ORIGINAL ARTICLE

Impact of micronutrients sprinkle on weight and height of children aged 6-36 months in Tonk district of Rajasthan state

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Abstract

Introduction: In India, multiple micronutrient deficiencies continue to be a major public health problem, especially for children below three years of age. It is a crucial period for the growth and development of children. There is lack of data from Rajasthan state on the effect of micronutrients supplementation on growth of children below three years of age. **Aims & Objectives:** To assess the impact of ICDS supplementary food with or without micronutrients sprinkles on weight and height of children aged 6-36 months in the Tonk district, Rajasthan state. **Materials & Methods:** The trial was conducted in the 15 Angan wadi centers, each from Tonk (rural) and Malpura blocks of Tonk District in Rajasthan state. Children from both blocks were considered as experimental and control groups. Experimental (N=790) and Control groups (N=540) received ICDS supplementary food for six months with or without micronutrients sprinkles. Anthropometric measurements were taken using standard techniques. **Results:** At baseline, children with severe underweight, severe stunting and severe wasting in experimental group stood at 19.2%, 19.3%, 7.3%, respectively, which declined to 14.9%, 15.3% and 6.3%, after intervention. Significant difference was observed in the mean weights of post intervention children between experimental and control groups, whereas, there was no significant difference in mean heights. In experimental group, statistical significant difference was also noted in the mean weights and heights of children between pre and post intervention periods. **Conclusion:** Micronutrients sprinkles can be effective in reducing malnutrition amongst vulnerable population.

Key Words

Micronutrient sprinkles; ICDS supplementary food; malnutrition

Introduction

Micronutrient deficiencies continue to be a major public health problem in India (1). Vitamin A deficiency (VAD), nutritional iron deficiency anemia (IDA) and iodine deficiency disorders (IDD) are the most common micronutrient deficiencies. More than 2 billion people in the world are affected by micronutrient deficiencies (2). World health organization (WHO) estimated that approximately 250 million preschool children are vitamin A deficient (3). In developing countries, an estimated 40% preschool children are afflicted with IDA (4).

Micronutrient deficiencies mainly occur due to inadequate intake, poor quality of diet and consumption of plant based cereal diets (5, 6). It leads to physical and mental impairment and also increases the risk of morbidity and mortality (2).

In India, scientific studies documented the prevalence of vitamin A, vitamin D, vitamin B12, iron and folic acid deficiencies in under five children as 61% (7), 77% (8), 2.3% (9), 61.9% (9) and 4.6% (9), respectively. Zinc deficiency amongst 6-60 months old children ranged from 36 to 51% especially in states of Gujarat, Karnataka, Madhya Pradesh, Orissa and Uttar Pradesh (10).

Malnutrition adversely affects growth, development and immunity of children. In developing countries, underweight affects 97 million under five children (11). According to UNICEF report (2013), one in four of all under five children were stunted (12).

Micronutrient deficiencies are one of the aspects of child malnutrition. Recent evidences suggested that administration of single or multiple micronutrients may be positively effective in improving the growth of younger children (13-16). Therefore, micronutrients supplementation may be a best strategy to control malnutrition due to micronutrient deficiencies.

There is paucity of data on the effect of micronutrients supplementation on growth of children 6-36 months old.

Aims & Objectives

To assess the impact of ICDS supplementary food with or without micronutrients sprinkles on weight and height of children aged 6-36 months in the Tonk district, Rajasthan state.

Material and Methods

Study Area: The trial was conducted in the Tonk District of Rajasthan state. **Selection of Anganwadi Centers:** In the Tonk district, two ICDS blocks namely Tonk (rural) and Malpura were selected randomly. From the list of total anganwadi centers in each block, a total of 15 anganwadi centers were selected randomly. Tonk (rural) and Malpura were considered as experimental and control groups, respectively. **Enrollment of Subjects:** From the records of registered children at respective anganwadi centers, all the children who were falling in the age group of 6-36 months were enrolled in the study through house to house visits. Informed consents were taken from the parents/caretakers of the children. Ethical issues comprising quality of supplementary foodstuffs and hygienic feeding conditions were accordingly addressed and ethical clearance obtained from institutional setup. Children suffering from chronic diseases were excluded. Informed consents were taken from the mother of the child. Age of the child was recorded in completed years and months. It was also validated by documentary evidences like birth certificates, medical records (delivery record and discharge slip), immunization cards and local event calendars. **Anthropometric Measurements:** All the children of 6-36 months were measured for weight and length/height using standard techniques. Electronic weighing balance was used for weight measurement whereas length/height was measured using stadiometer. Measuring scales were calibrated daily and standardization was checked periodically. All the necessary precautions were taken before and while measuring weight and length/height of children to get accurate results. The weight and height of children were measured during enrollment and after 6 months of intervention period. **Intervention:** Experimental group received 75 g new supplementary baby mix (6 times a week) with micronutrient sprinkles (5 sachets per week), whereas, micronutrients sprinkles were not administered to control group. A sachet of micronutrient sprinkles provided 12 mg of ferrous fumerate, 300 µg of vitamin A (retinyl acetate), 5 mg of zinc oxide, 30 mg of vitamin C, 50 µg of folic acid and dextrose as per the need. One packet which contained 450 g baby mix (both the groups) and 5 sachets of micronutrient sprinkles (only experimental group) were given to the mother for child feeding every week. **Out comes:** The weight and length/height measurements have three indices of nutritional status: weight for age, length/height for age and weight for length/height. Children below 2 standard deviation (SD) of the WHO reference median on the basis of weight-for-age, height-

for-age and weight-for-height were classified as underweight, stunted and wasted respectively, whereas children below -3 SD of the reference median were considered as severely underweight, severely stunted and severely wasted, respectively (17). Month-wise compliances for utilization of micronutrient sprinkles were noted. The effect of micronutrient sprinkles administration on anthropometric measurements was assessed by calculating the difference in mean weight and height of post intervention children between experimental and control groups. Post intervention changes in mean weights and heights of experimental group children from baseline were also calculated. **Statistical Analysis:** All the data were entered in to the Microsoft excel to calculate mean and SD. The significance of difference in the mean weights/heights of children between pre and post intervention periods as well as post intervention children between experimental and control groups was calculated by applying Z test. The differences were statistically significant at $p < 0.05$.

Results

The month-wise percent utilization of micronutrients sprinkles was above 70%. In few anganwadi centers, the compliance was around 80%, whereas, it was 97.3% and 93% in two anganwadi centers respectively, over the complete intervention period. At the baseline, a total of 1294 children of 6-36 months age were included. At the end-line, the data was collected from 1197 children. Eight percent of children were found to be dropped out during intervention period. Majority of children were in the age group of 18-36 months. In both the groups, male were found to be double in number than that of females. (Table 1)

The prevalence of underweight, stunting and wasting remained higher in both the groups even after intervention. However, as compared to experimental group, the rate of increase in children with either underweight or wasting category was found to be two to three times higher in control group. (Table 2) The weight and height gain was higher in female children who were consuming micronutrients as compared to ones abstaining from micronutrient sprinkles. (Table 3)

Statistical significant difference was observed in the mean weights and heights of children comprised in experimental group except children aged 18-36 months between pre and post intervention periods. (Table 4) A significant difference in mean weights (Z value 1.75, $p < 0.05$) of post intervention children between experimental and control groups were noted, while, between the same groups, no significant difference in mean heights (Z value 1.62, $p < 0.05$) was reported. (Table 5)

Discussion

When the magnitude of malnutrition in the study is compared with NFHS-3 national and state (Rajasthan) data, the prevalence of underweight (27.4%), stunting (28.4%) and wasting (13.6%) was found to be less in our study (18). Similar to other micronutrients intervention trials which reported compliances from 85% to 90% (13); our study has observed a good compliance for utilization of micronutrient sprinkles.

In the present study, gain in weight and height of children who received micronutrient sprinkles for six months was noticed as compared to control group. Similar positive effects on growth have been reported by a trial conducted amongst children aged 1-4 years who received either multiple micronutrients fortified (provided additional amount of 4 minerals and 3 vitamins) or control milk, residing in peri-urban community located in outskirts of Delhi (13). Another trial conducted amongst Mexican children aged 8 to 14 months, who were provided flavored beverage containing 1-1.5 times the RDA of six minerals and 13 vitamins for 1 year has shown a significant length gain amongst <12 months subjects than placebo group vis-à-vis children >12 months of age where no significant effects were seen (20).

In developing countries, growth faltering in children mainly occurs due to inadequate intake of energy, protein and micronutrients (21). In our trial, baby mix provided sufficient amount of energy and protein, and the group which received micronutrient sprinkles showed improved weight and height gain. These results seemed to suggest that micronutrients with sufficient energy and protein are effective in improving the nutritional status of malnourished children.

Conclusion

The study concludes that supplementation of baby mix with micronutrient sprinkles is effective in improving the weight and height of children aged 6-36 months.

Recommendation

The study reinforces the recommendation of supplementary feeding through DWCD anganwadi set-up fortified with micronutrients either from natural foods or micronutrients sprinkle.

Limitation of the study

Month wise compliance reports of micronutrients sprinkle intervention were obtained from Department of Women and child Development anganwadi set-up and not done by the research team itself.

Relevance of the study

It goes to validate the role of supplementary feeding, especially the micronutrient component for the growth of children aged 6-36 months.

Authors Contribution

Whereas Sheel Sharma designed the research and provided essential materials, Jyoti Vijay analyzed the data, wrote and presented the paper at 2nd International Workshop on Micronutrients and Child Health (MCHWS-2014).

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Tables

TABLE 1 AGE & SEX WISE DISTRIBUTION OF STUDY POPULATION

	Pre intervention		Post intervention	
Category	Experimental	Control	Experimental	Control
Age (months)				
6-18	372	225	356	208
18-36	418	279	391	242
6-36	790	504	747	450
Sex				
Male	215	131	207	122
Female	234	152	221	132
Total	449	283	428	254

TABLE 2UNDERWEIGHT, STUNTING AND WASTING IN CHILDREN OF EXPERIMENTAL AND CONTROL GROUPS BEFORE AND AFTER INTERVENTION

	Pre intervention		Post intervention	
Category	Experimental	Control	Experimental	Control
Weight for age Z score				
< -2SD	227 (28.8%)	128 (25.4%)	235 (31.4%)	143 (31.8%)
<-3SD	152 (19.2%)	69 (13.7%)	111 (14.9%)	64 (14.2%)
Height for age Z score				
< -2SD	223 (28.2%)	144 (28.6%)	257 (34.4%)	118 (26.2%)
<-3SD	152 (19.3%)	119 (23.6%)	114 (15.3%)	68 (15.1%)
Weight for height Z score				
< -2SD	134 (17.0%)	42 (8.3%)	158 (21.2%)	91 (20.2%)
<-3SD	58 (7.3%)	17 (3.4%)	47 (6.3%)	43 (10.0%)

*Figures in parenthesis indicates percentages

TABLE 3MEAN WEIGHTS AND HEIGHTS OF PRE AND POST INTERVENTION CHILDREN AMONG EXPERIMENTAL AND CONTROL GROUPS

Sex	Anthropometric Measurements	Experimental Group			Control Group		
		Initial	Final	Difference of means (Final-Initial)	Initial	Final	Difference of means (Final-Initial)
Male	Weight* (kg)	8.6±1.7	10.4±1.6	1.8±0.1	9.2±1.1	10.1±1.8	0.9±0.7
	Height* (cm)	76.7±7.3	83.9±7.1	7.2±0.2	77.4±7.7	82.9±7.4	5.5±0.3
Female	Weight* (kg)	8.1±1.7	9.6±3.5	1.5±1.8	8.6±1.7	9.6±1.8	1.0±0.1
	Height* (cm)	74.7±7.9	82.1±7.4	7.4±0.5	76.1±7.3	81.7±7.6	5.6±0.3

* denotes Mean ±Standard Deviation

TABLE 4STATISTICAL SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEAN WEIGHTS AND HEIGHTS OF PRE AND POST INTERVENTION CHILDREN IN EXPERIMENTAL GROUP

Variable	Category	Z value: Pre Vs. Post intervention	
		Weight*	Height*
Children	6-36 months	14.90*	19.00*
Sex	Male	15.30*	15.70*
	Female	7.52*	12.60*
Age (in months)	6-18	19.80*	24.50*
	18-36	0.89**	22.80*

* denotes significant at p value <0.05

** denotes non-significant

TABLE 5STATISTICAL SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS WEIGHTS AND HEIGHTS OF POST INTERVENTION CHILDREN IN EXPERIMENTAL AND CONTROL GROUPS

Variable	Category	Z value: Exp Vs. Control Groups	
		Weight	Height
Children	6-36 months	1.75*	1.62**
Sex	Male	2.17*	1.89*
	Female	0.34**	0.41**
Age (months)	6-18	0.26**	3.92*
	18-36	0.00**	2.34*

* denotes significant at p value <0.05

** denotes non-significant