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Impact of Nutrition Education of Parents of Preschool Children on Quality of Packed School Lunch

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Abstract

The objective of the study was to assess the quality of packed school lunch given to pre-schoolers for its nutritional value and to assess the impact of nutrition education to parents to improve the nutritional quality of the lunch. Children (n=70, with control and experiment groups, 35 each) from 3 schools in Mysore city were part of the study. The study was conducted using a pre-test post-test model. At the pre-test level the nutritional intake of a sub-sample of children (n=20) was assessed by 24 hour recall method. The nutritional quality of lunch boxes was assessed by 5 day weighment survey. An intervention of a nutrition education program was applied to the parents of the experiment group based on observational learning; nutrition knowledge scores were assessed using a standardized questionnaire. The impact of the education program was assessed at the post-test stage, studying the nutrition quality of school lunch boxes after the program. Results indicated that the diets of the children in the pre-test stage were adequate in protein and fat but inadequate in energy and micronutrients. Educational intervention resulted in increased dietary diversity in the lunch boxes with increased presence of fruits and vegetables. The post-test nutrition knowledge questionnaire showed an improvement in knowledge scores. The educational program had a positive impact on the nutrition quality of school lunch boxes of preschoolers.

Keywords: Dietary diversity; Food frequency; Nutrient intake; Nutrition knowledge.

Introduction

Food habits have a strong influence on childhood obesity.[1] Behaviours linked to unhealthy weight gain *viz.* food preferences, eating habits, exercise set in during early childhood before commencing regular school.[2-3] According to the World Bank, children between ages 0-8 years are most vulnerable for nutrition related development disorders impairing both their growth and cognition; this in turn affects their future earning potential. Ergo, pre-school is an ideal age to apply behaviour modification techniques for better health, lower the risk of overweight and obesity and provide optimum nutrition for required cognitive development. The school environment is a very useful area to teach and influence the food behaviour of children.[4-5] Parental feeding behaviours have a major impact on children's eating behaviour.[6] Most nutrition education programs have a single component approach of improving fruit and vegetable consumption in children and not a composite approach for the entire diet.[7-9] Parents are directly involved in daily food selection and support their children's food choices. Studies have proven that it is nutrition education which is critical for parents of pre-schoolers and not just having accumulated nutrition knowledge from allied sources, which will help their child achieve a balanced diet.[10] Nutrition education to families yielding a positive result in the nutrition intake of pre-school children has been established in the Indian context since the 80's[11]; the impact of better nutrition on cognition of pre-schoolers were seen by

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researchers in the USA at the same time.[12] Studies continue to indicate an emphatic positive association between parent's nutrition knowledge and children's nutrition intake.[13-15]

The present study encompassed a comprehensive nutrition education program for parents with special focus on school lunch boxes. The essential aim was to assess the nutrition quality of lunch boxes sent to school, and educate parents prompting auto-suggestion due to structured nutrition knowledge which in turn improves the nutrition quality of the lunch box comprehensively. Since children sit together and eat their school lunch, it is also an ideal time for the group to self-motivate itself into healthier food choices which can become habitual over the school years.

Materials and Methods

Sample

Children (4 to 6 years) were selected by random sampling from three pre-schools in urban Mysore (n=70). Parents were enrolled for the program upon invitation via the school for an introductory program by the researchers. Parents who signed the consent form to participate and attend the education program were classified into the experiment group; parents who preferred to not attend the education program but consented to their child's participation in the program formed the control group.

Data collection

A pilot tested and standardized, multiple choice questionnaire comprising of 25 marks; was used to assess nutrition knowledge scores. The questions spanned general nutrition needs of growing children, specific attention areas for pre-schoolers and family life style practices. The nutrition education program covered all topics in the questionnaire. A calibrated weighing balance (Docbel Braun) was used to weigh the food sent in the school lunch box by parents for 5 continuous days. A cross-sectional 24 hour dietary recall of the children's dietary pattern was recorded on interviewing the parents using standard tools and techniques[16]. The data was collected during mid-week for two consecutive days at the baseline stage and converted to nutrients using the food composition tables.[17] Percent adequacy of diets was computed using the recommended dietary allowances for Indians.[18]

The nutrition education program was conducted for parents from the experiment group.

Intervention

The education spanned basic nutrition for growth, healthy lunch box options, introducing new foods to children, controlling selection on unhealthy foods and a display of prepared lunch boxes and an age appropriate balanced meal. The education program was supported by a multimedia presentation, charts, photographs and take home material.

Follow up

After the follow up period of three months, the food behaviour and snack box quality was re-assessed for the experiment and control groups. Nutrition knowledge scores were re-assessed for parents of the experiment group.

Results

The results of the study are compiled in Tables 1-4. Average nutrition knowledge scores showed similar nutrition knowledge between parents of the control and experiment groups. In the post-test data of the experiment group, there was a percentage improvement in the nutrition knowledge scores (33.56%); reduction in the number of wrong answers (-72.30%) and the number of unanswered questions (-46.43%) was seen (Table 1). This indicated the positive impact of nutrition education on the knowledge level of parents.

Table 1: Nutrition knowledge scores of parents at baseline (experiment and control groups) and post-test level (experiment group)

Group	n	Phase	Nutrition knowledge scores		
			Number correct	Number wrong	Number left unanswered
Control	35	Pre-Test	16.4	6.8	3.07
Experiment	35	Pre-Test	17.37	6.5	2.8
Experiment	35	Post-Test	23.2	1.8	1.5
Improvement in knowledge scores in experimental group (%)			33.56	-72.30	-46.43

Table 2: Nutrient intake profile of subjects (n=20): Mean daily intake, percent adequacy and contribution from packed lunch

Nutrients	Daily Nutrient Intake	Desirable Dietary Intake*	Percent Adequacy (Excess or deficit)	Nutrient contribution from packed lunch per day [mean of 5 days]
Protein (g)	25.6	20.1	+ 27.3	4.05 ± 1.86
Fat (g)	24.7	30.0	-17.7	4.39 ± 3.21
Energy (Kcal)	766	1350	-43.3	178.0 ± 69.9
Calcium (mg)	524	600	-12.7	36.0 ± 70.16
Iron (mg)	5.51	13.00	-57.62	1.11 ± 0.79
Carotene (µg)	784	3200	-75.50	162 ± 64.0
Thiamine (mg)	0.57	0.70	-18.57	0.12 ± 0.08
Riboflavin (mg)	1.19	0.80	+ 48.75	0.46 ± 0.03
Niacin (mg)	4.26	11.0	-61.27	1.06 ± 1.02
Vitamin C (mg)	18.07	40.00	-54.83	4.93 ± 3.99

*: Based on Recommended Dietary Allowance, (ICMR, 2010).

The nutrient intake profile of subjects is presented in Table 2. The table compiles data on mean daily nutrient intake determined by 24 hour recall, excess or deficit of nutrients calculated as percent and nutrient contribution from the packed lunch. The nutrient intake data indicates that the subjects were obtaining protein (27.3%) and riboflavin (48.8%) requirements for the day through the diet. However, there were deficits in the consumption of fat, energy, calcium, iron, carotene, thiamine, niacin and Vitamin C. The overall nutrient content of the diet indicated poor dietary diversity. The average nutrient content of the school lunch box of the sample indicated limited diversity of fruit and vegetables and a very limited contribution toward vitamins and minerals intake.

Table 3 indicates data on the frequency of lunch sent to school. The dishes were categorised into various food groups. Cereal components in a school lunch box need to have the attributes of being easy to pick and eat by the child. All school lunch boxes in both groups always had a cereal based food present in it. In the post-test level, there was an increase in the consumption of chapatti (19%). The control group showed an increase in the consumption of poori (10.9%) and aloo parantha (11.1%). It is interesting to note the reduction in the consumption of processed noodles was greater in the experiment group (12.8%) compared to the control group (3.7%). Accompaniments are a significant part of the school lunch box to complement the cereal based foods present. The pre-test data showed a frequency of tomato+onion chutney, coconut chutney, jam, sugar, potato gravy and sambhar to be used often by both experiment and control groups. In the post-test level, the experiment group showed improved consumption of vegetable based accompaniments, viz. Tomato+onion chutney (10.7%), green leafy vegetables (6.2%), sautéed cabbage (6.2%), sautéed beetroot (6.2%). Honey was used in the experiment group in the post-test level (12.5%) and not used at all in the control group. Fruits and vegetables formed a part of the school lunch

Table 3: Frequency of dishes in the school lunch box (mean of 5 days, in %)

Food Group	Foods	Control Group (n=35)		Experiment Group(n=35)	
		Before	After	Before	After
Cereal based foods	Chapati	62.8	22.2	56	75
	Vegetable Upma*	--	--	4	12.5
	Plain Upma	22.8	27.7	16	31.2
	Rotti	8.5	11.1	16	--
	Poori	5.7	16.6	--	12.5
	Dosa	68.5	11.1	88	43.7
	Idli	45.7	--	56	43.7
	Lime Rice	14.2	22.2	4	6.2
	Vegetable Pulao	17.1	5.5	12	6.2
	Pongal	--	11.1	--	12.5
	Kesari Bhat**	2.8	11.1	4	6.2
	Noodles	31.4	27.7	44	31.2
	Aloo Parantha***	--	11.1	4	--
Accompani-ments	Tomato and Onion chutney	14.2	16.6	8	18.7
	Coconut chutney	40	11.1	37.1	34.5
	Jam	20	16.6	20	31.5
	Sugar	31.4	--	24	12.5
	Potato Gravy	14.2	11.1	--	12.5
	Green leafy veg	--	--	--	6.2
	Sautéed cabbage	--	--	--	6.2
	Sautéed beetroot	--	--	--	6.2
	Honey	--	--	--	12.5
Fruits and vegetables	Grapes	40	44.4	52	37.5
	Apple	14.2	22.2	8	18.7
	Papaya	--	5.5	12	12.5
	Sapodilla	--	16.6	16	37.5
	Banana	11.4	16.6	16	37.5
	Orange	8.5	11.1	16	6.2
	Watermelon	--	--	--	18.7
	Carrot	8.5	--	4	12.5
Snacks	Bread Jam	60	88.8	16	37.5
	Cake	20	16.6	20	6.2
	Chips	40	33.3	64	75
	Biscuits	14.2	33.3	88	12.5
Nuts	Cashew	--	11.1	--	12.5
	Pista	2.8	--	--	6.2

*: Breakfast dish prepared with wheat semolina. **: Sweet dish prepared with wheat semolina. ***: Unleavened bread stuffed with potato.

box in both experiment and control groups. Grapes, apples, banana and carrot formed regular inclusions into the school lunch box. In the post-test level, there was an increase in the inclusion of sapodilla (21.5%), banana (21.5%), watermelon (18.7%) and carrot (8.5%) in the experiment group. In the control group, there was an increase in papaya (5.5%) and sapodilla (16.6%) consumption. However there was a limited diversity of fruit and vegetable consumption in the control group when compared to the experiment group. Snacks form the core part of the school lunch box. There was a decrease in the inclusion of cakes in the experiment group (13.8%), biscuits (12.5%) and an inclusion of cashew nuts (12.5%) and pista (6.2%).

The repetitive pattern of dishes in school lunch over a duration of 5 days was studied to assess the impact of nutrition education on dietary diversification of children. The traditional family diet forms part of the child's diet from the pre-school days. There is a trend of repetition of a few standard food items often used in families across the study. There was a

Table 4: Average daily nutrient intake from lunch box

Nutrient	Control group (n=35)			Experiment group (n=35)		
	Pre-test	Post-test	Change	Pre-test	Post-test	Change
Protein (g)	3.9	2.53	-1.37	3.14	3.41	0.27
Fat (g)	3.1	4.2	1.1	3.08	2.7	-0.38
Energy (Kcal.)	150.3	154.2	3.9	131.8	130.8	-1.0
Calcium (mg)	34.7	35.9	1.2	20.1	22.8	2.7
Iron (mg)	1.6	2.2	0.6	3.4	4.8	1.4
Carotene (µg)	68.7	43.9	-24.8	68.1	78.01	9.91
Thiamine (mg)	0.092	0.18	0.08	0.50	0.800	0.30
Riboflavin (mg)	0.03	0.048	0.02	0.31	1.1	0.79
Niacin (mg)	0.57	0.50	-0.07	0.34	0.86	0.52
Vitamin C (mg)	1.46	1.29	-0.17	2.4	4.3	1.9

repetition in the consumption of dosa and processed noodles in the control group (2.5 and 2.3 times per week), however there was no repetition in the consumption of other cereal products viz. chapatti, breakfast cereal, upma and mixed rice. There was also a consumption of poori in the post-test (2 times per week) which was not subscribed to in the pre-test phase. The cereals subscribed were largely rich in fat and refined flours. The experiment group showed increase in repetition of chapati and idli (2.5 and 2 times per week). Although there was a subscription to processed noodles in the pre-test phase (2 times per week), in the post-test there was no subscription. The experiment group subscribed to more complex carbohydrate and nutritious cereal options in the post-test phase. Coconut chutney was popular accompaniment in both pre and post-test phases of both control and experiment group. There was a subscription to potato gravy and honey (2 and 3 times per week) in the experiment group, which was not subscribed to by the control group. The subscription to grapes remained the same (2 times per week) across pre and post-test phases for both the experiment and control groups.

There was a reduction in the subscription to banana in the control group (from 3 times per week to twice a week) and an increase in the experiment group (from 2 to 2.5 times a week). Apple consumption from 3 times per week from the pre-test reduced to nil in post test phase of the control group. There was a subscription to watermelon (3) papaya (2) and carrot (2) on a weekly basis in the post-test of the experiment group, which was not subscribed to in the pre-test phase. The post-test phase showed an increase in the consumption of bread with the control group (3.2 times per week) but there was no subscription to the snack by the experiment group. There was an increase in the consumption of potato chips from pre-test (3.5) to post-test (5) in the control group and a decrease from (3.2) to (2) in post-test of experiment group.

The average daily nutrient intake of children in the test and control groups changed in the post-test phase. There was decrease in protein (-1.37 grams), carotene (-24.8 µg), niacin (-0.07 mg) and Vitamin C (-0.17 mg). The post-test phase data of the experiment group showed improvement in calcium (2.7 mg), iron (1.4 mg), carotene (9.91 µg), thiamin (0.30 mg), riboflavin (0.79 mg), niacin (0.53 mg) and Vitamin C (1.9 mg). The results indicate improvement in micronutrient intake achieved by better dietary intake of the children in the experiment group. The control group showed poor dietary diversity reflected by the reduced micronutrient intake in the post-test phase (Table 4).

Discussion

The results of the study indicate that parents do have an existing knowledge base of nutrition needs for their children. However, this knowledge is not comprehensive in providing children with a balanced diet. The baseline data indicated the adequacy of only protein and riboflavin (Table 2). The data of deficient nutrients showed a sharp need for

overall improvement of nutrition in the children. The nutrient profile indicated poor consumption of energy rich foods, fruits, vegetables and dairy products. An inadequacy of nutrition quality of school meals was widely seen. A study of school children in a public school from USA showed snack profiles rich in saturated fats and sodium but lacking in all other nutrients indicating excessive consumption of unhealthy foods and processed snacks.[19]

The frequency of selecting more healthy school lunch options was seen in the post-test experiment group. Similar findings were established in a study[20], where after comprehensive nutrition education program to parents, there was an improvement in experiment group selecting healthy snacks (25.7%) and a decline in the control group (18.2%). There is a positive impact of nutrition knowledge of parents with food choices given to their children[21]. The most easily impacted food choices in children by nutrition education programs are that of fruit and vegetable consumption. Data seen from other studies[22-23] indicates improved fruit and vegetable consumption due to nutrition education of parents. The improvement in micronutrient consumption in the experiment group of the present study is indicative of better fruit and vegetable selection. It is essential to establish a preference for fruit and vegetable in pre-school children to form habitual food behaviour. As children grow older and are empowered to make school snack choices outside of home, they tend to skip on fruit and vegetables with emphasis on progressive increase in the grade in which they are studying.[24] Food related parenting practices which were encouraged in the education program of the study, have had a positive impact on the nutrient adequacy of the children's lunch boxes and also their food choices. A study from elementary schools in Belgium showed a similar impact, where behaviour modification strategies based on knowledge and proper communication showed by parents to children, showed improved food behaviour of children.[25]

Conclusion

The study showed that parents' nutrition knowledge is incomplete if they are not exposed to structured nutrition education programs. The inadequacy in total nutrients is evident and the presence of only protein and riboflavin in excess at the baseline indicates that children are still relying only on milk as a major food in their diet. The food frequency has a clear indication of preference of processed noodles in both pre and post-test. Children prefer accompaniments which are sweeter tasting than bland or spiced; jam and sugar form an integral component of children's food preference. Grapes, apples, bananas form popular fruit choices, however raw vegetables haven't yet been accepted as a regular inclusion into the lunch boxes. There is a predisposition to select foods rich in trans fats viz. cakes and biscuits. The reduction of the same in the experiment group at the post-test level indicates positive impact of the nutrition education to the parents. The overall improvement in nutrient profile indicates good dietary diversity in the experiment group, with improved micronutrient consumption. However, the group still needs to address better energy intake for growth. The control group in the post-test shows poor dietary diversity, high fat intake and has a dietary pattern which is conducive to support the onset of overweight and obesity in the children. Nutrition education to parents was found to have a positive impact on the nutrient profile of their children's school lunch boxes.

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