The impact of a nutrition programme on the dietary intake patterns of primary school children

Oosthuizen D, Centre of Sustainable Livelihoods, Vaal University of Technology
Oldewage-Theron WH, Director: Centre of Sustainable Livelihoods, Vaal University of Technology
Napier C, Food and Nutrition Consumer Sciences, Durban University of Technology
Correspondence to: Delia Oosthuizen, e-mail: deliao@mweb.co.za
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Abstract

Objective: The aim of this study was to improve the dietary intake patterns and food choices of children aged 9-13 years in a periurban community.

Methods: Two schools were randomly selected from within this periurban community. A nutrition education programme was implemented over one school term, with the testing of nutrition knowledge occurring pre- and post-intervention, and in the long term, with the experimental group only. A validated 24-hour recall questionnaire was completed pre- and post-intervention by both the control (n = 91) and experimental groups (n = 81), and in the long term, by the experimental group. Food models were used to assist in the estimation of portion sizes and identification of food items. The questionnaire was analysed using the computer software programme FoodFinder 3, with means and standard deviations calculated for macro- and micronutrients, and comparisons made with dietary reference intakes for specific age groups. A list was drawn up of the 20 most commonly consumed food items, based on weights consumed. Paired t-tests were conducted to assess significance in dietary intake and food choices after the intervention. Correlations between knowledge and dietary choices were determined among the experimental group in the long-term measurements.

Results: Correlations linked protein intake to knowledge of proteins, and vitamin C intake to knowledge of fruit and vegetables. Fruit and vegetable intake remained very low. Refined sugars and fat were still consumed among the experimental group. The diet for both groups was based on carbohydrates.

Conclusions: The objective of changing the dietary intake patterns of the children was not achieved. The intake of legumes, fruit and vegetables remained low. The lack of variety in intake results in a diet that does not meet the daily requirements of children.

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Introduction

The dietary patterns of primary school children living on commercial farms in the North West Province, South Africa, were found to be influenced by farm/household produce, family income and parental decisions. Breakfast items commonly consumed included tea and bread or maize meal, with the remaining meals of the day including meat, vegetables and milk at dinner time, although, unfortunately, only for a few children.[1] Research amongst adolescents living within households of low socioeconomic status has shown poor consumption of fruit and vegetables, and meals away from home usually include high levels of fats and refined sugars, resulting in increased empty calories.[2,3] The growth patterns of a child are disrupted when the value and amount of food consumed is poor.[4,5] This may lead to further adverse health consequences in adulthood and increase the risk of chronic diseases.[6]

It has been established that young children are able to make their own food choices and can develop healthy eating habits from the age of six up until the age of 12, provided the options are available.[7,8] Behaviour to develop healthy eating habits should be inculcated as early as possible and continue throughout life. Nutrition knowledge may be a key link in improving dietary intake patterns.[9]

The aim of nutrition education is to encourage the application of knowledge to action.[10] Nutrition education programmes (NEPs) implemented within school environments, coupled with food programmes, have proved successful in improving nutrition knowledge, and resulted in better dietary intake patterns.[11-14] The school environment ensures more regular attendance of NEP programmes by children because a large amount of their time is spent there. Moreover, a school is seen as a place of learning.[15]

This study was conducted in a periurban community in the Vaal region. A situation analysis revealed that the dietary intake patterns of the children were based on carbohydrates and fat, with very little consumption of fruit and vegetables. The nutritional assessment indicated dietary intakes below the daily requirements for energy in 86.7% of the children, with further deficient intakes for protein in 13.3%, fat in 26.7% and carbohydrates in 13.3%.[16]

The objectives of this study were to improve nutrition knowledge among primary school children and improve dietary intake patterns through the implementation of a NEP. This paper will report on the dietary intake patterns of the children before and after the nutrition education intervention. Although nutrition knowledge is not the focus of this paper, a brief outline will be provided in the methods section.

Methods

Ethics approval was obtained from the Medical Ethics Committee for Research on Human Beings at the University of the Witwatersrand (M080365). The caregivers (n = 173) gave voluntary written consent for the children to participate in the study and the children assented to participate. This study focused on primary school children and was therefore developed and implemented within a primary school setting. Two schools were randomly selected from a list provided by the care centre management representing the children who received food (donated once a week by non-governmental organisations and churches) and were divided into an experimental group (n = 82), where the NEP was implemented, and a control group (n = 91), where the children received no nutritional education. There was no gender specification, and all the boys and girls in grade seven, who signed the informed consent forms, were requested to participate and were included in the study. Although the power calculation indicated that only 63 children were needed in order for the study to be statistically significant, more subjects were included to allow for absenteeism and voluntary dropouts.[17] Trained fieldworkers were recruited to assist the researcher with any language barriers during the implementation of the NEP.

Measuring instrument

A nutrition knowledge questionnaire was developed for this intervention to assess the nutrition knowledge of the children before and after the intervention. Internal reliability testing was completed by the children meeting the selection criteria over a period of four consecutive weeks. These children would also form part of the experimental group. The questionnaire included questions relating to portion sizes, food group classification, the importance of variety in the diet, the link between sugar and tooth decay, the nutrient content of specific foods and functions of specific nutrients. The questionnaire developed for the intervention also included questions relating to hygiene and water consumption. The questions covered aspects of drinking water from a reliable source, daily requirements, as well as the necessity to wash fruit and vegetables before consumption. The queries relating to water were incorporated into the nutrition intervention to encourage hygienic practices, as determined during a baseline survey,[16] the community was observed to be consuming foods from a dumping area without washing or cleaning the food items. This community was also a low-income community, with poor access to clean and safe running water. Thirdly, the intervention was based on the South African Food-Based Dietary Guidelines (SAFBDG) which include the recommendation to drink plenty of clean and safe water.

A previously validated 24-hour recall questionnaire[18] was used to assess the dietary intake behaviour of the children in both the experimental group and control group. Food models were used to assist in the estimation of portion sizes and identification of food items. The questionnaire was completed before and after the NEP. The same questionnaire was administered nine months after the intervention to determine the knowledge retention among the experimental group. These results were reported as long-term results.

Both questionnaires were completed in the classroom, with each child sitting down at his/her own desk. An interview method was used to complete the 24-hour recall questionnaire, for which assistance was provided by a fieldworker. However, the nutrition knowledge questionnaire was completed by each child.

The 24-hour recall questionnaires were captured and analysed by a registered dietician on the computer software programme FoodFinder 3, and means and standard deviations (SD) were calculated. The means of the nutrients were compared with the dietary reference intakes (DRIs) for children aged 9-13 years of age. A list of the 20 most commonly consumed food items was drawn up based on mean portions consumed. Paired t-tests were conducted to compare significant differences between pre- and post-intervention, as well as the period between the immediate post- intervention stage and long-term intervention. Multivariate analysis was completed for the long-term measurement of the experimental group to determine whether any correlation occurred between knowledge and dietary intake patterns.

Nutrition education tools and implementation

The nutrition education tools used were developed in English for primary school children in the Vaal region and were based on the SAFBDGs.[19,20] The nutrition education tools that were developed included a text and activity book containing colouring-in activities, word searches and crossword puzzles. A card and a board game, as well as a food puzzle, supplemented the activity book.[21] A schedule was developed to correspond to one school term of nine weeks and the NEP was implemented once a week in sessions of 30-45 minutes, with an additional 15 minutes for the handing out of bags containing the NETs and snack items, which included fruit juice, an energy bar and a packet of crisps. Although the crisps are not necessarily in line with the aim of encouraging healthy eating, they were only given once a week and the portion size was only 30 g. To avoid disrupting the school curriculum, the lessons took place every Tuesday immediately after school. Seven hours were spent teaching the children the information in the activity book, which included the completion of the relevant activities, and two hours were spent on the games.

Results

Loss to follow-up

Only 55 and 20 children in the experimental group and control group, respectively, completed the post-intervention test. The long-

Table I: Pre-intervention dietary intake results for all the dropouts (n = 98)

Nutrient (unit of measure)	Mean	Standard deviation (SD)	Significance (p-value)
Energy (kJ)	41.66	41.66	0.90
Total protein (g)	-4.22	29.26	0.20
Total fat (g)	2.91	37.77	0.49
Carbohydrates (g)	-3.33	101.71	0.77
Total dietary fibre (g)	-1.21	8.70	0.22
Calcium (mg)	71.89	327.04	0.05
Iron (mg)	-1.03	7.36	0.21
Magnesium (mg)	-22.35	108.19	0.07
Zinc (mg)	0.39	5.09	0.49
Selenium (mg)	7.39	45.35	0.15
Vitamin A (µg)	106.44	1 217.49	0.44
Thiamine (mg)	-0.71	0.71	0.38
Riboflavin (mg)	-0.21	2.62	0.47
Niacin (mg)	-4.66	13.68	0.00
Vitamin B_6 (mg)	-0.24	1.08	0.04
Vitamin B_{12} (µg)	0.96	4.01	0.03
Vitamin C (mg)	-9.32	141.03	0.56
Vitamin D (µg)	1.11	3.79	0.01
Vitamin E (mg)	3.69	7.53	0.00

term measurement saw a further decline in participants in the experimental group, with only 21 completing the questionnaire. Paired correlations were calculated to determine whether all the children lost to follow-up (n = 98) had any impact on the dietary intake results of the pre-intervention test as reflected in Table I. Six micronutrients were reported with significance: calcium (p-value = 0.05), niacin (p-value = 0.00), vitamin B_6 (p-value = 0.04), vitamin B_{12} (p-value = 0.03), vitamin D (p-value = 0.01) and vitamin E (p-value = 0.00). Therefore, the group lost to follow-up may have influenced the intake results of the abovementioned nutrients in the pre-intervention results.

Dietary intake patterns

Table II represents the food items that were listed in the top 20 items most commonly consumed as recorded before and after the intervention for both experimental group and control group. The mean portions and the percentage of children consuming the items appear for the relevant food item.

Experimental group

Table II shows that the change in dietary intake patterns of the children included the omission and replacement of certain food items categorised as protein-rich foods, starchy foods and non-nutritious foods. However, changes occurred with the introduction of

Table II: Foods commonly consumed among primary school children

Food item (unit of measure)	Experimental group						Control group			
	Pre-intervention (n = 55)		Post-intervention (n = 55)		Long-term (n =21)		Pre-intervention (n = 20)		Post-intervention (n = 20)	
	Mean portion size	% consumed (n = 55)	Mean portion size	% consumed (n = 55)	Mean portion size	% consumed (n = 21)	Mean portion size	% consumed (n = 20)	Mean portion size	% consumed (n = 20)
Starchy foods										
Maize (g)	141	34.5	171	49.1	144	59.5	260	47.5	154	100.0
Bread (g)	146	94.5	358	100.0	121	100.0	153	100.0	119	100.0
Rice (g)	102	43.6	-	-	90	19.0	157	20.0	117	35.0
Potato (g)	-	-	56	23.6	-	-	-	-	-	-
Mabela (g)	-	-	-	-	-	-	250	5.0	-	-
Oats (g)	-	-	-	-	250	4.7	200	5.0	-	-
Breakfast cereal (g)	-	-	-	-	-	-	52	30.0	-	-
Non-nutritious food										
Potato crisps (g)	38	54.5	34	63.6	-	-	40	35.0	34	100.0
Vetkoek (g)	-	-	72	12.4	90	14.3	-	-	-	-
Sweets (g)	41	87.3	-	-	-	-	-	-	-	-
Sugar (g)	18	87.3	17	85.8	-	-	-	-	14	100.0
Cookies (g)	59	21.8	-	-	-	-	-	-	-	-
French fries (g)	-	-	66	23.6	45	23.8	-	-	38	60.0
Fruit and vegetables										
Apple (g)	140	25.5	67	14.5	90	14.3	132	25.0	126	45.0
Pear (g)	-	-	-	-	90	9.5	-	-	117	20.0
Orange (g)	-	-	116	16.4	-	-	-	-	-	-
Banana (g)	-	-	-	-	-	-	-	-	82	30.0
Peach (g)	-	-	-	-	-	-	-	-	450	10.0

Tomato-onion gravy (ml)	27	50.9	57	32.7	57	33.3	38	5.0	36	45.0
Atchar (ml)	-	-	42	25.5	-	-	-	-	18	100.0
Protein-rich foods										
Eggs (g)	-	-	72	18.2	-	-	-	-	-	-
Chicken (g)	94	25.5	89	76.4	86	33.3	124	55.0	110	100.0
Boerewors (g)	-	-	-	-	76	19.0	-	-	-	-
Sausages (g)	95	21.8	-	-	-	-	106	25.0	-	-
Polony (g)	38	50.9	41	63.6	57	66.7	55	60.0	38	100.0
Beef, cooked (g)	97	41.8	-	-	115	9.5	-	-	88	45.0
Fish (g)	118	12.7	-	-	-	-	-	-	-	-
Dairy foods										
Milk (ml)	124	56.4	77	47.3	152	33.3	222	50.0	-	-
Sliced cheese (g)	-	-	-	-	38	23.8	-	-	12	60
Beverages										
Juice (ml)	208	32.7	262	32.7	253	33.3	286	70.0	272	55.0
Water (ml)	400	9.1	-	-	-	-	-	-	700	25.0
Squash (ml)	316	32.7	250	9.0	-	19.0	310	15.0	323	75.0
Tea (ml)	263	78.2	240	69.1	283	42.8	290	25.0	258	95.0
Milo (ml)	-	-	-	-	-	-	200	5.0	-	-
Coffee (ml)	-	-	225	10.9	-	-	250	10.0	-	-

a different form of protein as well as food high in fat, namely eggs (72 g), vetkoek (72 g) and French fries (66 g), which were consumed by 18.2%, 12.4% and 23.6% of the children, respectively. However, healthy options in the form of oranges (116 g) and boiled potatoes (56 g) were also introduced. Unfortunately, the change was observed among only a few children. However, in the long term, cooked rice (90 g), consumed by 19%, was reintroduced. Certain food items, although introduced after the intervention, were no longer present nine months later, for example, atchar, oranges, boiled potatoes, eggs and coffee. The most commonly consumed items present in all three evaluations in the experimental group included maize meal, bread, apples, tomato-onion gravy, boiled chicken, polony, full cream milk, cold drink squash and tea.

Energy intake was below the daily requirements before the intervention. Changes after the intervention still reflected a deficient supply (see Table III). Energy intake improved significantly (p-value = 0.00) after the intervention by 1 473.04 kJ, to 8 016.6 kJ, but a significant (p-value = 0.00) decline in energy intake was seen in the long-term measurements. The mean intake (pre- and post-mean intakes in brackets) for protein improved significantly, from 52.2 g to 66.2 g (p-value = 0.00), with similar results for carbohydrates, which increased from 196.3g to 269.2g (p-value = 0.00). Fat intake decreased by 2.8 g, with no significance. All the nutrients were lower after the intervention, except total dietary fibre (p-value = 0.01), selenium (p-value = 0.00), magnesium (p-value = 0.03) and thiamine (p-value = 0.04). However, the mean values for zinc (7.8 g) (p-value = 0.00), iron (p-value = 0.02) (8.8 mg), riboflavin (0.9 µ) (p-value = 0.00), vitamin B_{12} (1.6 µ) (p-value = 0.00) and vitamin C (58.1 mg) were still higher than the estimated average requirements for children aged 9-13 years. A significant improvement (p-value ≤ 0.05) occurred after intervention, with further significant declines in energy (p-value = 0.00), total protein (p-value = 0.00), total carbohydrates (p-value = 0.00) and total dietary fibre (p-value = 0.03). Similar results occurred in the case of the micronutrients in the long-term measurements. The results showed a further significant (p-value ≤ 0.05) decline for most nutrients except vitamin K (24.7-25.5 µ), vitamin B_{12} (1.6-2.1 µ) and vitamin C (58.1-68.7 mg), all of which improved marginally.

Control group

Food items introduced after the intervention period, as reflected in Table II, included fruit (mean portion in brackets), namely pears (117 g), bananas (82 g) and peaches (450 g). These items were introduced into the school feeding programme and were consumed by 20%, 30% and 10% of the children (n = 20), respectively. The food item consumed by 100% of the children (n = 21) before the intervention period was bread (153 g), with the mean portion size decreasing to 119 g. After the intervention period, the number of items consumed by all the children increased to seven, with the inclusion of maize (154 g), atchar (18 g), sugar (14 g), cooked chicken (110 g) and polony (38 g). Similarly, all the food items listed for the control group, except for cold drink squash, decreased in mean portion size. Food items omitted from the list included a cereal product (52 g), mabela (250 g) and oats (200 g), beef sausages (106 g), full cream milk (222 ml), dried beans (320 g) and hot beverages (225 ml).

Except for total protein, total fat, vitamin E, total dietary fibre, magnesium and vitamins K, B_{12}, C and D, the remaining nutrients decreased significantly (p-value ≤ 0.00) after the intervention period.

Table III: Nutritional comparison of dietary intakes as measured by 24-hour recall

Nutrient (unit of measure)	Female EAR[a]/AI[b]	Male EAR[a]/AI[b]	Experimental group: Mean 24-hr recall pre-intervention (n = 55)	Experimental group: Mean 24-hr recall post-intervention (n = 55)	Experimental group: Significant (p-value) change after intervention	Experimental group: Mean 24-hr recall long-term (n = 21)	Experimental group: Significant (p-value) change after long-term evaluation	Control group: Mean 24-hr recall pre-intervention (n = 20)	Control group: Mean 24-hr recall post-intervention (n = 20)	Control group: Significant (p-value) change after intervention
Energy (kJ)[b]	8 628.0[c]	9 569.0[c]	6 543.6	8016.6	0.00	5 332.5	0.00	6 324.6	5 110.9	0.02
Total protein (g)[b]	34.0	34.0	52.2	66.2	0.00	48.7	0.00	54.7	47.0	0.21
Total fat (g)[b]	25.0–35.0	25.0–35.0	57.0	54.2	0.72	47.4	0.09	48.6	40.9	0.22
Total CHO (g)[b,c]	130.0	130.0	196.3	269.2	0.00	150.9	0.00	201.2	151.8	0.01
Vitamin E (mg)	9.0	9.0	9.1	5.1	0.00	3.5	0.04	4.5	2.9	0.06
Total dietary fibre (g)[b]	26.0	31.0	12.7	18.0	0.01	10.9	0.03	12.4	12.8	0.84
Zinc (mg)	7.0	7.0	9.0	7.8	0.00	5.8	0.01	7.4	5.5	0.00
Selenium (mg)	35.0	35.0	38.0	88.8	0.00	36.8	0.00	51.8	27.5	0.02
Calcium (mg)[b]	1 300.0	1 300.0	393.0	340.0	0.28	269.9	0.12	356.5	269.5	0.04
Iron (mg)	5.9	5.7	10.6	8.8	0.02	5.7	0.00	11.8	5.9	0.00
Magnesium (mg)	200.0	200.0	185.1	236.5	0.03	164.0	0.05	197.1	175.1	0.28
Vitamin A (µg)	445.0	420.0	682.0	212.6	0.00	121.0	0.12	335.5	132.2	0.00
Thiamin (mg)	0.7	0.7	0.9	1.1	0.04	0.7	0.00	1.1	0.7	0.00
Riboflavin (mg)	0.8	0.8	2.2	0.9	0.00	0.6	0.00	2.1	0.6	0.00
Vitamin B_6 (mg)	0.8	0.8	1.3	1.3	0.71	0.8	0.00	1.5	1.0	0.03
Vitamin K (µg)[b]	60.0	60.0	50.0	24.7	0.23	25.5	0.72	24.1	20.1	0.78
Vitamin B_{12} (µg)	1.5	1.5	3.1	1.6	0.00	2.1	0.77	2.0	1.8	0.74
Vitamin C (mg)	39.0	39.0	65.5	58.1	0.61	68.7	0.63	133.7	68.2	0.13
Vitamin D (µg)[b]	5.0	5.0	2.6	2.1	0.36	1.5	0.37	1.4	1.5	0.75

a = Estimated average requirements for age group 9-13 years[22]
b =Average intakes for age group 9-13 years[22,23]
c = Estimated energy requirement based on mean for age group 9-13 and with physical activity level: active

However, the mean intakes of certain nutrients after the intervention were still above estimated average requirements: total protein (47.0 g), total fat (40.9 g) and total carbohydrates (151.8 g).

Nutrition knowledge and correlations within the experimental group

The nutrition knowledge of the children in the experimental group improved significantly (p-value = 0.00) after the intervention from a total of 45.4% to 58.8% for all the questions. Nutrition knowledge was evident among the children before the intervention (mean correct answers > 50%) for topics relating to the importance of hygiene (72.7%), daily water consumption (52.7%), function and sources of calcium (58.2%), the linking of fruits and vegetables to specific colours and nutrients (74.1%), and the consequence of not eating breakfast (64.2%). Further improvements were seen after the intervention for the latter and other topics relating to the importance of health and physical activity (70.6%), and daily fat intake and classification (56.5%). However, although improvements occurred, the mean correct answers still reflecting below 50% after the intervention included topics on the importance of vitamin A (48.1%), the importance of variety in the diet (24.7%), and the daily serving requirements of each food group (43.4%). The long-term measurement reflected retention of knowledge among the children, except for topics relating to variety in the diet (23.8%), serving size of specific foods (34.9%), daily serving requirements of specific foods (42.9%), and fat intake and classification (42.9%).

A comparison was made between the energy intake of the children in the experimental group and their general nutrition knowledge. Significance was observed for knowledge relating to the importance of hygiene (p-value = 0.00), through the intercept model only, the number of eggs consumed weekly (p-value = 0.00), the importance of hygiene (p-value = 0.00), and the classification of the dairy (p-value = 0.01) and fruit (p-value = 0.00) food groups, showing a significant relationship between energy intakes and the mentioned variables in the experimental group.

The protein intake was compared with knowledge about protein and protein-rich foods. Protein intake was reflected as a covariant and statistical significance (p-value = 0.00) was seen through the intercept model relating to the number of eggs to be consumed on a weekly basis.

The vitamin C intake of the children was compared with knowledge relating to fruit and vegetables. Significance was evident when using the intercept and corrected model (p-value = 0.05, p-value = 0.00) for knowledge relating to the linking of vitamin C to oranges, grapes and raisins, and to the classification of the fruit food group, where significance (p-value = 0.00) was observed.

Nutrition knowledge within the control group

The control group had no form of interaction with the researcher during the nine weeks of intervention. The mean percentage of correct answers varied by only 1.3% between pre-intervention (49.2%) and post-intervention (50.5%) tests, and only one question showed a significant (p-value = 0.04) difference between pre- and post-intervention results in the control group. It related to the importance of including fruit and vegetables in the diet.

Discussion

A number (n = 27) of children in the experimental group could not complete the immediate post-test because of voluntary dropout. Similarly, 34 children were not present to complete the long-term evaluation as they had moved outside the region to attend secondary school. This is a limitation of the study and the sample size was therefore too small to generalise about the results. Another limitation was that measuring during the intervention was performed with 24-hour recall only, which reflects the diets of the children over a 24-hour period. This may not be a true reflection of their diets, as a large retail store dumps its expired produce where they live twice weekly, and the community members eat some of this food.

The children had little control over their nutritional environment as their mothers were primarily responsible for food procurement, preparation and feeding. Exposure to nutritional information may have improved nutritional knowledge, but the decision as to which foods were eaten daily remained the mother's responsibility. With unemployment levels being so high, introducing variety into the diet may simply be too costly.

The results recorded in this study showed an improvement in nutrition knowledge, as outlined in the definition of a NEP.[10] Unfortunately, changes in behaviour, also evident from similar studies carried out worldwide, did not occur in this particular community that is faced with poverty, high levels of unemployment and food insecurity. Nutrition interventions among children have been implemented globally with successful results in improving knowledge and increasing the fruit and vegetable intake within schools and communities,[7,11] but only a few such programmes have been implemented in South Africa, with emphasis on adults[24,25] and children aged between 2-5 years.[26,27]

The baseline survey reflected the mother's influence on food choices and purchases.[16] In the control group, fruit was included in the diet, but this was introduced in the school feeding programme. The children's dietary intake patterns in this study can be compared to those of other studies, which found a link between feeding practices, cultural obligations and the role of parent-focused decision making in different cultures.[28] The high consumption of bread and maize meal among the children, in both the experimental group and control group, emphasises the findings of the National Food Consumption Survey-Fortification Baseline-1 (NFCS-FB-1), namely that bread and maize meal are still consumed as staples by 80 and 90% of households, respectively.[29] The dietary choices of the children are not only based on available resources, but also determined by cultural obligations and dietary habits formed over many years.

One study examined the association between nutrition knowledge and dietary practices, and found that although some nutrition knowledge was evident, less than half the population was eating the recommended servings of food.[30] Similarly, the children in this study, from both the experimental group and control group, were consuming less than the recommended daily portions of fruit, vegetables and dairy. This was evident in the deficient micronutrient and poor energy intakes. Nutrition knowledge emerged as a strong factor determining dietary intake patterns, although no significance was observed for vegetables and fruit intake and nutrition knowledge. This concurred with the results of the study in this community, where nutrition knowledge was present among the children, and although the majority agreed that fruit and vegetables should be consumed daily, the actual practice did not occur, even after the intervention and in the long-term measurement.

A multivariate analysis among the experimental group revealed a link between the intake of energy, vitamin C and protein, and the nutritio n knowledge of the children. Significance (p-value ≤ 0.00) was noted through the intercept model for all three variables. Studies have shown that although nutrition awareness exists, the lack of available food and access to it experienced by the children in rural communities may make a complete change to healthier diets difficult.[31,32]

Although the schools are being provided with food aid through the Primary School Nutrition Programme (PSNP), the diets still reflect poor variety. The 24-hour recall reflected improved changes with fruit intake in the control group, but this may have been due to a few children (mean 26.2%) receiving food aid through the PSNP. The dietary intake patterns of the children in this intervention, in both the experimental group and control group, reflect results similar to those of a study of teens of low socioeconomic status in the USA, where poor intakes of fruit and vegetables occurred, with a higher consumption of fat and refined sugars.[2,33]

Upon comparing the dietary intake patterns with some of the recommendations of the SAFBDG, it is evident that a few recommendations are being adhered to. However, these may not necessarily be linked to the recommendations, but rather to cultural obligations and circumstances. Recommendations include making starchy foods the basis of every meal and eating fat sparingly.[34] The results of this study indicated a carbohydrate-based diet, provided primarily through bread and maize meal, and although the daily fat intake was higher than required, it was reduced to 25.6% of the total energy among the experimental group after the intervention. Although the children were taught to consume small quantities of low-fat items, the increase in mean portion size of polony and the inclusion of vetkoek could be an indicator of choices based primarily on cost and availability. Another recommendation was to include fruit and vegetables in the daily diet. Although the intake of fruit and vegetables was very low, the children did obtain some micronutrients, although not sufficient for their daily requirements, possibly from the fortified maize meal and bread. Another study found micronutrient levels to be lower in rural areas, but the high consumption of fortified maize meal and wheat flour (bread) contributed to the raised levels of micronutrients, although mean intakes remained below the EAR.[33] Another recommendation of the SAFBDG is inclusion of proteins and legumes in the diet. The inclusion of proteins was evident, but only among a few children. Legumes did not appear within the top 20 list of items most commonly consumed.

Conclusion

Unfortunately, the full impact of this study was not reflected in the dietary intake patterns, as very little variety occurred in the diet before the intervention, with minimal changes after the intervention. The level of poverty, cultural obligations and the lack of influence that the children have on their food choices and preparation may also have contributed to the lack of significant change in dietary practices, even though there was an improvement in the knowledge of daily requirements. The SAFBDGs were developed to encourage change in food consumption behaviour, but no impact was seen in this study.

Recommendations

The first recommendation is to commence with an NEP in the first quarter of a year. This would allow for the same participants to complete the long-term evaluation. This study commenced during the third quarter of the year.

The second is to carry out multiple 24-hour recalls with a single individual over a period of time in order to obtain a more comprehensive estimate of the child's usual intake.[35] A food frequency questionnaire may also be used as this records the dietary intake over a seven-day period, which may be more accurate for this community, as they consumed items disposed by a retailer on a weekly basis.

Although nutrition education within schools has been proven to be an effective vehicle for encouraging improved knowledge of nutrition and diet change within poor communities, further research needs to be conducted. In a long-term study, a coordinated NEP improved the recognition and use of a variety of foods in the diet, even after four to six months.[33,36] Unfortunately, such changes were not observed in this study. Very few children changed their dietary habits. Therefore, another recommendation is to consider conducting a coordinated NEP simultaneously with other family members (children and others), as the caregivers in this community were responsible for food choices, food preparation and food purchases. Simultaneous intervention may be more effective in encouraging behavioural change. Further studies involving simultaneously food-based strategies, such as home vegetable gardening within poor communities, may assist in alleviating food insecurity, while also promoting nutritional awareness.

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