block reduced significantly by 6% (from 6.1% to 0%), while in control block, the % reduction in severe anemia was 3.6% (from 3.6% to 0%). Significantly improved vitamin A status of child beneficiaries in the intervention block Kalsi is further substantiated by the significant decline in the presence of Bitot's Spot (clinical manifestation of vitamin A deficiency in children), from 1.3% at the baseline to 0.3% at the end line. Prevalence of severe and moderate malnutrition declined significantly within both interventions as well as control blocks.

Conclusion: The results of the present study state that consumption of fortified blended food by the programme beneficiaries has made a positive impact on the status of micronutrient malnutrition.

Key Words: Probability Proportion to population Size (PPS)Sampling, WHO classification , Anemia level, Vitamin-A Deficiency, Standard Deviation classification, Severe malnutrition

Introduction:

Micronutrients are life-sustaining nutrients that are needed only in small quantities for effective functioning of brain, the immune system and energy metabolism. To call them micronutrients may be in conformity with the minute quantities needed by the human body but it is certainly not consistent with the nature and extent of damage being brought about by their deficiencies. Micronutrient malnutrition makes a considerable negative impact on the health, learning abilities, cognitive development and work capacity of both children and adults. Among women, it affects the pregnancy outcome. Deficiencies of micronutrients are closely linked with childhood illness and mortality. Yet these deficiencies are largely preventable. Diet diversification, food fortification, supplementation and public health measures are the ways to control and prevent micronutrient malnutrition.

In children, the prevalence of anemia is about 40-70%. The situation is even more alarming amongst children below 3 years with about three- quarter of them suffering from anemia (IIPS,2000). There is also a sizeable proportion of vitamin-A deficiency amongst women and children (5-7% children suffering from vitamin-A deficiency).

There are several reasons for micronutrient malnutrition and these include poor access to micronutrient rich food, morbidity, parasitic infestations, soil quality, compromised agricultural practices, climatic conditions and geographical isolation of the populace.

There are scientific evidences available from the western population, which reassures that the consumption of most foods is self-limiting and no incidence of nutritional imbalance / adverse effects on consumption of micronutrient-fortified foods in any supplementary nutrition programme has ever been reported worldwide. However, the concept of food fortification is relatively uncommon in India. Hence, sometimes due to ignorance or due to paucity of research to assess the impact of fortifying supplementary food in large feeding

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programmes, there is an apprehension that fortification may either lead to imbalance of nutrients in the body or may not really improve the nutritional status of people consuming marginal diets. This has lead to a prudent approach in taking bold decisions to fortify the ICDS supplementary food to reduce micronutrient malnutrition in different states of India.

This paper has been planned to assess the impact of fortifying the supplementary food provided under the ICDS programme, on the reduction of anemia and vitamin-A deficiency in children 12-59 months under programmatic conditions.

Methodology:

Kalsi block of Dehradun district of Garhwal region of Uttaranchal was selected as the intervention block where FBF was to be provided to the ICDS beneficiaries and the baseline was undertaken. The baseline assessment in the control block could therefore start almost one year later after it was undertaken in the intervention block in order to be in line with the seasonality factor of the baseline study in the intervention block. While the baseline survey was conducted in December 2003, the distribution of fortified food could however start only towards the June 2004, nearly 6 months after the baseline survey was undertaken. Hence, the endline survey was initiated in December 2006, after about 30 months of intervention with FBF. Under the present study, extensive surveys were undertaken in both the control and intervention areas to assess the baseline levels of food consumption patterns, nutrition and health behaviors, nutritional status, and prevalence of micronutrient malnutrition amongst children 12-59 months; followed by an endline evaluation on the same parameters to assess the impact, if any, of ICDS food fortification, if any.

Sampling Methodology:

Thirty villages were selected by Probability Proportion to population Size (PPS) from each of the two blocks. From the each selected village, 25 children were selected for the anthropometrics measurement and dietary intake, 10 children for clinical examinations and 5 for bio-chemical examinations.The sample size was worked out by assuming μ =0.05, 80% power of test, p_1=0.15,p_2=0.10 and taking into account the design effect as1.5. The prevalence of severe anemia was around p_1=15% and it was hoped that it would be reduced to a level of p_2=10% by the fortified ICDS supplementation. A sample of control with half sample size was taken from the same district but from other blocks not covered under ICDS fortification. In the end line evaluation survey, half of children registered for receiving ICDS services from base line survey were covered and remaining were taken from the fresh group of children (because of migration and over age).

The sample design as well as the sample selection for endline assessment was similar to the one used in the baseline assessment. However, during the endline evaluation, the age cohort for children to be covered changed from 12-59 at the baseline stage to 24-71 months at the endline stage to account for the gap between the two rounds (baseline and endline).

Results:

Majority of the households in both (control and the intervention) blocks belonged to lower socio-economic groups and the underprivileged sections of the society. Almost all the selected households were Hindus in Kalsi, while nearly one-tenth households were of Hindus in Paunta Sahib. Almost 95% of the population covered in Kalsi was from the scheduled castes (SC) / scheduled tribes (ST). All the three major castes were almost equally represented in the other block. The demographic profile did not change much at the time of endline evaluation. There was a substantial increase in the size of the land-holdings but there was only a marginal increase in the income - 20% in the intervention block and 10% in the control block, over a 30 months' time period.

Micronutrient malnutrition among children:

Anemia is very widespread amongst children below three in India (74.2% as per NFHS-2 and 79.2% as per NFHS-3). Testing for the serum hemoglobin levels assessed the change if any, in the prevalence of anemia. The details on hemoglobin (Hb) levels of the children of both the rounds (baseline and endline) have been presented in this section. As per WHO classification, the levels of anemia have been defined as severe anemia (for Hb less than 7g/dl), moderate anemia (for Hb level between 7 g/dl to 9.9 g/dl), and mild anemia (for Hb level between 10-10.9 g/dl). All these types of anemia taken together have been defined as the any type of anemia, estimated at <11g/dl.

It is observed that there is considerable improvement in the prevalence of any anemia in all blocks. The decline was 24.4% in Kalsi block and 19% in Paunta Sahib block. The values of 't' for differences in declines in any anemia level between Kalsi and Paunta Sahib was 5.This difference is statistically significant. This clearly shows that there were statistically significant declines in anemia in intervention block compared to the control block. (Table 1)

Table 1: Anemia Level (%) in children by age and sex

Paunta Sahib	Baseline Control Block						Endline Control Block					
Age (Yrs)	N	Normal	Any Anemia	Mild	Moderate	Severe	N	Normal	Any Anemia	Mild	Moderate	Severe
1-2	46	21.7	78.3	30.4	45.7	2.2	-	-	-	-	-	-
2-3	67	25.4	74.6	16.4	55.2	3.0	62	27.4	72.6	25.8	46.8	0.0
3-4	89	20.2	79.8	25.8	49.4	4.5	100	34.0	66.0	44.0	22.0	0.0
4-5	105	27.6	72.4	26.7	41.9	3.8	70	45.7	54.3	38.6	15.7	0.0
5-6	-	-	-	-	-	-	67	68.7	31.3	20.9	10.4	0.0
Sex												
Male	149	24.2	75.8	28.9	43.6	3.4	157	42.0	58.0	37.6	20.4	0.0
Female	158	24.1	75.9	20.9	51.3	3.8	142	44.4	55.6	29.6	26.1	0.0
Total	307	24.1	**75.9**	24.8	47.6	**3.6**	299	43.1	**56.9**	33.8	23.1	0.0
Kalsi	**Baseline Intervention Block**						**Endline Intervention Block**					
Age (Yrs)	N	Normal	Any Anemia	Mild	Moderate	Severe	N	Normal	Any Anemia	Mild	Moderate	Severe
1-2	33	0.0	100	6.1	87.9	6.1	-	-	-	-	-	-
2-3	76	3.9	96.1	3.9	84.2	7.9	71	25.4	74.6	39.4	35.2	0.0
3-4	101	7.9	92.1	3.0	82.2	6.9	100	28.0	72.0	41	31	0.0
4-5	99	11.1	88.8	3.0	81.8	4.0	91	34.1	65.9	36.3	29.7	0.0
5-6	-	-	-	-	-	-	32	50.0	50.0	37.5	12.5	0.0
Sex												
Male	154	3.9	96.1	3.9	84.4	7.8	168	29.2	70.8	39.9	31.0	0.0
Female	155	10.3	89.7	3.2	81.9	4.5	127	34.6	65.4	37.0	28.3	0.0
Total	309	7.1	**92.9**	3.6	83.2	**6.1**	295	31.5	**68.5**	38.6	29.8	**0.0**

NFHS-II: Any anemia – 76% (12-35 months), 70% (36-71 months),IASDS/KGMC: Any anemia -78% (12-35 months), 69.9% (36-71 months)
(>11 g/dl Normal, <11 g/dl Any Anemia, 10-10.9g/dl Mild, 7-9.9 g/dl Moderate and <7 g/dl Severe)

Vitamin – A deficiency among children

Vitamin- A deficiency based on Serum Retinol Levels As per the WHO, the children having serum retinol levels between 10 mcg/dl and 19.9 mcg/dl are classified as having vitamin A deficiency. It is observed that there is significant improvement in serum retinol levels of children at the end line stage in both the blocks. In Kalsi, the percentage of children below the cut-off 19.9 mcg/dl has reduced from 30.9% at baseline to 4% after the intervention with fortified food. The corresponding percentages in Paunta Sahib was 2.3 and 1.4. The "t" value for difference in Kalsi and Paunta Sahib is statistically significant. (table 2)

Table 2: Vitamin A deficiency in children (%)

Age (Yrs)	Kalsi		Paunta sahib	
	Baseline	Endline	Baseline	Endline
1-2	32.6	-	3.0	-
2-3	28.4	6.5	1.3	0.0
3-4	28.1	5.0	5.0	3.0
4-5	34.3	4.3	0.0	1.1
5-6	-	0.0	0.0	0.0
Male	24.8	1.3	3.2	0.6
Female	36.7	4.9	1.3	2.4
Total	30.9	4.0	2.3	1.4

Nutritional status of pre-school children

Standard deviation (SD) classification has been used to determine the extent of malnutrition using weight-for-age as an indicator. Children who fall below –3sd median weight are classified as having severe malnutrition (severely underweight), and those below –2SD but–3SD and above median weight are termed moderately underweight. Prevalence of both severe and moderate malnutrition declined in Kalsi and Paunta Sahib blocks of which Paunta Sahib was the control area. The values of't' for differences in declines in severe under nutrition were 2.6 for Kalsi vs. Paunta Sahib. This t value has been found statistically significant.(Table 3)

Table 3 : Nutritional status of children (%)

Nutritional Status	Baseline			End-line		
	Male	Female	Overall	Male	Female	Overall
Severe	9.4	9.0	9.2	4.5	6.8	5.6
Moderate	39.7	36.2	38.0	34.1	31.5	32.9
Normal to mild	50.9	54.8	53.8	61.4	61.7	61.5
Severe	7.3	8.5	8.0	4.6	3.5	4.1
Moderate	31.5	36.1	33.9	25.1	27.8	26.4
Normal to mild	61.2	55.4	58.1	70.3	68.7	68.5

Perception of mothers about the fortified food provided at the AWCS

Majority (78-97%) of the mothers stated that food distribution was regular and almost all children were also taking usual meals at home. On an average, children were getting 73-80g of fortified supplementary food per day from AWC. The average quantity consumed by children, as reported by mothers, was 76-79g in case of children above 3 years and about 46-69g by those below three years. The gap in consumption was apparently because of sharing of FBF by others. Majority (71-80%) mothers preferred FBF for their children. About 18% expressed the view that different types of food should be supplied (even fruits, Biscuits), and some stated that FBF should be sweeter. A few AWWs and mothers suggested that supplementary food should have a variety and include foods like biscuits and puffed snacks. Most children and mothers (76-84%) liked it. Those mothers who did not prefer this food for their children stated that it was not of good quality, as it did not have oil in it as in the traditional home-based blended food- Panjiri. A few gave low levels of sweetness as the reason for not liking it.

Association between Hb levels and food consumed

It has been observed that in Kalsi block, among the children who consumed less than 50% of fortified supplementary food, marginally higher percentage of children were observed to be anemic, in comparison to children consuming more than 75% of fortified food. (table 4)

Table 4: Hb Levels according to food consumed

% of fortified food consumed	% of children with any anemia at the end line evaluation
< 50	63.0
> 75	60.0

What is Already Known

Fortification is the most cost-effective, sustainable option for eliminating micronutrient deficiencies.

What this Study Adds

Based on the findings of this, Ministry of WCD, GOI recommended the revised norm to ICDS beneficiaries.

Discussion:

The results of the present study state that consumption of fortified blended food by the programme beneficiaries has made a positive impact on the status of micronutrient malnutrition. This has been substantiated by many studies that have been conducted in the past three decades across the world and have been reported in various widely cited journals.

Fortification of food staples with iron, vitamin A, iodine and other micronutrients is the most cost-effective, sustainable option for eliminating micronutrient deficiencies. In most developing countries, and in some groups in developed countries, the micronutrient content of unfortified, complementary foods is inadequate to meet infant requirements. It is particularly difficult for infants to consume enough calcium, iron, and zinc from the family pot. Even the riboflavin, thiamine, vitamin A, and vitamin B6 intakes are often low.

Research findings of the present study with respect to reduction in anemia and vitamin A deficiency among the children; upon using fortification as a strategy of choice for intervention in the ICDS programme, have also been validated by similar studies the world over.

Based on the results and trends shown by this study in the improvement of micronutrient malnutrition status of young children, the intervention with micronutrient fortified food in the large scale feeding / nutrition programmes like the ICDS and MDM, should therefore be recommended for replication at the national level.

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