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Impact of Intervention Feeding Trial on Nutritional Status of 6-10 Years Old Malnourished Children

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INTRODUCTION

The importance of optimal nutrition for health and human development is well recognized. As a result, there has been improvement in access to food and well being of the population of the country. The country has moved from chronic shortages to an era of surplus. Yet, due to post harvest losses and unequal distribution, 8 percent of Indians do not get two meals a day and there are pockets where severe undernutrition takes their toll even today. Every third child born is under weight. About half of the preschool and school age children suffer from undernutrition. Micronutrient deficiencies are wide spread; more than half of the children are anemic; reduction in vitamin-A deficiency and IDD are sub-optimal. (Tenth Five Year Plan Report, 2002-2007).

As on today, the micronutrient deficiencies particularly vitamin A and iron are attracting considerable attention. Serious efforts are being made in the entire developing world by the governments in combating the menace of micronutrient deficiencies commonly known as "Hidden hunger". The most tragic feature of these deficiencies is that their victims are infants, young children and pregnant women.

The age of 6-10 years is a period of growth and at this stage, the foundation for adulthood is laid down. Hence, the nutritional deprivation during this period may influence the adult size and capabilities of the individual at later stages of life. Incidence of anemia is quite prevalent among school going children also and they usually do not benefit from any of the micronutrient intervention programmes for they are focused on preschoolers, pregnant and lactating women. Micronutrient intervention is necessary for this age group also.(Rajagopalan, 2003).

Nutrition scientists concerned with the task of solving the gigantic problem of malnutrition hold the responsibility to develop technologies, which are capable of controlling conditions underlying malnutrition. These technologies require the basis of several nutritional intervention studies. Hence, in the present investigation, attempt was made to assess the impact of supplementation of the developed product(s) on 6-10 years of malnourished children.

MATERIALS AND METHODS

Locale: Two government schools one each from Manpura and Bheelwara villages of Badgaon Panchayat Samiti of Udaipur district were selected for the intervention programme. While identifying the villages, established linkages, ease of work and vicinity within 10-25 kms. from the city were kept in mind. In addition, willingness of the CDPO, sarpanch, teachers, parents and the children was given due consideration. They all were apprised about the nature of work to be undertaken.

Selection of Sample: Only malnourished children between 6 to 10 years of age as predetermined criteria were selected for the intervention trial. For the purpose, 53 children were taken in the experimental group and matched 30 children constituted the control group. During three months of feeding trial, 11 students were dropped owing to irregularity in taking the supplements, finally making a group of 42 experimental and 30 control children.

Selection of the Food Supplements: Two value added traditional foods of superior nutritional composition viz. Paushtic laddu and Mathari were selected as the food supplements to be given during feeding trial. The selection was made on acceptability, shelf life and its nutrient contribution furnishing 1/3rd to 1/4th of the day's requirement of school age children for the nutrients viz. protein, energy, iron & beta carotene.

To develop these food supplements, underutilized foods of the study area viz Kangni (*Setaria italica*)- a millet, Kulathi (*Dolichos biflores*)- a legume and Leafy vegetable, Bathua (*Chenopodium album*)/ Lunakia (*Portulaca oleracea*) were used.

Efforts were made to ensure regular and proper distribution of the supplements among the experimental children.

Assessment of Nutritional Status: Assessment of nutritional status was done to determine the type and magnitude of malnutrition prevalent among

the study population. Following methods were used to assess the nutritional status:

Dietary Assessment: To find out the inadequacies in the diets of the study group, 24 hour recall method was used. This method was considered appropriate as the diets consumed in these rural areas are invariably monotonous. For the purpose, a standardized cup set was used and intake of each food item in the daily diet by the study group was assessed, converted to nutrients and compared with respective RDA.

Clinical Examination: Clinical examinations assess levels of health of individuals in relation to the food they consume. The study population was examined carefully for the presence or absence of clinical signs directly related to nutrient deficiencies using a list of clinical signs. (Bamji et al., 1996)

Anthropometric Measurements: Height and weight of the study subjects were measured before and after feeding of the supplement in experi-mental and control groups as per the standard method. (Jelliffe, 1966)

Biochemical Estimation: Hemoglobin level of a sub sample of 10 experimental children and 10 control was examined prior and after feeding programme. For the purpose, shale's method was used.

RESULTS AND DISCUSSION

Dietary Assessment: As evident from table 1, the subjects in both the groups were found consuming diets highly deficient in milk and milk products, fruits, green leafy or other vegetables. A deficit of more than 50 percent was recorded in all these food groups. This trend was similar in both control as well as experimental group of children, where the intake of cereals, fats & oils, and sugar & jaggery was about 40 to 50 percent of RDA.

The data regarding nutrient adequacy in the diet of these rural children has been presented in table 2 which clearly shows that the most deficient nutrient in the diets of these children was β-carotene which was not furnishing even one fourth of the day's requirement followed by iron, calcium, energy and protein, all of which were meeting nearly half of the days requirement stressing the need of additional supplements to their diets. Only fat intake can be considered relatively satisfactory which was more than 65 percent in both of the groups. The results are in coherence to the findings of an earlier study conducted by Kumari and Singh (2001) which revealed similar pattern of deficient intake of protective foods by the children in the age group 6-12 years.The findings of the survey conducted

Table 1: Mean intake of food stuffs with percent deficit of the children

Food Stuffs	*Control (N=30)*			*Experimental (N=42)*	
	RDA(g)*	*Intake mean ± SD*	*%*	*Intake mean ±SD*	*%*
Cereals	270	164.0 ±20.12	40	157.9 ± 29.6	42
Pulses	60	26.7 ± 4.5	56	22.2 ± 6.7	63
Green leafy vegetable	100	38.24 ± 15.5	62	41.26 ± 23.2	69
Roots & tubers	100	56.4 ± 10.2	44	52.32 ± 16.4	48
Other Vegetables	100	36.27 ± 6.4	64	39.17 ± 8.4	61
Fruits	100	31.2 ± 12.6	69	23.4 ± 10.2	77
Milk & Milk products (ml.)	500	135.2 ± 15.6	73	128.0 ± 20.8	74
Fat and oil	25	15.4 ± 3.5	39	12.3 ± 6.7	51
Sugar & jaggery	30	19.8 ± 4.6	34	17.2 ± 5.4	43

* NIN, Hyderabad

Table 2: Mean nutrient intake with percent adequacy

Food Stuffs	*Control (N=30)*			*Experimental (N=42)*	
	RDA(g)*	*Intake mean ±SD*	*%*	*Intake mean ±SD*	*%*
Protein (g)	41	24.6 ± 3.08	60	22.4 ± 5.6	54
Energy (K cal)	1950	968 ±52.36	50	971 ± 48.4	50
Fat (g)	25	18.7 ± 2.1	75	16.4 ± 3.0	66
Calcium (mg)	400	216.9 ± 12.2	54	232 ± 8.9	58
Iron (mg.)	26	11.0 ± 1.2	42	10.1 ± 2.6	40
β-carotene (μg)	2400	486.0 ± 23.1	20	412.1 ± 26.3	17

*Gopalan et al (2000)

Table 3: Mean anthropometric measurements of the children

Variables	*Control Group (N=30)*			*Experimental Group (N=42)*		
	Initial	*Final*	*"t" Value*	*Initial*	*Final*	*"t" Value*
Height (Cms.)	112.9 ± 5.5	113.4 ± 5.6	NS	115.9 ± 8.5	117.0 ± 8.4	NS
Weight (Kg.)	14.9 ± 1.9	15.4 ± 2.0	NS	15.5 ± 2.8	18.5 ± 2.7	Sig (P<0.001)

NS: Non-Significant.

by NNMB also portrays deficient intake (<50% of RDA) of vitamin A by the young children (Bhasker, 2000). Another study depicting protein calorie adequacy in the diets of the rural children in the age group of 7- 12 years in Tamil Nadu was much less (<15%) while micronutrient intake was relatively satisfactory but still below 50 percent of the RDA. (Rajagopalan, 2003)

Anthropometric Assessment: As evident from table 3 presenting height and weight, the simple anthropometric measurements of the group, there was no significant difference between the initial height and weight of experimental and control group of children depicting homogenity in the group. The experimental group was given paushtic laddu and mathari furnishing enhanced quantities of protein, energy, iron and β carotene. Those belonging to control group were not given the supplement. After 90 days of continuous feeding, their weight and height were again recorded and presented as the final values. Statistical comparison ('t' test) clearly reveals a significant improvement in the weight of experimental group of children. In case of their height, the increment was of greater magnitude as compared to their control counterparts yet the difference was statistically non significant.

Weight of each individual subject when assessed in view of their height (Wt. for Ht.), it was observed that the initial deficit values were 23.6 in case of control and 26.7 in case of experimental. On completion of three months duration feeding trial, the significant improve-ments in weight of the experimental group of children obviously was reflected in reduction of percent deficit. However, control group children did not show any improvement in this index (Table 4).

Table 5 presents frequency distribution of the subjects in categories formulated on the basis of water low classification using NCHS standards for Wt / Ht. which clearly shows that 30 experimental and 17 control group of children had their Wt/Ht. in the category of less than 80% depicting mild to moderate malnutrition. The corresponding figures under 80 to 90 % category (sub clinical malnutrition) were 11and 13. Here, effectiveness of feeding nutritious supplement was exhibited in more than double increase in number of subjects in this category. The effect was more pronounced if we look at the data given in 90% and above category, where prior to feeding, only one child had normal Wt/Ht. but after feeding for a duration of three months this number rose to 14, Whereas in control group subjects this effect was not discerned. Similar findings were observed by Bhagyalakshmi and Vijayalakshmi (2002), whereby effect of supple-mentation in ICDS beneficiaries (3-4 years old girls) was studied. Here, the weight improved from initial level of 75 to 89 percent of NCHS values and height deficit reduced from 25 to 11 percent of NCHS values after one year of feeding.

Clinical: Study subjects, when examined for the presence of clinical signs, manifesting deficiency of one or more than one nutrients, it was observed that none of the study subject had red and raw tongue as well as koilonchya. Very few subjects had bitot's (2) and Angular stomatitis (2). Pale conjunctiva was observed in 4 children belonging to control group and 9 children belonging to experimental group. Whereas, relatively common observance was recorded for dryness and roughness of skin and emaciation. Changes in colour of hair were observed in 6 control and 14 experimental children which was indicative

Table 4: Average % deficit in weight for height

Control		*Experimental*	
Initial	*Final*	*Initial*	*Final*
23.6	20.4	26.7	12.6

Table 5: Frequency distribution of subjects in view of their weight for height

Study group	*Cut off levels as % of NCHS median*		
	Less than 80	*80-90*	*90 & above*
Control			
Initial	17	13	0
Final	14	15	1
Experimental			
Initial	30	11	1
Final	4	24	14

of presence of protein energy malnutrition (Table 6).

Table 6: Clinical status of the respondents

Clinical status	*Control (N=30)*				*Experimental (N=42)*			
	Present		*Absent*		*Present*		*Absent*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Bitot's Spot	-	-	30	100	2	4.7	40	95.3
Dryness & roughness of the skin	12	40	18	60	14	33	28	67
Dispigmented Hair	6	20	24	80	14	33	28	67
Angular Stomatitis	1	4	29	96	1	3	41	97
Red & Raw tongue	-	-	30	100	-	-	42*	100
Emaciation	10	33	20	66	18	43	24	57
Pale Conjunctiva	4	13	26	87	9	21	33	79
Koilonychia	-	-	30	100	-	-	42	100

* One child had slight deviation from the normal

Biochemical Estimation: The hemoglobin levels of a sub sample of subjects (10 each in experimental as well as control group) was measured using shale's method. The results as can be seen from table 7 established the utility of feeding dried leafy powder containing supplements in markedly improving the hemoglobin levels in experimental group of children where, by the end of three months, the average hemoglobin level rose from 7.96 g/dl to 10.08 g/dl. In contrast, the mean values remained unaltered in case of control group. The results are in conformity to the study conducted by Sarwate et al. (1994) whereby impact of supplementation on Hb. levels was assessed on ninety children. The children were divided into two groups experimental and control. The experimental children were fed Laddoo, for a period of 30 days. The results clearly concluded that there was an improvement (P<0.01) in Hb. level of experimental group as compared to control group and recommended that supplemen-tation of iron in form of food is helpful if considered in national nutrition anemia pro-phylaxis programme.

Picture emerged on perusal of data given in table 8 was also not much different from what we have observed in case of average hemoglobin levels of the subjects. Here, the significant improvement in hemoglobin level was also reflected in the upward shift in number of subjects leading finally to more number of subjects.

Table 7: Mean hemoglobin level of children before and after intervention

Groups	*Hemoglobin level (g/dl)*		*"t" value*
	Initial	*Final*	
Control N=10	8.36 ± 1.59	8.27 ± 1.16	NS
Experimental N=10	7.96 ± 1.34	10.08 ± 0.73	Sig (P<0.01)

NS: Non significant

Table 8: Frequency distribution of study subjects in view of who classification of anemia in children

Classification	*Control N=10*		*Experimental N=10*	
Normal (>12 g/dl)	0	0	0	0
Mild (10-11.9 g/dl)	1	2	2	6
Moderate (8-9.9 g/dl)	5	4	3	4
Severe (<8 g/dl)	4	4	5	0

CONCLUSION

Findings of the present study led us to draw conclusion that feeding the malnourished children with nutritious supplements did bring about improvement in their nutritional status. Simultaneously, it also establishes the nutritional significance of less familiar foods being utilized to prepare the supplements.

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KEY WORDS Nutritious Supplement. Feeding Trial. Diet. Anthropometry. Hb Levels

ABSTRACT The present piece of research was undertaken to study the effect of feeding nutritious supplements (based on underutilized foods) to selected 6 to 10 years old malnou-rished boys and girls using pre and post test experimental design. For the purpose, two supplements viz. Paushtic Laddu and Mathari, on the basis of its sensory, microbial and chemical qualities were selected. The amount of these supplements to be given daily furnished 1/4 to 1/3 of the day's requirement for protein, energy, iron and β- carotene. The supplements were fed daily to selected malnourished children for a period of three months, which resulted in discernable improvement in weight and Hb. levels of experimental (42) children. However, no such change was observed in control (30) children. There was slight increment in height of children but the difference was statistically non significant. The data on dietary survey reveals

variable inadequacies in the diet of both experimental and control group of children. Regarding clinical examination, the majority of signs indicative of PEM were common. Overall, the findings of the feeding trial were encouraging and need to be undertaken on wider cross -section.

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