IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 10, October 2021

DOI: 10.17148/IARJSET.2021.81012

Effect of Traditional supplementary snack on underweight children-A Systematic Review

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Abstract: The period of pre-school children is an important stage for formation and preservation of health in the future. (Bergier et al., 2016). The aim of this research is to study the effect of a developed traditional supplementary snack on underweight pre-schoolers. The sample comprised of preschool children of 42-48 months, from the rural areas of Malappuram district, Kerala. Normal weight for age children formed the control group and underweight children constituted the experimental group. The anthropometric standards of the control group and experiment group showed statistical significance with respect to their height, weight, head circumference, chest circumference, and MUAC measurements. The average weight of children in control group lies in between the WHO reference median and -1SD value.The traditional supplementary snack was made from Barley, green gram, sesame seeds, jaggery and ghee. It provided an additional 1/3 calories for the experimental group. Two balls (100gm) rich in macro and micronutrients (436.5 calories, 8.2 g protein, 171 mg calcium, 119.5 mg phosphorous and 2.55 mg iron) were supplemented daily for a period 3months. The cost was Rs 4.25 /ball(50g).The present study indicated that blending traditional supplementary food can improve the growth rate of underweight preschool children and help catch up and reach normal standards.

Keywords: Preschool children, supplementation, supplementary snack, weight for age, underweight, Barley, green gram, sesame.

INTRODUCTION

Nutritional status is the great mirror which shows the healthcare practices and its determinants of any country (Black et al., 2013). Worldwide it is estimated that every fourth child is affected by protein-energy malnutrition.

Supplementary food is any combination of ingredients which should be calorie dense, and can full fill and correct nutritional deficiencies in growing children. Effective supplementary food will meet additional one third calorie requirement for moderately malnourished children (Elizabeth et al., 2016). **T**argeted Supplementary Feeding Programmes (TSFPs) are the most commonly used approach for treating MAM (Annan et al., 2014). Targeted Supplementary Feeding Programmes use a variety of different products, including fortified blended flours and ready-to-use supplementary food (RUSF) supplements (Lenters et al., 2013). The World Health Organization has issued guidance on the recommended nutrient composition of such supplements (WHO, 2012).**S**ome studies have suggested that nutrition counseling, particularly focusing on improving infant and young child feeding practices, may be as effective as specialized food-based interventions for the treatment of MAM (Nikiema et al., 2014, Ashworth & Ferguson, 2009).

Strategies for tackling childhood stunting and micronutrient deficiencies may include child-centred specific nutrition counseling, cash transfers, linkage to social protection services (safety net programme, income generation schemes), a food multimix approach using locally available food, and using specialised food supplements such as fortified blended flours or ready-to-use supplementary foods (Lenters et al., 2013., Nikiema et al., 2014., Ashworth & Ferguson, 2009., Zotor & Amuna, 2008).. The author suggests supplementary feeding for children who are breastfed for minimum for one year or more **(**Nsereko et al., 2018).

The present experiment was conducted to assess the impact of supplementary food on the nutritional status of low weight preschool children who were identified from the rural areas of Malappuram district. In this interventional experiment, a food supplementation strategy was administered to compensate for the weight of low weight for age children.

METHODOLOGY

This study assessed the effect of supplementation of the developed snack for preschool children of low weight for age (3½ - 4 years, ie 42 - 48 months, N = 50).**T**wenty-five children with normal weight for age were selected as control group and twenty-five children with low weight for age were selected as experiment group. The product developed was given as food supplement for a period of 3 months (90 days) for experiment group. Data pertaining to anthropometry

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were collected before and after intervention. The dietary profile collected before intervention using 24 hour recall for three days and the nutrients were computed. The supplemented snack contains 439 calories, 7.8g protein, 96.5 mg calcium, 133 mg phosphorous and 2.41mg iron per 100g of 'ladoo'. The cost was Rs 4.25 /ball, (50g).

RESULTS AND DISCUSSION

Table.1 Distribution of respondents on the basis of religion, caste & family size

Groups	Religion			Caste		Family size		
	Hindu	Muslim	Christian	Backward	SC	>5 members	5 members	4 members
Control group	7 (28%)	18 (72%)	0 (0%)	24 (96%)	1 (4%)	18 (72%)	5 (20%)	2 (8%)
Expt. Group	6 (24%)	19 (76%)	0 (0%)	23 (92%)	2 (8%)	23 (92%)	2 (8%)	0 (0%)

Table.1 shows, on basis of religion, 28 percent of the control and 24 percent in the experiment group belonged to Hindus, 72 percent and 76 percent from control and experiment groups respectively belongs to Muslims. 96 percent of the control group and 92 percent of experiment group were from the backward category. SC community in these groups was 4 percent and 8 percent respectively. Based on the size 72, 20, 8 percent of the family possesses more than five, five and four members respectively in the control group. In the case of experiment group, 92 percent of family had greater than five members, and 8 percent had 5 members in their family.

Table.2 Distribution of respondents on the basis of type of family, education & occupation

	Type of family		Educational status of parent (up to10th class)		Occupation of parent		
	Joint	Nuclear	Father	Mother	Coolie	Agriculture	Business
Control group	17 (68%)	8 (32%)	23 (92%)	18 (2%)	23 (92%)	0 (0%)	2 (8%)
Experiment group	23 (92%)	2 (8%)	25 (100%)	13 (52%)	19 (76%)	1 (4%)	5 (20%)

From Table.2, 68 percent of children from the control group and 92 percent from the experiment group belongs to joint family. 92 percent of father and 72 percent of mother in the control group had education up to 10th class. In the experiment group, 52 percent of mother and cent percentage father obtained education up to 10th class. Majority of the parents from both the groups are daily wagers (92% and 76%). Moreover 4 percent depend on agriculture as their livelihood.

Table. 3 Variance analysis for control and experiment groups

Group	Average monthly income (Rs.)	Per capita income (Rs.)	F-value	P-value
Control group (N=25)	22080 ±1869	3723 ± 622	0.006	0.938
Experiment group (N=25)	22120 ± 1740	3499 ± 285	2.682	0.108

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Table.3 shows that there was no statistical difference in the monthly income and per capita income of the control group and experimental group. Thus these groups show no economic disparity between them. Both the groups were homogeneous with respect to economic variable.

Table.4 Anthropometric measurements of the groups

Anthropometry	Groups	Mean	Std. Deviation	F-value	P- value
Height (cm)	Control	96.36	2.8705	4.571	0.038
	Experiment	95.04	1.1358		
Weight (kg)	control	14.612	0.6366	250.862	0.000
	Experiment	11.628	0.6943		
Head circumference (cm)	control	49	1.118	22.840	0.000
	Experiment	47.72	0.7371		
Chest circumference (cm)	control	48.4	1.5546	13.431	0.001
	Experiment	47.08	0.9092		
MUAC (cm)	control	14.44	0.3629	399.555	0.000
	Experiment	12.492	0.3252		
WHO reference median values - Height –101.9 cm , Weight -15.9kg , Head .C – 49.2cm , Chest. C – 48.5 cm, MUAC - 16.1cm					

Table.4 shows the mean anthropometric measurements of the control group and experimental group. It showed statistical significance between the groups with respect to their height, weight, head circumference, chest circumference, and MUAC measurements.

Table.5 Distribution of Anthropometric standards - pre and post intervention										
MUAC (cm)	Expt. group	12.492	0.3252	0.000	13.36	0.3391	0.868	0.011	0.917
	Control group	14.44	0.3629		14.92	0.3448	0.48	399.555	
Chest Circumference (cm)	Expt. group	47.08	0.9092	0.001	48.60	0.763	1.52	2.621	0.112
	Control group	48.40	1.5546		49.000	1.3844	0.6	13.43	
Head. Circumference (cm)	Expt. group	47.72	0.7371		47.72	0.7371	0.00		
	Control group	49.00	1.118		49.00	1.118	0.00		
Weight (kg)	Expt. group	11.628	0.69	0.000	13.312	0.7167	1.684	4.950	0.031

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		Control group	14.612	0.6443		15.160	0.5795	0.548	250.86	
	Height (cm)	Expt. group	95.04	1.1358		95.920	1.115	0.88	0.100	
		Control group	96.36	2.8705	0.038	97.040	2.669	0.68	4.571	0.753
	Anthropometric variables	Groups	Mean (A)	Std. deviation	p- value	Mean (B)	Std. deviation	(A) – (B)	F-value	p-value
			Pre intervention			Post intervention		Diff		

Table.5, anthropometric measurements of the pre and post-intervention revealed that the intervention study was effective with an increased growth spurt in the experiment group. The p-values prior to intervention show that all the anthropometric measurements were significant in between the control and the experiment groups. After intervention, except for weight the p-value is greater than 0.05. It further implies that there was no statistical difference between these groups after intervention. In the case of weight the p-value changed from 0.000 to 0.031. The control group had a weight increase of 0.548 kg after 3 months, while the experiment group had an increased growth rate of 1.684 kg after supplementation. The difference in mean weights of the control and experiment group before intervention was 2.984 (14.612–11.628), but after intervention it become 1.848 (15.16–13.312). About 38 percent of weight gain occurred in the experiment group over control group on an average. These values points out that weight difference of children in between the groups get reduced. Thus it shows the supplementation provided some extent of improvement in the weight of children. More evidences was brought for this by computing the Z scores of these groups.

Table.6 Z score summary – pre and post supplementation intervention

Control group				**Experiment group**			
Pre intervention		**Post intervention**		**Pre intervention**		**Post intervention**	
Weight (kg)	**WAZ**	**Weight (kg)**	**WAZ**	**Weight (kg)**	**WAZ**	**Weight (kg)**	**WAZ**
13.9	-1.33	14.5	-1.24	10.1	-3.16	12	-2.36
13.8	-1.39	14.5	-1.24	12	-2.39	13.9	-1.57
13.8	-1.39	14.3	-1.35	10.4	-2.97	12.1	-2.26
13.7	-1.19	14.4	-1.05	11.9	-2.21	13.8	-1.44
13.9	-1.08	14.4	-1.05	12.1	-2.33	13.8	-1.62
14.7	-0.65	15.3	-0.58	11.9	-1.89	13.4	-1.28
15.2	-0.46	15.7	-0.43	10	-2.97	11.5	-2.33
13.7	-1.14	14.4	-1	12	-2.29	13.7	-1.51
15.4	0.11	15.7	0	12	-2.06	13.6	-1.38
14.5	-0.4	15.1	-0.33	12	-2.24	13.8	-1.39
15.4	-0.37	15.8	-0.41	10.2	-3.31	11.8	-2.54
15.5	-0.32	15.9	-0.36	12.1	-2.18	13.6	-1.5
15.2	-0.28	15.7	-0.31	12.3	-2.22	14	-1.51
15	-0.58	15.4	-0.62	12.3	-2.11	14.1	-1.3
14.9	-0.72	15.4	-0.68	12.3	-2.06	14	-1.28
14	-0.94	14.6	-0.87	12	-2	13.6	-1.32
14.5	-0.84	15.1	-0.77	11.5	-2.29	13.2	-1.53

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14.2	-1	14.8	-0.92	11.4	-2.39	12.8	-1.79
15.5	-0.39	16	-0.37	12	-2.33	13.7	-1.58
13.9	-1.33	14.5	-1.24	12	-2.29	13.6	-1.57
14.4	-0.72	14.9	-0.72	11.6	-2.23	13.4	-1.42
15.3	-0.56	15.9	-0.49	11.7	-2.27	13.4	-1.58
15	-0.39	15.7	-0.31	11.8	-2.5	13.3	-1.89
14.9	-0.17	15.4	-0.17	11.6	-2.61	13.4	-1.84
15	-0.18	15.6	-0.12	11.5	-2.42	13.3	-1.69

Table.6 gives the z scores for weight for age of the children in the control and the experiment group respectively in pre and post intervention. The z scores of all the twenty five children of the control group were greater than -2SD of the standard population. Hence, before and after intervention they fall in the normal range. However the z scores of the experiment group children were lesser than -2SD (92%), before supplementation intervention so they lie in underweight category. But after supplementation, the z scores crosses above -2SD of the standard population (84%). It shows that after intervention only 16 percent children were lying in underweight category. This further implies that the supplementation of developed product gave a strong positive impact on the nutritional status of these children.

The same conclusion was drawing from the statistical analysis explained with the Table.5 and 6. From the above two comparisons, it can be to concluded that proper supplementation with systematically developed supplementary foods for a continuous period of six months or more can enhance the nutritional status of children and thereby reduce the malnutrition.

CONCLUSION

The present study indicated that blending traditional supplementary food can improve the growth rate of underweight preschool children and help catch up and reach normal standards.

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