PRIMARY SCHOOL PUPILS IN MURANGA COUNTY, KENYA ACQUIRE NUTRITION KNOWLEDGE AND ENHANCE IRON RICH FOOD CONSUMPTION

[1]Gladys Njura Gitau, [1]Judith O. Kimiywe , [1]Judith N. Waudo, and [2]Jimmy Ndungu Gitau,

[1]Department of Food, Nutrition and Dietetics, Kenyatta University, P.O. Box 43844, Nairobi,

[2]P.O.Box 4974-01002, Thika, Kenya..

Corresponding author email : njuragg@yahoo.com Mobile No+254-722671727

Co-Authors : Jokimiywe@gmail.com Mobile No+254-72291545 , waudojudith@gmail.com Mobile No+254-720967985, jimigitau@gmail.com Mobile No+254-720781488

Abstract

Adequate nutrition knowledge lacks in school going children and it is in this light that this study was designed. The main objective of this study was to evaluate the effect of nutrition education on nutrition knowledge. A baseline survey was conducted in 12 randomly selected schools for 601 class six pupils and 67 households while 154 pupils participated at intervention. Questionnaires and an interview schedule were used to collect data with pre and post tests. Dietary intake was assessed. Baseline data were analyzed and on average, the mean mark in nutrition knowledge at baseline was 30.05% which was low. In the post-tests; all experimental schools significantly improved in nutrition knowledge and practices that enhance nutrition. Pupils Lacked of adequate nutrition knowledge and therefore the need for intervention strategies by all stakeholders in these settings. The study findings would contribute towards national school health policy and guidelines implementation to address malnutrition.

Key words: Nutrition knowledge. Facilitators. Interventions. Peers, Pre-test, Post-test

1.0. Introduction

1.1. Background

In Kenya nutrition as a subject is integrated into science or other subjects; as such children do not realize how important it is to their health (MOE, 2009a). Improving health and nutrition brings greatest benefits to the poor and the most vulnerable especially school going children. According to a Food and Agriculture Organization report (FAO, 2013a), it is important to incorporate nutrition and health education into the curriculum of primary education which considers priority nutrition issues affecting children and their families in the country. It is also coherent with the national health and nutrition policy. Children are eager to learn, are role models for their peers and schools can stimulate and support children to develop skills and knowledge to face daily challenges now and in the future (Guiney, 2010). Boys and girls need support as they enter puberty to understand the importance of nutrition and health especially the role of iron as a micro-nutrient (MOE, 2009a). Since nutrition education is concerned with changing an individual's behaviour, it would be worthwhile to use different change agents including pupils as a vehicle also to change. Primary schools are particularly suitable vehicles for nutrition education because nutrition education is necessary for children whose habits are still being formed inorder to change them for better nutritional practices (FAO, 2005b). The various extension agents, researchers and communities should work hand in hand with these children in addressing malnutrition. However, the methods employed in content delivery and dissemination must be appropriate and acceptable socially and culturally to the target audience.

Malnutrition including Iron deficiency may, however occur throughout the lifespan where diets mainly consist staple foods and little of animal products. The cause is a one-sided diet based mainly on grains. These contain phytates, substances which bind the nutrient iron from plant sources as insoluble salts (Andang'o *et al*., 2007). A family's knowledge, attitudes, beliefs and practices have important effects on the nutrition, health, and psychosocial condition of their children. Some of the objectives of the Kenya National Nutrition Plan of Action (2011-2017) are to improve knowledge, attitudes and practices on optimal nutrition, improve nutrition in schools and reduce the prevalence of micronutrient deficiencies in the population with strategic issues that contribute to improved nutrition practices in the lifespan (MOPHS, 2011). Although nutrition information and action are present in all relevant government sectors including agriculture, education, water and health, nutrition education is not adequately prioritized. Consequently, resources dedicated to nutrition are limited, leading to low impact of nutrition interventions in schools. The food security and nutrition and school health policies and guidelines, recognize the importance of involving stakeholders in the reduction of malnutrition in school children (MOPHS/ MOE, 2009; GOK, 2012).

1.2.Iron Status and Dietary Intake

In Kenyan households, studies have been undertaken and diets are mainly cereal-based with tubers and a variety of vegetables and fruits when available. White maize, sorghum and millet are high in phytate and fiber, which inhibit the absorption of micronutrients such as zinc and iron. There are multiple sources of dietary iron including heme and non-heme iron, contamination iron and fortification iron. Heme iron is usually of animal origin and of high bio-availability with sources including meat, fish and blood products. Dietary intake of heme iron is

negligible in developing countries while iron status and health status (infection, mal-absorption) are the host factors influencing iron absorption (Ramzan *et al*., 2009). Iron deficiency could also be due to inadequate folic acid, riboflavin, copper, vitamin A, & B_{12} and zinc intake (WHO, 2005). Micronutrients such as vitamin A, zinc and iron interact with each other to promote appetite which leads to increased food intake and intake of other macro-nutrients and micro-nutrients (Ramakrishnan *et al*., 2008).

1. 3.Nutrition Education, Iron Rich Food Consumption and Iron Status Outcomes

The pressures from population growth and poverty contribute to severe malnutrition and continue to affect nearly half of the world's population. Also alarming is that an 18 percent rise in the number of malnourished children is projected for Africa by 2020. Over 2 billion people suffer from malnutrition in their diets, including protein-calorie deficiencies and micronutrient malnutrition like iron deficiency anaemia. Such malnutrition prevents much of the world's population from reaching their full potential - mentally, physically or financially (GOK, 2012). Dietary intervention may be a safer and more feasible solution to address iron deficiency anaemia in the long run compared to other strategies like supplementation. This intervention requires nutrition education to improve knowledge and practices that support healthy outcomes. Integrated rural nutrition projects and nutrition education have a significant impact on knowledge and attitudes leading to long-term beneficial health effects than activities that only aim at increasing food availability. Nutrition education is therefore a viable, sustainable solution in resource limited setting (Kakunted, 2008). In a study by Kapur *et al* (2003) in a population group in India, where, the iron and nutritional status was highly compromised, nutrition education intervention was effective, as it improved the dietary iron intake and prevented the children from

suffering the sharp decline in iron status noted in the control group. The physical growth of school children is mainly the result of environmental and genetic factors and their interaction. In population groups that have experienced constraints to economic and social development, most of the factors affecting school children are related to environmental factors experienced before puberty, including poor food consumption patterns, illness, lack of good sanitation, poor health and hygiene practices (WHO, 2001).

The influence of school goes beyond the classroom and includes normative messages from peers and adults regarding foods and eating patterns. In a study in Voi, Kenya Kakunted said that targeted behavior change should include identification and selection of locally available foods that provide a balanced diet rich in iron and vitamin C foods and less inhibitors on a daily basis in-order to improve anaemia status and decrease its adverse effect on general health. There is need for nutrition education to focus on both practical application and theoretical knowledge related to dietary intervention for iron deficiency anaemia (Kakunted, 2008). Evaluations suggest that school-based nutrition education can improve the eating behaviours of young persons (MMWR, 1996). Deficits in syllabi on nutrition education, among other factors, imply that nutrition knowledge and good dietary practices are lacking and need improvement among school children in Kenya. However, this requires concerted efforts of the researchers, teachers, parents and other relevant stakeholders in order to operationalize the School Health and Food Security and Nutrition Policies (MOE, 2009 a; MOE, 2009 b).

Over 80% of the school children are either directly or indirectly related to members of the immediate community to the schools which provides an advantage of community involvement in the school programmes. Children influence and sometimes make decisions on food for

themselves and others at home and are therefore a good entry point for nutrition and health education. Since children spend most of their time at school it becomes inevitable to ensure that they are not only well fed, but also that their general health is catered for. The school is a protected environment providing security which instils confidence and builds self-esteem in the children. The school also offers an ideal environment of contact for interventions, service provision and as a meeting center for any stakeholders that may want to carry out activities both at the school and for the community as a whole (MOPHS, 2012b).

2.0. Methodology

2.1 Baseline Study

A baseline study was undertaken in-order to have a general overview of the study area and get the schools that met the required criteria for intervention. The gaps were identified which led to the identification of a corrective measures model.

2.2.Intervention Study

Four (4) intervention schools (three experimental schools and one control school) with 154 pupils were randomly selected. All the class six pupils (115) in the experimental schools participated in the nutrition educatioon lessons. Pre and post-tests questionnaires on nutrition knowledge were administered to the experimental schools and control school before and after the interventions. The schools were mixed day schools, and with the necessary resources like land for cultivation of vegetables, classrooms for teaching purposes, cooking facilities like water and room. The FAO (2005a) nutrition education classroom curriculum for primary schools in developing countries was used to guide the teaching process using class five and six guidelines.

The intervention study was meant to address the gaps in the baseline findings to improve on nutrition knowledge and also the iron status of the school pupils.

The researcher had identified what was to be taught (content) in nutrition knowledge, the structure (framework) with who was to teach in each experimental school. The topics covered were relevant fitting with psychological development of class six pupils, considering existing dietary needs, local foods, nutritional practices and the children's perceptions. From age 11-13 children learn about food supply and that plants are the basis of food chain (food production). The pupils' were taught using visual aids where necessary. Real objects like, foodstuffs and fireless cookers were used (Plate 1). The lessons that took 30-35 minutes and included the nutritive value of food, the balanced diet, the food guide pyramid, deficiency diseases, hygiene and food safety, cooking methods and selection of balanced meals from locally available foods and recipe improvement.

2.3. Data Analysis

Data were cleaned and validated before the actual analysis using Statistical Package for Social Sciences (SPSS version 17) and SAS version 9.2 for clustering data in school categories. Data were checked for normality by running the exploratory data analysis procedure. Both quantitative and qualitative data analysis procedures were used to test the hypothesis. The dietary intake was determined by assessing the intake of calories, protein, vitamins and minerals like iron, zinc, magnesium, folate, vitamin A, C and E among other nutrients. The dietary intake data were analyzed using the computer software Nutri-survey (For windows(c) ERHARDT, 2005). Kenyan (Jaswant, 1993) and American (Alex, 2011) food composition tables were also used to generate data

3.0. Results

3.1. Nutrition Knowledge at Baseline

Source of Nutrition Knowledge

The pupils interact with the entire environment they live in such as, the community around them, the school and media and hence may gain nutrition knowledge through such sources. Majority (64%) said (1 they had been taught some nutrition lessons by their science teachers during the science classes. The rest received knowlege from other sources while some did not respond or said they had not learnt any nutrition. The limited nutrition knowledge they had been taught in class five science lessons showed they did not know what iron deficiency was. Figure 1 shows pupils' source of nutrition knowledge at baseline study.

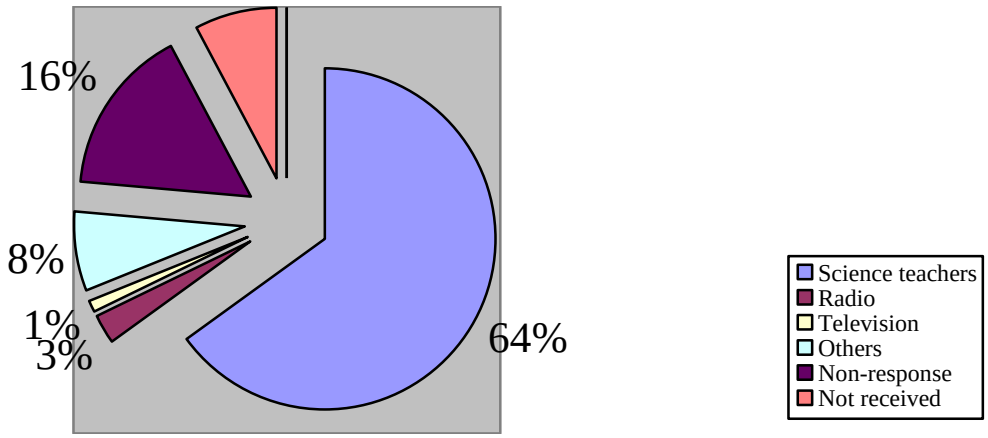

Figure 1: Source of Nutrition Knowledge

3.2. Knowledge on Food Groups

Nutrition knowledge of food groups can help the pupils and their households select the locally available foods wisely for their healthy living. More than half (64%) had some knowledge on a balanced diet while 73% had some knowledge on vitamins and only 23% had some knowledge on minerals. The results revealed that 77% children did not understand much about minerals (Table 1).

Table 1: Knowledge on Food Groups at Baseline

Food Group	n=601	%
Balanced Diet		
Had attained some knowledge	385	64
No idea	216	36
Protein		
Had attained some knowledge	231	38.5
No idea	370	61.5
Carbohydrates		
Had attained some knowledge	373	62
No idea	228	38
Minerals		
Had attained some knowledge	138	23
No idea	463	77
Vitamins		
Had attained some knowledge	459	73
No idea	162	27

3.3 Household Technologies that Enhance Nutrition and Health

Most children (52%) practised some kitchen gardening with their parents. The other available technologies were also done by their parents. It is well documented that children at this age can be change agents and any knowledge gained can be translated for household and community growth and development. The deficit in presence of the health and nutrition technologies called for further interventions. Table 2 shows the projects at pupils' home during the baseline study.

Table 2: Nutrition and Health Related Projects Homes at Baseline

Project	n= 67	%
Multi-storey gardens	8	12.0
Kitchen garden	35	52.0
Leaky tins	6	9.0
Improved stoves	2	3.0
Dish racks	1	1.5
Rabbits	7	10.5
Chicken	8	12.0

Technologies that promote the overall health, hygiene and nutrition of children such as gardening are very important in improving the nutritional status of populations. Healthy pupils will exhibit enhanced cognitive development, concentration, participation and retention in school hence improved academic performance. Children may also gain knowledge from their parents from the activities that they undertake at home.

3.4. Household Food Consumption Patterns

3.4.1. Food Consumption Patterns

The study showed that in 57% (Figure 2) of the households men were served food first before other members of the family and then children came second at 39% followed by grandparents at 4%. Figure 2 shows priority in household food distribution in priority.

Figure 2: Priority in Household Food Distribution

The type and meal consumption pattern is crucial in determining the household and pupils iron intake. Culture in many African households affects intra-household food distribution.

3.4.2. Food Frequency and Consumption of Selected Iron Rich Foods

The average weekly intake on the seven day food frequency was analysed and the T- test computed (Table 3). The iron rich foods selected provide more than 1mg/100g edible portion (calculated by the method of (Monsen *et al.*, 1978) except for milk (source USDA (1976-1994).

Maize and maize products (average of 5 times) and irish potatoes (average of 3 times) had highest intake by both boys and girls. Table 3 shows the times various foods were eaten by each sex in the seven day food frequency.

Table 3: Mean Number of Times Various Foods were Eaten by Sex

N=67				
Food item	**Boys**	**Girls**	**t**	**p value**
Kales	2.88+2.2	3.21+2.1	-0.622	0.536
Carrots	2.82+2.8	3.47+2.8	-0.961	0.340
Cabbage	1.21+1.6	1.85+2.1	-1.413	0.162
Amaranth	0.94+1.6	0.76+1.5	0.459	0.648
Black nightshade	0.30+1.1	0.0+0.0	1.691	0.096
Cowpea leaves	0.06+0.4	0.15+0.6	-0.710	0.480
Pawpaw	0.24+0.6	0.21+0.6	0.238	0.812
Mango	2.15+2.7	1.79+2.2	0.591	0.556
Beans	2.67+1.9	2.85+2.1	-0.381	0.704
Dolicos lablab	0.67+0.9	0.62+1.0	0.206	0.837
Green grams	0.27+0.3	0.41+0.7	-0.855	0.396
Beef	0.85+1.4	0.59+0.9	0.934	0.354
Eggs	0.58+1.2	0.71+1.4	-0.415	0.680
Maize	4.73+2.2	5.24+1.7	-1.076	0.286
Sorghum	1.67+2.7	0.94+2.3	1.186	0.240
Millet	0.52+1.8	0.65+2.0	-0.286	0.776
Rice	1.21+1.0	1.47+1.0	-1.034	0.305
Wheat	0.64+0.7	0.79+1.3	-0.617	0.539
Irish potato	3.06+2.5	3.12+2.6	-0.091	0.928
Arrowroot	1.18+1.9	1.32+2.0	-0.299	0.766
Banana (Unripe)	1.24+0.9	1.62+1.5	-1.213	0.229

The primary schools visited in Gatanga Sub-County did not have any school feeding programme. It was mandatory as a school rule that pupils' should carry packed lunches, of which some pupils defied due to various reasons such as lack of food to carry to school. From the seven day food frequency meat was eaten less than once in a week by both sexes (Table 3). Eggs were consumed moderately by most pupils. The most commonly consumed legumes were beans (*Vicia faba)* while blackbeans *(Dolicos lablab)* and green grams *(Vigna radiata*) were consumed moderately.

The most frequently eaten vegetables were cabbage, kales *(Brassica oleracea)* and carrots (*Daucus carota)* which were eaten more than once in a week. The vegetables were usually stewed in some water and overcooking was cited by a number of respondents. Further probing revealed that there was little consumption of traditional vegetables like amaranth (*Amaranthus bitum*), black nightshade (*Solanum scabrum*) and cowpeas (*Vigna unguiculata*).

The commonly consumed fruit was mango *(Mangifera indica)* more than once in a week. The mango (*Mangifera indica*) was in season at the time of data collection and hence highly consumed. The pawpaw and avocado were consumed less than once in a week by both sexes. Other fruits like loquats *(Eriobotrya japonica),* tree tomato *(Solanum betaceum*) and passion fruit *(Passiflora edulis*) were out of season. None of the households mentioned having consumed the pineapple (*Ananas cosmosus)* although it is grown in the neighbouring Gatundu sub-county, this was probably due to limited purchasing power that existed at the time of data collection. Fruits and vegetables provide vitamin C that promotes iron absorption. Tea (*Camelia sinensis*) as a beverage was common and predominantly taken at breakfast, while coffee *(Coffee arabica)* was less consumed by both boys and girls. These beverages are known to contain tannins and caffeine respectively that inhibit iron uptake in the gut. However, these beverages were rarely consumed with the main meals. There was a high consumption of maize *(Zea mays)* and its products, for example, maize and beans (Githeri) and stiff maize porridge (ugali) respectively. Rice *(Oryza sativa),* sorghum (*Sorghum bicolour*), millet *(Pennisetum typhoides)* and wheat (*Triticum aestivum*) were also moderately consumed based on the food frequency. These foods are known to have high amounts of phytates if unpolished which inhibit iron absorption. The maize and wheat flour were sifted and therefore contained less phytates, but less nutritious than

whole grain cereals. Wheat flour consumption was inform of chapatti (flat fat cake) and *mandazi* (deep fried doughnuts). The root tubers, irish potato *(Solanum tuberosum*), arrowroot/*talo (colocasia esculenta)* and the unripe banana (*Musa)* were commonly consumed based on the food frequency as part of the main dish at least once a week by both sexes (Table 4.2). These are energy giving foods known to provide some micro nutrients that are known to promote iron uptake such as vitamin A. From the information gathered, it was routine to fry food with commonly used was hard yellow fat. Fat helps in the uptake of fat soluble vitamins A, D, E, K, which in turn interact with absorption of iron in the gut. The intakes were not statistically different for all the foods at $p>0.05$ (Table 3). However, the girls consumed vegetables more times than boys.

3,5. Nutrition Education Through the Different Facilitations

Nutrition knowledge was offered to all the experimental schools using the three facilitators; 5 peers, an agriculture extension worker and the researcher. It included classroom lessons on nutrition, cookery and kitchen gardening activities in the school. School gardens help to improve the nutrition and education of the children and their families in both rural and urban areas. The gardens included a variety of vegetables and small livestock like rabbits (FAO, 2005b).

3.6. Nutrition Knowledge Before and After Interventions

Learners were taught by the different facilitators on various predetermined nutrition education topics. Table 4 shows the performance in nutrition knowledge before and after the interventions.

Table 4: Nutrition Knowledge by Sex Before and After the Interventions

	Total marks		Mean marks: boys		girls	
	Before	After	Before	After	Before	After
Exp. Schools						
Peer facilitated [1] n=26	31.31[a]	51.52[c]	31.69[ab]	48.93[c]	34.79[a]	55.40[c]
Researcher facilitated [2]n=38	32.21[a]	49.67[c]	28.64[a]	41.67[b]	28.64[a]	54.67[c]
Agriculture staff facilitated [3]n=58	28.64[a]	39.29[b]	26.90[a]	38.90[b]	29.46[a]	39.69[b]
Control school						
Control[0] n=39	29.81[a]	31.21[a]	22.91[a]	27.45[a]	33.12[a]	33.88[a]
p value	0.212	<0.05	>0.05	<0.05	>0.05	<0.05

Means in the same column with the same letter are not significantly different.

[0=]**Control school:** Gakurari**, Experimental Schools**: [1=]Kirwara, [2=]Mabanda , [3=] Kigio

After the interventions, girls still did better than the boys in nutrition knowledge. Post-tests showed a significant difference with the experimental schools performing significantly better than the control school at $p<0.05$. There was no intervention in the control school during the intervention study. The performance of the control school improved but not significantly. The improvement may have been caused by the sensitization at pre-test, such that pupils may have tended to remember their responses during the post-test as reported by Mugenda and Mugenda (2003). The pre-test post-test improvement in the control school was however not significant ($p> 0.05$) as compared to the performance of the experimental schools.

3.7. Use of Fireless Cookers

The WHO estimates that exposure to smoke from cooking constitutes the fifth worst risk factor for disease in poor developing countries and causes almost two million premature deaths per year. Exposure to these toxic fumes is greatest among women and children who spend most time near open fires or traditional cook stoves tending to the family meal or school children who may study by the weak light of an open flame (Rascona, 2011). The study promoted the use of energy

saving device the fireless cooker. Plate 1 shows use of fireless cookers by pupils at school which was promoted in their households.

Learners did cookery practicals with iron rich foods using energy conserving cookers thus the *ceramic jiko* and the *fireless cooker* as shown in Plate 1.. Pupils' were explained about the healthy plate which included demonstration on portion size. The vegetables should take half of the plate then the carbohydrates and proteins the other half, a quarter plate of each food group. Explanation was made for the need of taking fruits with the meals and also taking plenty of clean safe drinking water.

Plate 1: Fireless Cooking of Balanced Meals with the Pupils at School

Adoption in use of the fireless cooker (An insulated container to conserve heat to finish the cooking) occurred in the agriculture staff facilitated experimental school.

3.8 Relationship of Nutrition Knowledge, Consumption of Iron Rich Foods

Nutrition interventions are known to help in management of all kinds of malnutrition amongst the populations. Table 5 shows correlation and p values post interventions.

Table 5 : Correlation and p values post Interventions

Nutrition knowledge and:	r	**p value**
Protein intake	0.218	0.080
CHO intake	0.667	0.000
Kcal intake	0.661	0.001
Vitamin A intake	0.217	0.036
Vitamin C intake	0.272	0.068
Zinc intake	0.037	0.261
Folic acid intake	0.230	0.057
Iron intake	0.349	0.007

Bivariate correlations (r) explain the relationship between nutrition knowledge and selected nutrients at post-test. The Kcal, Carbohydrate, Vitamin A, folic acid and iron intake relationships were statistically significant except for protein, zinc, folic acid and vitamin C (Table 5).

4.0 Discussion

Nutrition Knowledge of Pupils at Baseline

The study revealed that pupils had learnt some nutrition lessons at school and out of school but very little content as was demonstrated by the pupils' nutrition knowledge performance at baseline. According to FAO (2013b), there is need to enhance nutrition education content by development of new educational materials in this area. The Kenyan National School Health policy and Guidelines and the National Food Security and Nutrition policy emphasize the

importance of prevention and control of micro-nutrient malnutrition through enhancing nutrition education in schools.

Food Consumption Pattern of Pupils at Baseline

The pupils food consumption was average in that three meals were eaten in a day and 90% carried packed lunches from their homes. The food may not have been adequate qualitatively and quantitatively because they carried left over foods from the last evening meals. According to Gunde (2004) in a study done in Egypt, the aim of packed lunches is to ensure that children are not hungry and unable to concentrate on school work. Teachers perceived that the unhealthy feeding habits of the school children especially lack of breakfast affected the interaction between the school children and the teachers. The school teachers observed that the active child in class was usually the child who received breakfast at home and at the same time the more intelligent child with good scholastic performance.

Food Consumption

At baseline survey, most households consumed plant based foods with very little vegetables and animal foods which are rich in iron, and with less inhibitors compared with vegetable based foods. During the study, there was total crop failure due to erratic rainfall pattern and many households depended on food purchase. These findings were in agreement with other studies, which have shown low consumption of animal products and increased consumption of plant foods in developing countries (UNICEF, 2008).

Pupils' Nutrition Knowledge and dietary intake before interventions

The pre-intervention tests showed that pupils lacked adequate nutrition knowledge (an average of 30.05%) and identified the need to increase effort on nutrition education in Gatanga Sub-County,

Muranga County. This is comparable to a study undertaken in Machakos County whereby most pupils scored an average of 35% at pre-test in nutrition knowledge (Mbithe, 2008).

This study showed a low intake of most nutrients except carbohydrates which were above RDA. In poor countries, diets tend to be deficient in multiple micro-nutrients and not only iron and folate, but deficiency in vitamin B_{12}, vitamin A as well as zinc contribute to iron deficiency anaemia (Bwibo and Newmann, 2003). Food-based intervention should be one of the important strategies for reducing the magnitude of the problem of anaemia in school children and their communities (Tatala *et al*., 2004).

Pupils' Nutrition Knowledge at After Interventions

Post-tests showed a significant difference in nutrition knowledge with the experimental schools performing significantly better than the control school. Findings in an integrated rural nutrition project in Kawambwa, Zambia indicated that nutrition education programs have a significant impact on knowledge and attitudes than activities that only aimed at increasing food availability (Kakunted, 2008). Significant improvement in nutrition knowledge and practice were observed in all the experimental schools under the different facilitators, while the control school improved but not significantly. Changes in practice after intervention demonstrate the effectiveness of the intervention programmes in improving nutrition both among school pupils and household members. Class participation and iron rich food consumption improved greatly. These findings are in agreement with a study done in India whereby there was improved nutrition knowledge after interventions (Sangeetha *et al*., 2010). Pupils in the experimental schools adopted new projects as compared to the control school.

Pupils' Nutrition and Health Practices After Intervention

The findings of the intervention study leads to the conclusion that the food based approach using the three facilitators (Peer facilitated, Researcher facilitated and agricultural extension worker facilitated) could have some influence and hence effective to combat deficiencies and promote good health and well-being of the pupils. Gains made may be attributed to the interventions made, when comparison were made between the experimental schools and the control school. Similar findings are reported in a study done in Chennai district, India where by haemoglobin levels of school children who used micronutrient rich foods improved significantly. Sound nutrition knowledge imparted to the children and their households may also have helped to promote their home food intake (Sangeetha *et al*., 2010). The impact was the improved dietary intake. The School Health and Nutrition Policy emphasize the promotion of school gardens to enhance integration of nutrition interventions into routine school activities (MOPHS, 2011).

Nutrition knowledge offered to the pupils impacted positively as the results revealed. The experimental schools improved in all aspects of the intervention. Improved stoves were used which add to food nutrient retention in the experimental schools. The relevant stakeholders should come up and address this public health problem with strategies to improve nutrition and help the growing child attain their educational dreams successfully for the growth and development of our nation.

The Impact of the Study After the Intervention

The average mean mark in nutrition knowledge in experimental schools improved from 30.05% to 46.8% while the control school did not improve at 31.21%. Post-tests showed a significant difference with the experimental schools performing significantly better than the control school

at p=0.001. Practices like increased consumption of fruits and green leafy vegetables after the interventions were noted. Nutrition knowledge given to the experimental schools improved their dietary intake. Emphasis should be laid on the importance of nutrition education among the school pupils to address malnutrition. Learners should be given comprehensive knowledge for them to understand the importance of a balanced diet and the causes of deficiency diseases.

5.0. Acknowledgement

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