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## DEVELOPMENT AND EVALUATION OF A NUTRITION EDUCATION PROGRAMME FOR PRIMARY SCHOOL CHILDREN IN THE VAAL TRIANGLE

ONWABA MAKANJANA, B Tech Food and Beverage Management

Dissertation submitted in fulfilment of the requirements for the degree  
Magister Technologiae (Food and Beverage Management)  
in the Department of Hospitality and Tourism  
Faculty of Human Sciences,  
Vaal University of Technology

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February 2006

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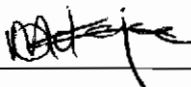
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- All my friends who have been helpful when things were difficult.

## DEDICATION

This dissertation is dedicated to the memory of my late grandparents, Noyekile and Lusani Makanjana.

## ABSTRACT

**Objectives:** The aim of this study was to develop and evaluate a nutrition education programme for Setlabotjha Primary School children in order to improve current knowledge. The study included all grade seven learners from two primary schools in one of the poorest areas in the Vaal Triangle. Children from Setlabotjha Primary School formed the experimental group, while children from Ekujuleni Primary School formed the control group.

**Methods:** The initial steps involved a baseline survey (Napier 2001:78), which indicated that malnutrition exists at Setlabotjha Primary School. The baseline survey indicated stunting, wasting, underweight and poor food consumption patterns among the children. A literature survey was conducted, as a result of the findings of malnutrition, poverty and household food insecurity in Eatonside. Pre-tests were undertaken to determine current nutritional knowledge (for both groups) using a nutritional knowledge questionnaire developed by the Medical Research Council. The pre-tests results revealed poor nutritional knowledge and these results were used to develop the nutrition education tool (nutrition education playing cards) based on the South African Food Based Dietary Guidelines. The intervention, which involved the issuing, reading, playing and exchanging of the nutrition education playing cards had taken place over eleven weeks for the experimental group. The control group had received pamphlets and nutrition education lessons. After the intervention had taken place, post-tests were undertaken to compare the difference between the two groups and to determine the effectiveness of the nutrition education programme.

**Results:** In general, the subjects of both groups had a good knowledge regarding sugar, water and salt consumption, as well as 'the key to a healthy way of eating'. Thus the inclusion of fruit and vegetables and variety were in the diet. Poor knowledge was evident in both groups pertaining to pregnancy, the importance of starch in the diet, alcohol consumption, physical activity, vitamin A-rich foods and the inclusion of pilchards as a calcium-rich source.

**Conclusions:** The results in this study indicated success in both the NEP with the playing cards as well as the lecture with the pamphlet. It is difficult to determine which of the two strategies was more effective as the lecture with the pamphlet subjects showed improved results than the card game when comparing the subject's knowledge regarding starch, water, salt, fruit and vegetable and alcohol-related questions, as well as the questions pertaining to healthy living, vitamin A sources and calcium. The experimental group showed better knowledge on soya, energy and fibre-related questions, as well as fruit and vegetable nutrient content, whereas the questions pertaining to pregnancy, sugar and physical activity showed similar results in both groups.

**Keywords:** nutrition education, malnutrition, school age children, and school based nutrition education programmes

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Annexure F: Article

Annexure G: Certificate from the Language Editor

## LIST OF ABBREVIATIONS

ADA	American Dietetic Association
ASB	Asiatic Society of Bangladesh
CDC	Centre for Disease Control and Prevention
CGIAR	Consultative Group on Intern Agricultural Research
DCFL	Minnesota Department of Children, Families & Learning
DOH	Department of Health
FANRPAN	Food & Agricultural & Natural Resources Policy Network
FAO	Food and Agricultural Organization
FBDG	Food Based Dietary Guidelines
FGP	Food Guide Pyramid
GADOE	Georgia Department of Education
ICN	International Conference on Nutrition
IDD	Iodine Deficiency Disorder
IMR	Infant Mortality Rate
INP	Integrated Nutrition Programme
MDOE	Massachusetts Department of Education
NASBE	National Association of State Boards of Education
NCSL	National Conference of State Legislature
NEP	Nutrition Education Programme
NFCS	National Food Consumption Survey
ORS	Oral Rehydration Solution
PEM	Protein Energy Malnutrition
PI	Prevention Institute
SA FBDG	South African Food Based Dietary Guidelines
SAVACG	South African Vitamin A Consultative Group
SFP	School Feeding Programme
UNESCO	United Nations Education, Scientific & Cultural Organization
UNICEF	United Nations Children's Fund
USDA	United States Department of Agriculture

VAD	Vitamin A Deficiency
WBG	World Bank Group
WFP	World Food Program
WHO	World Health Organisation

## CHAPTER 1

### PROBLEM AND SETTING

#### 1.1 Introduction

The World Health Organization (WHO) has indicated that malnutrition involves insufficient as well as excess food, including the body's response to a wide variety of infections that result in the malabsorption of nutrients or an inability to use them appropriately to sustain health (WHO 2003a:1). Malnutrition arises when nutrients in the diet do not fulfil the requirements of the body. Children that are more at risk are those who do not have nutritionally sufficient diets as well as those not protected from regular illness and do not receive adequate care (Bellamy 1998:2).

There are various kinds of malnutrition. Malnutrition occurs in different forms that frequently emerge in combination and contribute to each other, e.g. protein-energy malnutrition, iodine deficiency disorders and deficiencies of iron and vitamin A. The Food and Agriculture Organization (FAO) stated that the most important causes of most micronutrient malnutrition are insufficient intakes of micronutrient-rich foods and damaged absorption or consumption of nutrients of these foods. Poverty is persistently at the root of micronutrient malnutrition and is also related to insufficient access to food, sanitation and safe water (FAO 1997b:9).

#### 1.2 Background to the problem

##### 1.2.1 Prevalence of malnutrition globally

Malnutrition persists as a key problem throughout the developing world, especially in Southern Asia and sub-Saharan Africa. Research indicated that in central Africa, 55% of the population is undernourished, 40% in East Africa, 40% and 16% in Southern Africa and West Africa respectively (FAO 2004a:5). Diets in Asia and sub-Saharan Africa are commonly lacking in macronutrients, thereby leading to protein-energy malnutrition, and micronutrients or combination of the two nutrients (Muller & Krawinkel 2005:3).

According to the United Nations Children's Fund (UNICEF), malnutrition is involved in more than half of all deaths globally. Approximately half of Asia's children are malnourished. In South East Asia, 13% of the population is undernourished, 22% in South Asia and 10% and 20% in South America and Central America respectively (FAO 2004a:34). Malnourished children have reduced resistance to infections and are more likely to die from common childhood sicknesses such as diarrhoeal diseases and respiratory infections. There are still several countries, predominantly in South Asia and sub-Saharan Africa, with very high levels of chronic malnutrition (UNICEF 2001:4)

Malnutrition of infants and young children has deep negative effects on health, development and survival of children and thus society at large. There are 10.9 million children worldwide who die annually under the age of five. Most of these are in Asia. Child malnutrition contributes to more deaths globally than any other health illness. It is accountable for about six million of these 10.9 million deaths. Even the survivors are unable to develop their full potential (Gupta 2004:1).

The World Food Program (WFP) stated that the utmost number of hungry people in the world reside in Asia. More than 500 million people in Asia do not get adequate food to meet the daily requirements for nutritional well-being. Micronutrient deficiencies are particularly serious in Asia, where children are born mentally retarded as a result of iodine deficiency, others go blind and die of vitamin A deficiency and massive numbers are defenceless and weakened by iron deficiency anaemia (WFP 2005:1).

In many Asian countries the underlying causes of malnutrition include poverty, low status of women, poor care during pregnancy, high rates of low birth weight, life threatening child bearing practices and poor access to healthcare. Figure 1.1 indicates the percentage of malnourished people in developing countries (UNICEF 2001:4).

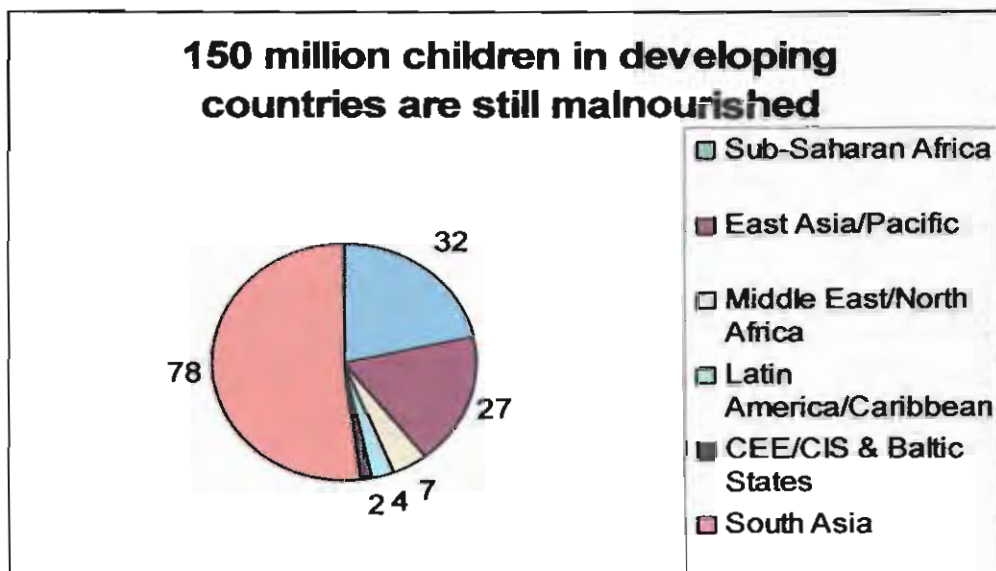


Figure 1.1: Percentage of malnourished children in developing countries (UNICEF 2001).

Malnutrition is the most important risk factor for the burden of disease in developing countries. Figure 1.2 indicates that malnutrition is the major cause of death globally among children less than five years of age (Muller & Krawinkel 2005:3).

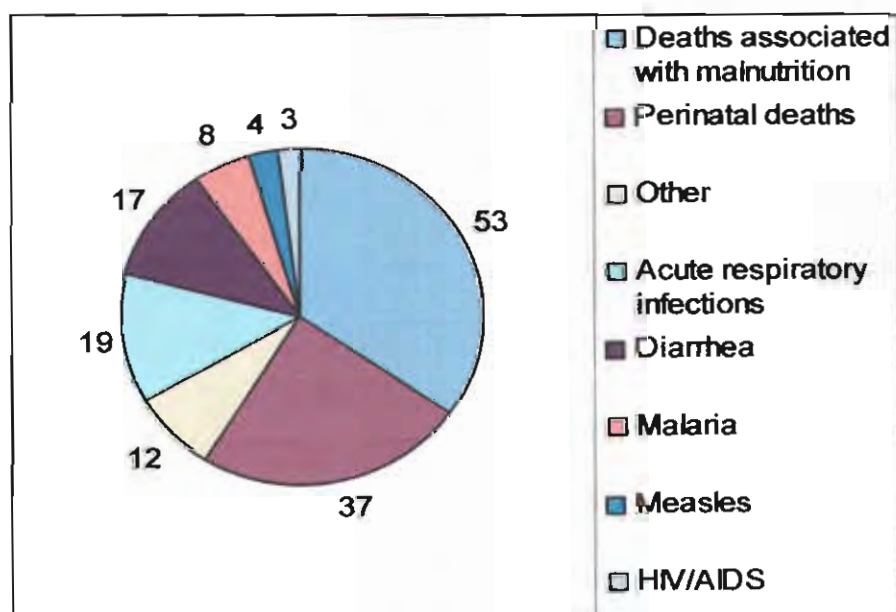


Figure 1.2: Percentage of the causes of death among children less than five years between 2000 and 2003 (Muller & Krawinkel 2005:3).



### **1.2.1.1 Prevalence of malnutrition in Bangladesh**

Child malnutrition is persistent in Bangladesh, with virtually one-half of all children below the age of five years being either underweight or stunted (Deolalikar 2005:55). The main public health problem in Bangladesh is malnutrition caused by the shortage of nutrients. Due to low intake of nutrients, lack of nutrition education, faulty intra-household food distribution among the members of the family, recurrent attacks of diarrhoeal diseases and other interrelated causes, the nutritional status of the populace is impoverished. Children are significantly affected by such problems. The Asiatic Society of Bangladesh (ASB) has indicated that only over six percent of children aged 0-72 months are not suffering from malnutrition-related illnesses. The remaining 93.8% experience various degrees of malnutrition. One third of all deaths amongst children in Bangladesh are linked to acute malnutrition. The danger of dying from severe malnutrition is high among girls if compared with boys (ASB 2005:1).

In the mid 1990s, it was calculated by FAO that about 56% of children in Bangladesh were underweight for their age. Despite substantial improvement in the status of health and nutrition, the rates of malnutrition among children in Bangladesh are still the highest in the world. There is a high prevalence of child malnutrition due to vitamin A deficiency in Bangladesh. Vitamin A deficiency is the principal cause of blindness among children and women, and it is also linked to increased risk of morbidity and mortality. Most rural children are at risk of vitamin A deficiency because of poor dietary intake of the vitamin, due mostly to poverty, and partially to poor eating habits resulting from ignorance (ASB 2005:2; Hossain & Hussain 2002:1).

### **1.2.1.2 Malnutrition in Palestine**

Large numbers of Palestinian children suffer from acute and chronic malnutrition. Causes for the substantial increase in malnutrition are due to poverty and unemployment (Loucks 2002:2). Research shows that more than one-fifth of young Palestinian children are malnourished. This is more than a threefold increase since the last study had been conducted. The predicament of children under five years of age was particularly serious. Twenty-two percent of Palestinian children under the age five were emaciated, marking

an increase from seven percent in an agency study two years earlier. Of that number, nine percent suffered from acute malnutrition resulting from inadequate diet over the short term. Thirteen percent suffered from chronic malnutrition, including longer-term deficiencies that can result in stunted growth. About 20% of children under five had some form of anaemia (Thompson 2002:1).

The latest study also shows that 45.5% of Palestinian children aged six months to five years suffer from chronic malnutrition. Their growth has been stunted because of poor diet. Another 35% display acute malnutrition, where they were found to weigh less than average for their age or height group. When weighed against statistics of a study conducted in 2000, the survey found a 22% increase in the number of children suffering from moderate stunting due to malnutrition and a 36% increase in the number of children who are underweight for their age. There was an increase of 50% in the number of children suffering from low weight for their height (Thompson 2002:2).

#### **1.2.1.3 Malnutrition in India**

Malnutrition affects enormous numbers of people in India, particularly women and children (Lak 1999:1). A study conducted by the World Bank Group (WBG) indicated that malnutrition remains a silent emergency in India, as more than half of all children under the age of four are malnourished. Among newborns 30% are extensively underweight, while 60% of women are anaemic. Malnutrition rates in some parts of India are highest among children and women, mainly due to inadequate food intake, illness and harmful child care practices and delayed complementary feeding. Underlying these are household food insecurity and insufficient knowledge of proper care (WBG 2001:1).

#### **1.2.1.4 Malnutrition in Kenya**

Micronutrient malnutrition remains a serious problem facing Kenya's poor and disadvantaged population. Droughts are among the major causes of malnutrition and nutritional imbalance. Women and children are the main foci as they are the most vulnerable groups affected by malnutrition (Hongo 2003:1; Mezich 2005:1).

A study done among pre-school children in the Kiambu and Kwale districts indicated that malnutrition is a serious problem in Kenya. The prevalence of stunting, wasting and underweight are 37%, six percent and 27% respectively. Stunting was highest amongst the 12-23 months age group, while the rate was the lowest amongst six to twelve months age group. The most serious form of malnutrition in Kenya is protein-energy malnutrition, which largely affects infants, pre-school and school children (Ngare& Muttunga 1999:377).

#### **1.2.1.5 Prevalence of malnutrition in Nigeria**

There is significant food shortage and nutrient deficiency in Nigeria. Only 35% of the population has access to current health services. There are age variations in the prevalence of malnutrition. Malnutrition in Nigerian children, notably stunting, begins early in life and increases with age. The prevalence of stunting ranges from 25.3% in infants six to eleven months to 52.9% in children aged 48-59 months. The prevalence of iron deficiency anaemia is estimated at about 25% for children. It has been estimated that seven million pre-school children in Nigeria suffer from vitamin A deficiency (Adelekan 2001:86).

#### **1.2.1.6 Malnutrition in Tanzania**

Tanzania has been recognised as one of the countries with malnutrition in both rural and urban areas. As with most countries in sub-Saharan Africa, the causes of malnutrition in Tanzania include insufficient food consumption, poor sanitation and inadequate knowledge about healthful eating. Research undertaken has indicated that malnutrition is prevalent amongst school-aged children, especially those aged ten. Adolescents in Tanzania lack nutrition education. Among adolescent girls 50% were reported to be underweight and 70% were stunted. Adult males and females also suffer from malnutrition, indicating that malnutrition is prevalent in different generations in that country. Protein-energy under-nutrition, iron deficiency anaemia, vitamin A and iodine deficiency disorders are the most common nutrition disorders of the Tanzanian population. Anaemia occurs in 86% of children and 42% of adolescent girls.

Approximately 25% of the Tanzanian population is iodine deficient (Kinabo & Musuya 2002:64).

### **1.2.2 Malnutrition in South Africa**

South Africa is characterized by a lot of prosperity and poverty. Even though it is classified as a middle-income developing country, the majority of the people are poor. The national infant mortality rate (IMR) is 45 per 1 000 live births. The IMR is higher in rural areas, where infants are born to mothers with no official education; there are families where the birth gap between children is less than two years and others with four or more children. These factors are all correlated to underlying poverty, poor access to formal education and a lack of empowerment to make more suitable life decisions (Witten, Jooste, Sanders & Chopra 2003:2).

Nutrition related problems in South Africa evidently reflect the double burden of disease linked to the nutrition transition that can be associated with trends of increasing urbanisation. Distinct from rapid urbanisation, poverty is a major problem in the country with the level estimated at 59% (Love, Maunder, Green, Ross, Smale-Lovely & Charlton 2001:9). Research shows that 20-25% of pre-school children and 20% of primary school children are chronically malnourished. Severe malnutrition remains the main cause of death amongst young black children in South Africa. It was estimated that 30% of South Africa's population does not have a steady supply of food. All these problems are notable in the Eastern Cape and Northern Province, two of the country's poorer regions (Strachan 1999:5).

The South African Vitamin A Consultative Group (SAVACG) conducted a comprehensive national survey on the nutritional status of pre-school children in South Africa. The survey found that one in ten children was underweight and one in four was stunted. Malnutrition was prevalent in the Eastern Cape, Northern Province and in Kwazulu-Natal. The national survey also found that one in three children had trivial vitamin A status. The occurrence of vitamin A deficiency was highest in non-urban areas in children with deficiently educated mothers. One in five children was found to be

anaemic. Anaemia and poor iron status were most prevalent in urban areas among 6-23 month old children (SAVACG 1999:3).

The SAVACG survey reported anaemia common among children between six to seventy-one months of age as 21%. Prevalence rates of anaemia were the same in urban and rural areas, as well as among boys and girls. The national Iodine deficiency disorder (IDD) survey, which was carried out in 1998 among primary school learners, indicated that those in 89.4% of the primary schools surveyed had a normal iodine status, following the compulsory iodation of salt in 1995. However, learners in 10.6% of the schools (mainly in rural areas) were iodine deficient (SAVACG 1999:4).

Micronutrient deficiencies are widespread in the country and affect susceptible groups such as children and women. Figures 1.3 and 1.4 indicate the underweight and stunting rate per province respectively. The national Food Consumption Survey (NFCS) indicated that most children seem to consume a diet low in energy and poor in protein quality. One out of two children has an intake of less than half the recommended levels of energy, vitamins A and C, iron, zinc and calcium (Labadarios, Steyn, Maunder, MacIntyre, Swart, Gericke, Huskisson, Dannhauser, Vorster & Nesamvuni 1999:65).

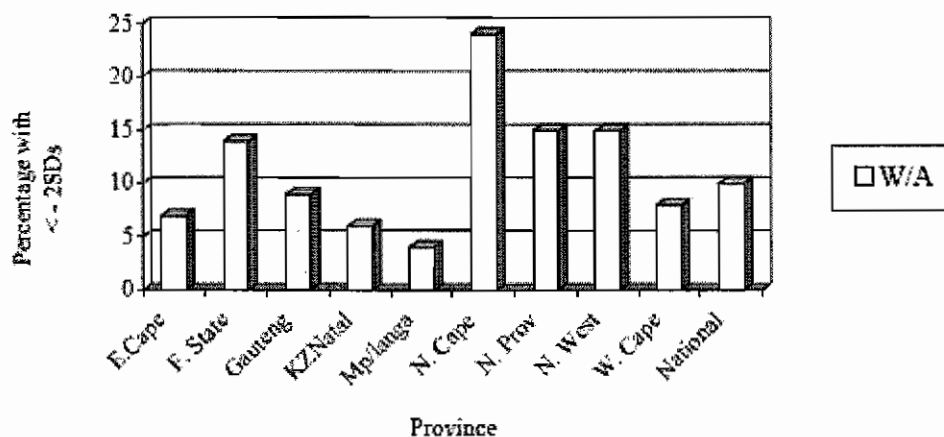


Figure 1.3: Prevalence of underweight in children aged one to nine years (Labadarios et al. 1999).

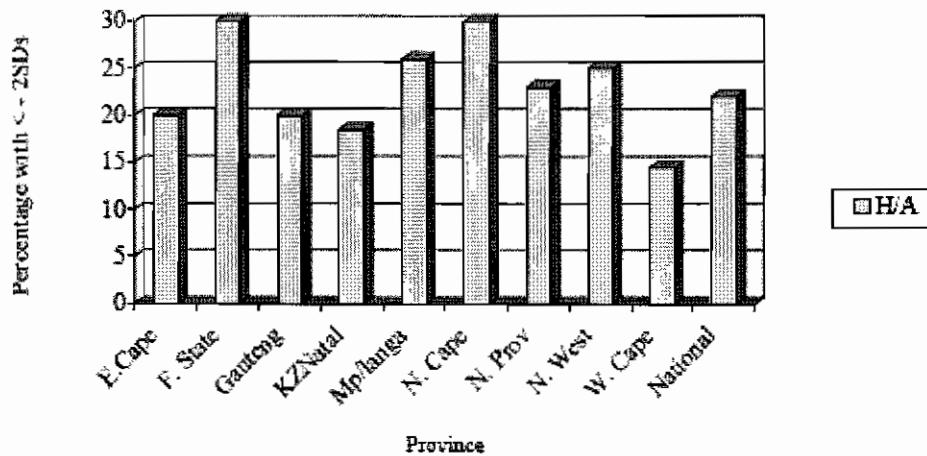


Figure 1.4: Prevalence of stunting in children aged one to nine years (Labadarios 1999).

When comparing the NFCS with the SAVACG study, the NFCS revealed that in terms of stunting, the national average prevalence had not changed much. The prevalence of stunting appeared to have decreased in the Eastern Cape and the Northern Province, while the rate appears nearly to have doubled in Gauteng. The prevalence of underweight appeared to have increased in children living in the rural areas. The prevalence of wasting appeared to have decreased in the Eastern Cape and the Free State (Labadarios et al. 1999:73).

### 1.3 Causes of malnutrition

Causes of malnutrition are multi-sectional, focusing on food, health and caring practices. Figure 1.5 indicates that causes are categorised as immediate, underlying and basic, in which factors at one level influence others (Bellamy 1998:1)

#### 1.3.1 Immediate causes

Insufficient dietary intake and disease are the immediate causes or determinants of malnutrition. The shortage may include total energy, protein, vitamins or minerals. Inadequate dietary intake may increase vulnerability to and rigorosity of infection (UNICEF 1998:1).

Kwashiorkor is a nutritional disease resulting from insufficient dietary intake. Improvement of calorie and protein consumption will rectify kwashiorkor, if treatment is not started too late. Nevertheless, full height and growth potential will never be achieved. Severe kwashiorkor may leave a child with mental and physical disabilities. Risk factors include living in poor countries, those in political conflict and others affected by frequent natural disasters. Such conditions are directly or indirectly accountable for food scarcity that leads to malnutrition. A diet with a suitable amount of carbohydrates, fat and protein will inhibit kwashiorkor (Smith 2001:1).

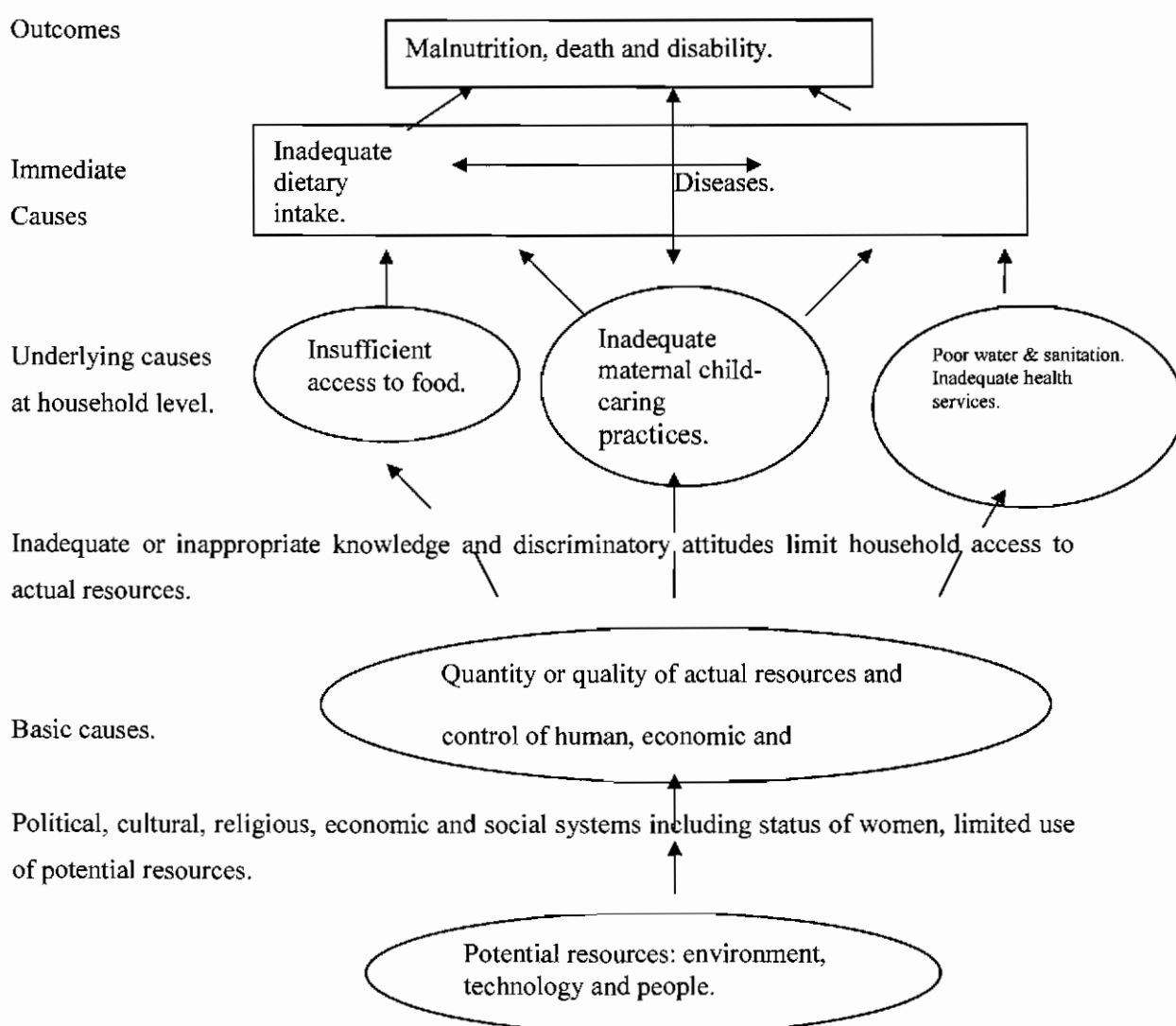


Fig. 1.5: Conceptual framework for the causes of child malnutrition (UNICEF 1998).

### **1.3.2 Underlying causes**

Three clusters can be identified, namely: adequate access to food (household security); adequate care of children and women; and adequate access to preventive and basic health services together with a healthy environment (UNICEF 1998:1).

#### **1.3.2.1 Household food security**

This is defined as sustainable access to safe food of adequate quality, including energy, protein and micronutrients so as to ensure adequate intake and a healthy life for all members of the family. Household food security depends on access to food and finances. There may be plentiful food available, but poor families that cannot afford it are not food secure (UNICEF 1998:2).

#### **1.3.2.2 Adequate care of children and women**

Care refers to behaviour such as breastfeeding, food and personal hygiene, diagnosis of illnesses and provision of emotional support. Care also refers to support that the family or community offers to members of the family, as well as to behaviours within the household that determine the allocation of food to members of the household. Important causes of inadequate childcare include poor health of the mother, lack of education and incorrect beliefs of caregivers and lack of control over available resources (UNICEF 1998:3).

#### **1.3.2.3 Access to health services and a healthy environment**

Pre-natal and post-natal care, immunization, distribution of micronutrient supplements and health education are all vital health services that have a great impact on nutrition. Access to water and safe waste disposal are fundamental to the control of diarrhoea and other diseases that influence the nutritional status of children (UNICEF 1998:3).

According to WHO nutritional status is compromised when people are exposed to high infection due to dangerous and insufficient water supply and inadequate sanitation. In secondary malnutrition, those suffering from diarrhoea will not benefit fully from food because abnormal faecal discharges prevent adequate absorption of nutrients. Moreover,



those who are already experiencing protein-energy malnutrition are more vulnerable and less able to recover from infectious diseases (WHO 2000:1).

Individual nutritional status depends on the relations among food that is eaten, the overall state of health and the physical environment. Malnutrition is both a medical and social disorder, often rooted in poverty. When combined with poverty, malnutrition contributes to a downward spiral marked by an increased burden of disease, stunted development and reduced ability to work. Poor water and sanitation are key determinants in this relationship, yet they sometimes do not benefit the entire population when only the more affluent can maintain better conditions (WHO 2000:1).

### **1.3.3 Basic causes**

There are three main kinds of resources, namely human, economic and organizational. Resources are both accessible at different levels of society and controlled in many different ways. At household level it is usually men who control more of the resources, which often limits achievement of the necessary conditions of food, care and health (UNICEF 1998:3).

## **1.4 Major forms of malnutrition**

### **1.4.1 Protein-energy malnutrition**

Protein-energy malnutrition (PEM) is an illness that results from a dietary lack of protein, energy-giving foods and other nutrients. Symptoms of PEM are failure to grow, lack of energy and lower resistance to infections (Clarke 1999:6; WHO 2003a:1).

PEM is characterized not only by an energy deficit due to reduction of all macronutrients but also by a shortage of many micronutrients. This syndrome is one example of a variety of inadequate protein or energy intake levels between starvation and adequate nourishment (Smith 2001:2).

Marasmus (infantile atrophy) is caused mainly by energy deficiency characterized by stunted growth and wasting of muscle and tissue. Marasmus commonly develops

between the ages of six months and one year in children who have been weaned from breast milk or suffer from weakening conditions such as chronic diarrhoea (Smith 2001:2).

#### **1.4.2 Iodine deficiency disorders**

Iodine deficiency is the world's most widespread, yet easily preventable cause of brain damage. Iodine deficiency disorders (IDD) jeopardize both the mental health of children and often their lives (WHO 2003a:1).

Through its effects on the developing brain, iodine deficiency has limited millions of people to a life of few prospects and continued underdevelopment. People living in areas seriously affected by IDD may have an intelligence quotient of about 13.5 points below that of those from comparable areas where there is no iodine deficiency. This mental deficiency has an immediate effect on child learning capacity, the quality of life of communities and their economic productivity (WHO 2001:1).

#### **1.4.3 Vitamin A deficiency**

Vitamin A deficiency (VAD) is the most important cause of avoidable blindness in children and raises the risk of disease and death from severe infections. VAD is a public health problem in 118 countries, particularly in Africa and South-East Asia. VAD is public health problem in 118 countries, particularly in Africa and South-East Asia. Vitamin A is essential for child survival. The application of vitamin A in high-risk areas can reduce mortality extensively. In the case of children, a lack of vitamin A causes severe visual impairment and blindness, while significantly increasing the risk of severe illness, and even death from common childhood infections such as diarrhoeal disease and measles (WHO 2003b:2).

Lack of vitamin A in the diet also affects the cells lining the digestive and respiratory systems, making them less resistant to infection. Cellular immunity is also reduced. Hence, the child is more vulnerable than usual to infection (Clarke 1999:6).

#### 1.4.4 Iron deficiency anaemia

Iron deficiency anaemia is caused by a decreased in the number of red blood cells due to a lack of iron. Children who as infants had suffered from serious iron deficiency remain disadvantaged with regard to learning and behaviour as they begin adolescence. Anaemia results in fatigue, listless and inability to work. Children learn more slowly due to anaemia (Clarke 1999:7).

#### 1.5 Important classifications of malnutrition which affect pre-school and school-age children

Table 1.1 Classifications of malnutrition (WHO 2003b).

CONDITION	CHARACTERISTICS	EFFECTS ON SCHOOL CHILDREN
Under-nutrition.	Inadequate total food energy and nutrients are consumed.	Low body weight, wasting of body fat and later of muscle.
Protein-energy malnutrition.	Insufficient intake of protein and/or energy.	Failure to grow, less resistance and high vulnerability to infections.
Wasting.	Low weight for height.	See above.
Stunting.	Low height for age.	See above.
Marasmus.	Dietary deficiency of both protein and energy.	See above. Severe mainly in pre-school children.
Kwashiorkor.	Dietary deficiency of protein with sufficient or even excessive energy intake.	See above. More harsh mainly at pre-school age.
Iron Deficiency Anæmia.	Body is depleted of iron stores, hindering the body's ability to produce haemoglobin, which is needed to carry oxygen in	Increased exhaustion, shortened attention span, decreased physical and intellectual work capacity, reduced resistance to

	the blood.	infections, impaired intellectual performance.
Vitamin A deficiency.	Body is low or depleted of vitamin A, which is important for vision.	Night blindness and ultimately total blindness, reduced resistance to infection (mainly pre-school age).
Iodine Deficiency.	Body is low or depleted of iodine that is essential for cell differentiation and thyroid hormone synthesis.	Can influence brain development, learning disabilities and when severe, grossly impair mental development.
Over nutrition (Overweight /Obesity).	More food energy is consumed than expended, resulting in surplus of body fat.	Elevated blood cholesterol and high blood pressure, linked with increased adult mortality.

### 1.6 Rationale and motivation

A survey undertaken at Setlabotjha Primary School in Eatonside indicated that 14% of the children were severely underweight, 39% were severely stunted and five percent wasted. Stunting usually indicates a chronic shortage of food, experienced possibly due to low-income levels and a high unemployment rate in this community. These results further revealed a problem of malnutrition, thereby indicating a need for meaningful intervention (Napier 2001:78).

There is a government school feeding programme currently in progress at the school. It involves younger children who are provided with bread and cold drink on a daily basis, but nutrition education is not given. A school garden has also been established wherein vegetables are grown. Another recommended long-term intervention was nutrition education, involving grade seven pupils. Other grades were involved with interventions

undertaken at the school, on order to help the children to make better food choices so as to improve their nutrition status (Napier 2001:90).

Nutrition education engages a combination of activities, including the provision of information, increasing knowledge of why specific foods and behaviours are beneficial, influencing attitudes and beliefs while helping to develop personal skills (FAO 2004b:1).

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), schools are critically important settings through which to promote good nutrition and provide dietary interventions. Nutrition education has been shown to have a major effect in the development of healthful eating habits, which can lead to reducing the risk of nutrition-related diseases. Nutrition education at schools presents more effective, efficient and better opportunities than does any other setting to promote healthful eating. Schools reach young people at a critical stage of development at which lifestyles and eating patterns are established (UNESCO 2002b:2). It was for such reasons that a nutrition education programme (NEP) was planned for the malnourished children of the relevant community.

### **1.7 Hypothesis**

The underlying hypothesis of the study was that the current nutrition knowledge of Setlabotjha Primary School children is low. Therefore, the implementation and evaluation of a nutrition education programme would increase existing knowledge in order to motivate children in making more healthful food choices in order to prevent malnutrition.

### **1.7 Objectives of the study**

The general aim of the study was to develop and evaluate a passive nutrition education programme for grade seven learners at the Setlabotjha Primary School.

In order to test the hypothesis empirically, the following specific objectives were identified:

- Determining the current state of nutritional knowledge of grade seven learners at Setlabotjha Primary School using a nutrition knowledge questionnaire.
- Developing a passive nutrition educational tool to address the problem areas as identified by analysis of the completed questionnaires.
- Implementing the nutrition education programme (Intervention).
- Measurement of effects by administering a pre-test and post-test to the intervention group and comparing results for improvement in nutrition knowledge.

### 1.9 Structure of the dissertation

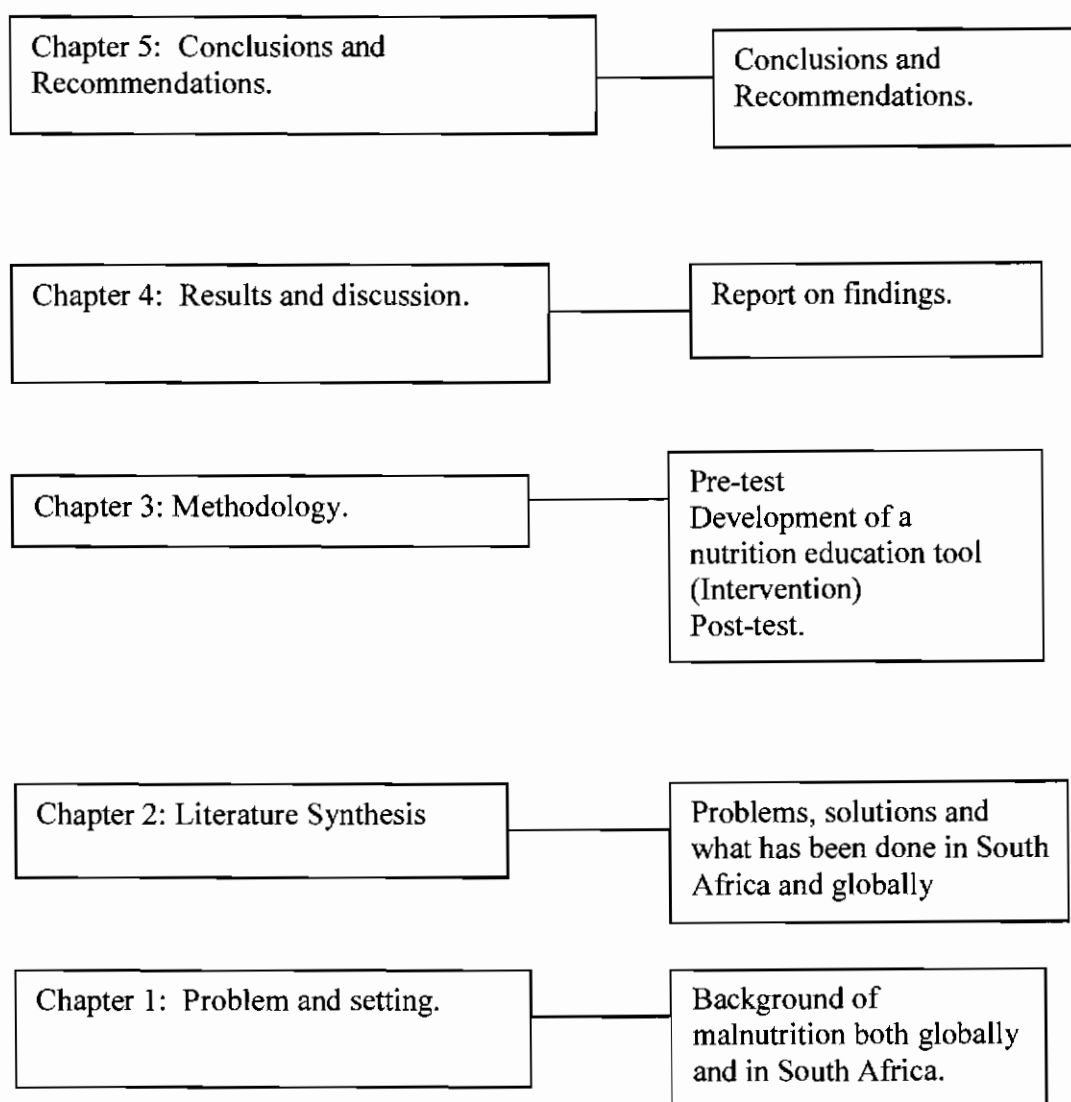


Figure 1.6: Structure of the Dissertation

## CHAPTER 2

### LITERATURE REVIEW

#### **2.1 Introduction**

Malnutrition affects about half of the world's population. More than 840 million people do not have adequate food in order to meet their basic daily needs. The Consultative Group on International Agricultural Research (CGIAR) has indicated that an estimated two billion people who have sufficient food still suffer deficiencies in micronutrients. In Sub-Saharan Africa, South and South-East Asia, Latin America and the Caribbean, women and children are at jeopardy of disease, premature death, and lower quality of life as a consequence of nutritional deficiencies in vitamin A, iodine and iron (CGIAR 2001:1). Half of South Asia's children are malnourished. One of every three children in Africa is underweight and in a number of countries there, the nutritional status of children is deteriorating (Bellamy 1998:2).

#### **2.2 Strategies applied to address micronutrient malnutrition**

Food-based approaches were recognised at the International Conference on Nutrition (ICN) as the most successful way to address existing micronutrient deficiencies. These approaches should include strategies to assure dietary diversification, enhanced food availability, food preservation, nutrition education and food fortification. Three of the main strategies of addressing micronutrient malnutrition are food fortification, supplementation and dietary diversification (FAO 1997b:1). Expanding the production, processing, marketing and consumption of a diversity of foods can boost dietary diversification. In treating a problem of micronutrient deficiencies, food-based approaches that focus on improving overall dietary quality are useful, rather than simply delivering a single nutrient (Kennedy, Nantel & Shetty 2005:5).

### **2.2.1 Food fortification.**

Food fortification involves the addition of one or more vital nutrients to regularly consumed foods, with the aim of preventing and correcting a verified deficiency of one or more nutrients in the population or of specific groups (FAO 1997b:3; Bangladeshi Jute 2004:3).

A fortification programme is largely undertaken in response to dietary, biochemical or clinical confirmation of nutrient need. Food fortification has various advantages over other interventions. In developing countries fortification is increasingly recognized as a successful medium and long-term approach to improving the micronutrient status of large populations. Fortification does not compel changes in dietary habits of the population, yet can be repeatedly implemented relatively quickly and can be sustained over a long period. Fortification is well thought-out as being one of the mainly worthwhile means of overcoming micronutrient malnutrition (FAO 1997b:3; Reddy 2003:1).

Fortification strategies utilise commonly consumed foods in order to deliver one or more micronutrients. The most widespread effort to date has been the fortification of salt with iodine. However, many other foods may be used as vehicles for a variety of micronutrients. Some of the common combinations are wheat products such as cereal or bread, with one or more nutrients including calcium, iron, niacin, riboflavin, thiamine and zinc, while milk can be fortified with vitamin D (Kennedy et al. 2005:2).

Selecting a food vehicle for fortification involves identifying a food that:

- Is consumed by a sizable portion of the population, including members of lower income groups and others who are likely to be at jeopardy of micronutrient malnutrition.
- Can be circulated widely to reach key groups throughout the country.
- Is consumed in fairly regular amounts.
- Is reasonably priced.
- Can be processed in units large enough to allow controlled fortification.
- Retains suitable levels of the nutrient after additional processing or cooking.



- Is not eaten in amounts that would present a risk of consuming toxic levels of fortification (FAO 1997b: 4; Darnton-Hill & Nalubola 2002:232).

Staples such as rice, wheat, and corn (maize) flour are some of the commonly consumed foods that can be fortified. Other food vehicles fortified with vitamin A include fats and oils, tea and cereals. (Darnton-Hill, Nalubola 2002:235). However, these foods are often eaten where they are grown and processed at community level. This limits the control and safety of fortification. Fortification of a number of foods may be considered when there is no single universally consumed vehicle in a country. Fortified foods may not reach all segments of the population who need micronutrient supplements. When access to commercially or centrally processed foods is limited due to low economic status, public health and welfare approaches to deliver fortified foods to the selected population are the only options (Reddy 2003:1).

#### **2.2.1.1 Trials conducted in South Africa using the school feeding system as a vehicle for micronutrient fortification**

The Department of Health (DOH) published regulations that require all South African millers to abide by the law of fortifying the micronutrients in white and brown bread, flour and maize meal with specified amounts of iron, zinc and six vitamins. The fortification of such staple foods will contribute to alleviating poverty and also ensure that people who cannot afford the ingredients of a balanced meal can at least prevent the negative effects of malnutrition (DOH 2001:1).

The fortification of school supplies is the most efficient and successful route to take when reducing micronutrient deficiencies in school children where SFP are in operation. Soup fortified with iron and vitamin C was offered in South Africa to 350 schools in an area of low socio-economic development in the Cape Peninsula (Western Cape). Results showed that originally 12% of six to seven year old and 20% of eight to twelve year old children had low weight-for-age, while 49% and 31% of the children had low serum ferritin (a measure of iron deficiency) respectively. At a follow-up session, after 15 weeks of

intervention, the iron status improved considerably, having fallen from 49% to 28% in six to seven year old children and 31% to 21% in eight to twelve year old children (Del Rosso 1999:7).

Efforts completed in South Africa include a fortified biscuit used to address the micronutrient deficiencies present in children. The biscuit was fortified with iron and iodine and was given collectively with a cold drink fortified with 100 mg ascorbic acid in order to improved iron absorption. The children received the biscuit on a daily basis during the school week, while no intervention took place on weekends or during school holidays. Having been assessed over a period of 12 months, the intervention resulted in substantial improvement in the vitamin A, iron and iodine status. Vitamin A deficiency decreased from 40% to 12%, while anaemia was reduced from 27% to 13%. A year after introducing the biscuit, lower absenteeism and improved performance were also clearly demonstrated (Stein 2001:1).

### **2.2.2. Supplementation**

According to the American Dietetic Association (ADA), a dietary supplement refers to a product planned to complement the diet. Such a product should contain dietary components, e.g. vitamin or mineral; a dietary substance for utilization by man to supplement the diet by increasing the total dietary intake; a product that is anticipated for ingestion in tablet, capsule or liquid form and a product that is not presented for consumption as a conventional food or as a sole item of a meal or the diet (ADA 2002:2). Micronutrient supplementation involves the allocation of pharmaceutical vitamin A, iron or iodine supplements. This is an efficient but relatively costly strategy (Bangladeshi Jute 2004:3).

Supplementation has some latent advantages over fortification. Pregnant women and infants are expected to benefit from supplementation. Recent experience with vitamin A supplementation has proved to be successful. Supplementation can offer a quick enhancement of the nutritional situation of selected groups, but has the drawback that the

recipients are required to take the supplement regularly. Supplementation is an excellent option when the occurrence of a micronutrient deficiency in a population is high, and especially if the needs for a nutrient are hard to attain through a normal diet (Shrimpton & Schultink 2002:224). A disadvantage of supplementation is that it may not reach non pregnant women, female adolescents and young children, as they are usually not part of supplementation programmes (Darnton-Hill & Nalubola 2002:236).

Supplementation can be a successful intervention for the improvement of iron and vitamin A status in deficient populations. Depending on the level of the problem, a supplementation programme may be suitable especially where food-based and fortification programmes cannot be carried out in the short term (Hongo 2003:4). However, large supplementation requires enough support and delivery programmes, which are often costly. A supplementation programme may be possible for a restricted period, but for sustainability, it should be included in a valuable community health care system (FAO 1997b:2).

### **2.2.3 Food diversification**

#### **2.2.3.1 School gardens**

School gardens offer an excellent instrument for teaching nutrition education. There are numerous ways through which teachers can present nutrition education, but gardening provides an enjoyable, interactive way to teach and acquire these habits. School gardens can be an influential tool for improving the quality of nutrition and education of children and their families in rural and urban areas. The Food and Agriculture & Natural Resources Policy Network (FANRPAN) indicated that one of the main benefits of school gardens is that children gain knowledge of how to grow healthful foods and how to utilize them for better nutrition. Other important benefits of using gardens to teach nutrition education include the following:

- Gardens provide an opportunity for applied learning and practice using the scientific method.
- Children are eager to consume fruits and vegetables cultivated by them.
- Students will acquire a greater satisfaction about how their food is grown.

- Gardens can be used to teach food safety through appropriate harvesting, processing and storage.
- Children may have the opportunity to practice organizing nutritious foods and try new foods to improve their diets.
- Gardening is a talent that children can use during their entire lives, while it also encourages better health and wellness.
- Nutrition education through school gardens enhances children's knowledge about fruits and vegetables, which may improve their outlook towards such foods and lead to better eating habits.
- Gardens can teach children how to acquire fruits and vegetables, while giving them a greater appreciation for food processes by observing growth, maintaining plants and participating in the harvest (Lineberger 2005:1; FANRPAN 2005:1).

Diets in developing countries are usually lacking in many nutrients, including energy, so strategies need to accentuate an increase in food intake in addition to greater variety. An intervention strategy is needed that is sustainable without external support and is capable of simultaneously combating multiple micronutrient deficiencies. This strategy should receive support from a nutrition education programme (Tontirisin, Nantel & Bhattacharjee 2002:245).

Figure 2.1 indicates factors that influence nutritional well-being, relate to a country's political, economic and social environment, its institutional capacity and delivery and empowerment capacity. This range of factors may be grouped into three categories: basic factors, underlying factors and outcomes (FAO 2004b:9).

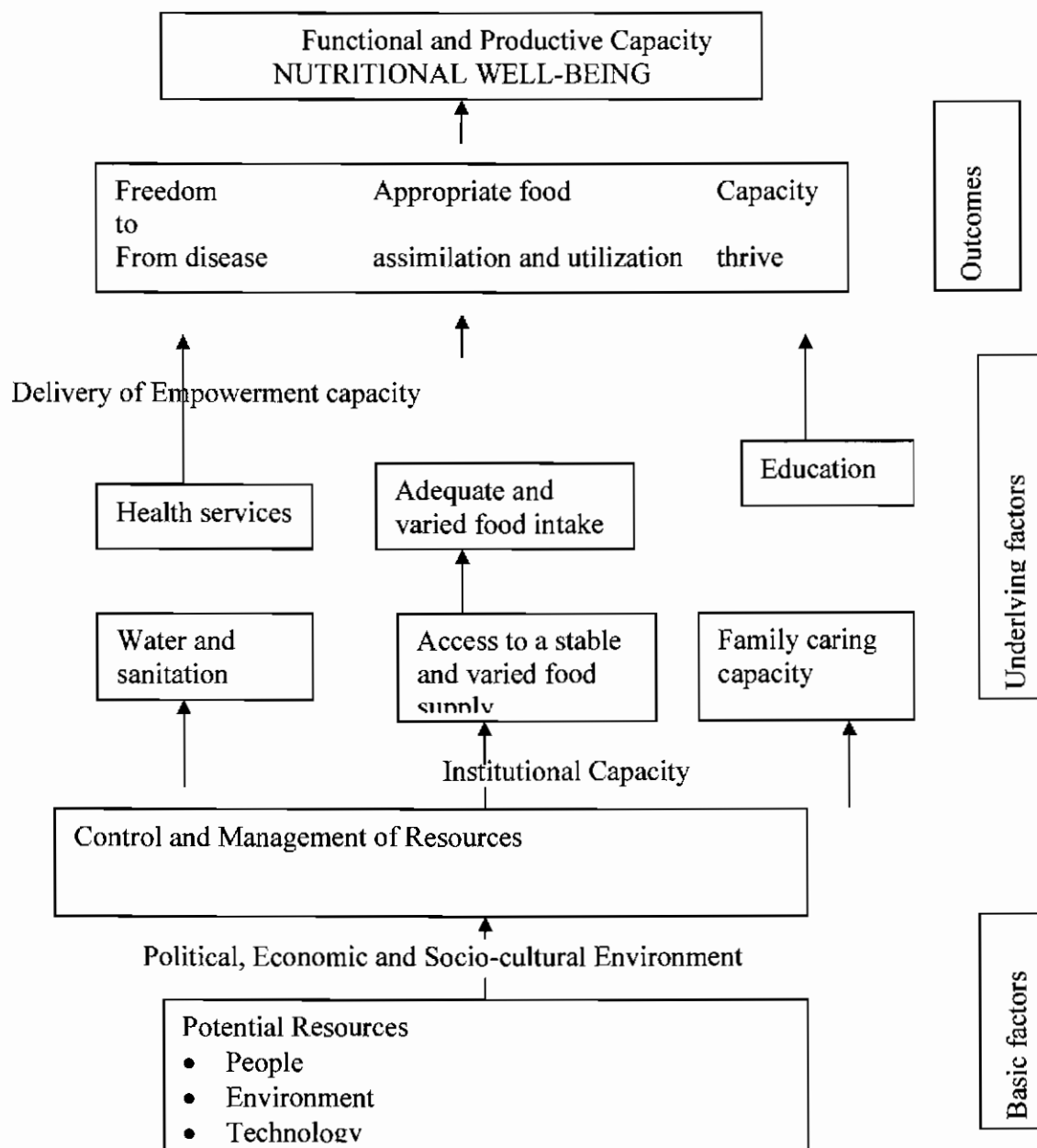


Figure 2.1: Conceptual framework for nutrition improvement (FAO 2004b).

### 2.3 Nutrition education

Nutrition education involves a combination of activities, together with the provision of information, increasing knowledge of why specific foods and behaviours are beneficial, influencing attitudes and beliefs, helping to expand personal skills and motivating for the adoption of healthful eating practices. In its broadest sense nutrition education also

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involves influencing public policy and promoting access to a selection of nourishing foods that are rich in macro and micronutrients. Nutrition education provides knowledge, inspiration and reinforcement to allow people to address efficiently their own long-term food and nutrition problems (FAO 2004b:1; Stuart & Achterberg 1997:1).

The objective of nutrition education is to reinforce precise nutrition-related practices or behaviours in order to encourage participants to eat a healthful diet. This is done by creating a motivation for transformation among people so as to set up desirable food and nutrition behaviour for the support and protection of good health. The main purpose of nutrition education should be to help people to implement healthful eating behaviour that will be beneficial while reducing the risk of disease. Nutrition education provides accurate information on the dietary value of foods, food quality and safety, ways of conserving, dispensing and handling and preparing food to assist with making the best choices for a healthful and balanced diet (FAO 1997a:2; CDC 1996:10).

### **2.3.1 Importance of nutrition education in health promotion**

Research done by the Minnesota Department of Children, Families and Learning (DCFL) indicates that nutrition education has been shown to have a significant effect in fostering healthful eating habits. Nutrition education and high-quality meals have been shown to improve eating habits and health status. Nutrition education is a vital component of most major health promotion and disease prevention programmes. Constant healthful eating habits assist in avoiding health problems later in life, including the three most important causes of death, i.e. heart disease, cancer and stroke. Knowledge gained from school-based nutrition interventions over the past 20 years provides further validation for implementation of comprehensive school-based nutrition programmes and services. Current research results provide verification of school-based nutrition programmes and services that will both improve health and contribute to the educational achievement of young people both now and in the future (ADA 2003:506; DCFL 2003:1; WHO 2003a:5).

### **2.3.2 Opportunities and challenges for nutrition education**

Nutrition education should be an essential component of each country's efforts to improve the nourishment of its people. Some of the challenges facing nutrition education include the following:

- Nutrition problems rooted in deficient, unbalanced or surplus food utilization has solid costs, which result not only in poor health and augmented risk of early death, but also in reduced productivity and increased national health care costs. It is intolerable that such distress and loss of human potential arise from all forms of malnutrition.
- Due to high rate of urban growth found in most countries, more people will live in towns and cities than in rural areas. While urban residents depend upon food supplied by others, it is critical that the former have the ability to select healthful diets and practise suitable lifestyles.
- Economic development and urbanisation alter dietary habits and lifestyle patterns, which can result in over-consumption when food sufficiency is attained. Some segments of the population have a larger disposable income that permits a greater food choice. As more children are eating away from home or can look after themselves, they make more of their own food selection.
- Under-nutrition affects great numbers of people. The improvement of household food security is well known as being the primary component of strategies to reduce widespread under-nutrition (FAO 2000:4).

### **2.4 Economic benefits of investing in nutrition**

Adequate nutrition is essential if children are to become productive adults, who are skilled in accomplishing their goals in life. Those who are well nourished and knowledgeable are more productive and can improve their own returns as well as contributing to the national economy. For example, the enhancement of the health and welfare of women and their families through better nutrition helps to reduce their financial burden and time limitations. Extra time and resources can be used for income

generation and productive activities or for participation in educational, health or social functions through which women and their families can derive benefit (WHO 2003a:6). A healthy workforce is necessary for sustainable development. The nutritional well-being of a population is an indication of the performance of its social and economic sectors and can demonstrate the competence of national resource allocation (FAO 2004b:1).

Figure 2.2 indicates that investing in good nutrition can result in good nutrition can result in better social and economic results provided that it is based firmly on effective community participation.

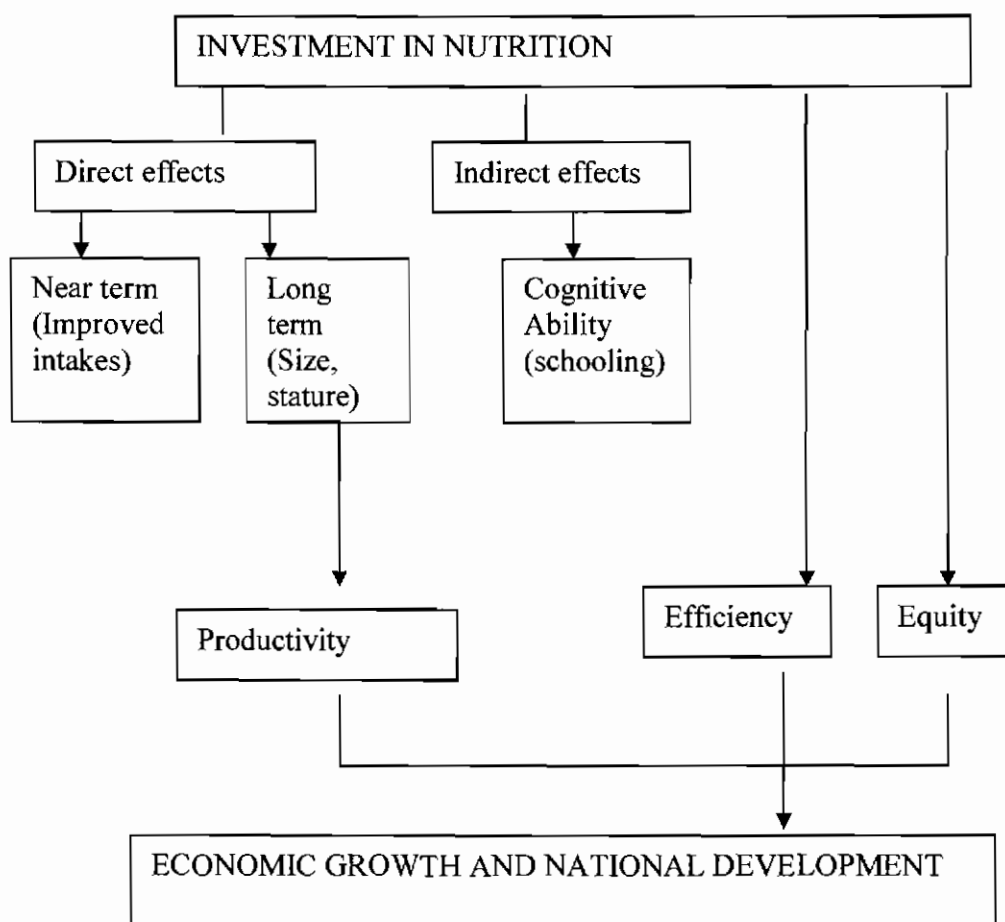


Figure 2.2: The benefits of improved nutrition for economic growth (FAO 2004b)



## **2.5 Nutrition education in schools**

UNESCO has indicated the significance of school-based nutrition education. School children are recognised as being a priority group. Focused effort to increase nutrition education through schools is very important as it reinforces the learning potential and well-being of children. Good nutrition is essential for children to perform well in school because it influences both academic development and learning capability. Cost effective nutrition interventions in schools can avert or greatly reduce health problems and consequences of malnutrition (UNESCO 2002b:4; WHO 2003a:4).

Nutrition education in schools should also be seen as an important entry point for building the ability of both the school and community to take action related to important food, nutrition and health needs. (FAO 2000:10).

According to the Prevention Institute (PI), children will not routinely choose healthy foods. Their inborn liking for sweetened fare makes them particularly exposed to the highly sugared cereals, flavoured drinks, and desserts that are made known virtually from birth. In order to develop lifelong healthy eating patterns, children need to be introduced to a range of nutritious foods in a positive manner (PI 2000:1). The accessibility of high-fat foods in the children's environment, the positive social setting linked with some non-nutritious foods and the children's tendency to like such foods are contribute to the augmented occurrence of childhood obesity (ADA 2003:506).

Available verification of the effectiveness of nutrition education programmes in schools illustrates that nutrition knowledge is most successful if there is an encouraging environment and if nutrition education is correlated with practical food and nutrition-related activities. Lunch, gardening and health programmes in schools offer a good opportunity for practical lessons in nutrition. Engaging the parents is an efficient way to build a supportive environment for nutrition education in a school. The Massachusetts Department of Education (MDOE) has indicated that for a complete approach to school-based nutrition programmes and services, it is fundamental that all members of the community be of assistance to create an environment that supports healthful eating

practices. Administrators, teachers, school food service personnel and students are all required to be involved (MDOE 2005:4). A school gardening programme offers excellent opportunity for community participation where water availability does not pose a limitation and agricultural extension can support the programme by providing the required contributions and guidance. This kind of programme assists in promoting a nutritional environment, which involves everyone from the education authorities to the village community. The intention of such programmes is not only to send out knowledge to children, but also to increase the value of school and village life (FAO 1997a:23).

Schools are particularly important settings for nutrition education for the following reasons:

- Schools reach a larger number of children and adolescents on a daily basis, and for a number of years.
- Schools provide a chance to practice healthful eating and food safety.
- Schools have the permission and accountability to guide young people to adulthood. Having the ability to decide on a healthful diet and practicing sound lifestyles are amongst the most vital life skills and a major element of maturity.
- Schools can teach students to oppose harmful social pressures since eating is a socially learned conduct that is influenced by communal pressures.
- As future parents, school children will assume responsibility in the development of their own offspring.
- As members of the family unit, school children offer important connections between school and parents and the entire community.
- There is access to trained personnel to provide follow-up guidance after suitable training of students and other service personnel.
- Good nutrition improves education, as it is one of the most important assets in the community's resistance to poverty.
- Assessments illustrate that school-based nutrition education can improve the eating behaviour of young persons (WHO 2003a:8; CDC 1996:3).

School-based nutrition programmes function in various community environments influenced by improved public responsiveness of nutrition, concern for the health and education of children, and aspirations to become involved in the schools' decision-making process. Local school policy, developed through a combined process that acts in response to community needs and priorities, should include the incorporation of the school nutrition program with education. Although the central school nutrition programs contribute significantly to the health and education of children, their complete advantage can be derived only through supportive local policy (ADA 2002:1). Involving parents in a school nutrition programme is another way of ensuring that parents are more aware and more involved in what is going on in the school and children are more likely to adopt healthful eating behaviours if they receive constant messages through multiple channels (Del Rosso 1999:6).

### **2.5.1 Key features of effective nutrition education programmes in schools**

The effectiveness of school-based nutrition programmes and services can be improved by outreach efforts in the neighbouring community (MDOE 2005:5). The basis of the efficacy of school-based nutrition education programmes is the acknowledgement that children learn better in an accommodating environment, which represents and emphasizes the principles taught. As a result, school-based nutrition education should be more than just learning about food and nutrients. Rather, nutrition education programmes should also address the in-depth socio-cultural, economic and environmental matters applicable to food security and nutrition both in the home and community (FAO 2000:10).

School-based nutrition education should also include the following:

- Encouragement and promotional activities that highlight nutrition as one of the key factors for physical and mental development, both for the current well-being of school children and for their future as adults.
- Providing children with essential information about food and nutrition, including food and nutrition topics in the school curriculum.

- Providing a wide variety of practical, community-based learning opportunities intended at creating positive attitudes, skills and behaviours. Such an approach could consist of school gardens, post-harvest food handling in rural schools, visits to food shops and markets in urban schools, learning about hygienic food preparation at home and at school and how to protect land and water resources.
- Involving nutrition and education officials, teachers, students, parents and community leaders in the process of school nutrition education.
- Implementing policies, practices and measures that encourage children to attain life skills and self-esteem.
- Working to provide a healthy school environment with, for example, good catering (FAO 2000:10).

### **2.5.2 Healthy school nutrition environment**

The United States Department of Agriculture (USDA) has stated that a healthful school nutrition environment provides students consistent, reliable health information and an opportunity to apply it. In a healthful environment, the classroom, the school dining room and other centres of activity supply clear and consistent messages that explain and support wholesome habits of eating and physical activity. Students learn to make healthful lifestyle choices not only in the classroom and the school dining room, but also at class parties and sporting events. The Georgia Department of Education (GADOE) indicated that schools can produce an environment that encourages learning, while teaching good eating and physical activity patterns for long-term health. This environment provides an occasion to practice these healthy eating habits (USDA 2005:1; GADOE 1997:1).

The school environment plays a major role in determining whether interventions to promote health and good nutrition will be valuable and sustainable. A health promoting school provides a secure and sound environment that presents a sensible and attractive range of health choices to encourage a healthy lifestyle. It also helps students to develop their physical, psychological and social potential (WHO 2003a:26). Schools are suitable settings in which to base physical activity and nutrition interventions for young people.

Opportunities in schools for involvement in bodily activity include physical education classes, extracurricular sports and related activity programmes (Wechsler, Devereaux, Davis, & Collins 2000:121). A beneficial school nutrition environment is very imperative because nutrition is related to physical well-being, growth and development. The challenges of a healthful school environment include taking a leading role altering in the total school nutrition environment by improving nutritional value of the meals served. These provide students with more nutritious health foods and beverage choices, and providing opportunities for nutrition education and physical activity (USDA 2005:3).

#### **2.5.2.1 The physical environment**

This includes the school building, classrooms, eating facilities, water and food provided there, in addition to the surroundings. The latter can have an influence on the strengthening of or opposition to health education and nutrition interventions in the school. Nutrition-related features such as sanitation, healthful food choices, outside vendors and pleasant eating environment can be integrated into a health promoting school (UNESCO 2001:3; WHO 2003a:27).

#### **2.5.2.2 The psychological environment**

The psychological environment relates to social and mental environment, which affects education and health. This integrates the cultural customs and expectations concerning food and eating patterns. The following aspects of a wholesome psychological environment should be integrated into a health promoting school programme:

- **Support:** the psychological environment should maintain health conducive perceptions and actions of all who work and learn in the school.
- **Teacher role models:** can encourage students to follow a vigorous approach of life by demonstrating healthful eating.
- **Peer reinforcement:** students can provide positive reinforcement to their peers by advising and reminding each other of healthy eating habits (WHO 2003a:27; UNESCO 2001:5).

## **2.6 Promoting healthy eating through a comprehensive school health programme**

School policies that support student's healthful dietary behaviours must be developed and compulsory. Food and beverages sold or served on school grounds or at school-sponsored events must meet nutritional standards and guidelines (ADA 2003:513). In the school environment, classroom lessons single-handedly might not be adequate to effect lasting adjustments in students' eating behaviours. Students also need exposure to nourishing food and the encouragement of persons around them. The influence of school goes further than the classroom and includes messages from peers and adults concerning foods and eating patterns. Students are more likely to obtain a strong constant message when healthy eating is encouraged through a comprehensive school health programme. Such a programme equips students not only with knowledge, attitudes and skills needed to make positive health decisions, but also the environment, motivation, services and support needed to develop and maintain healthy behaviours (CDC 1996:4).

The National Association of State Boards of Education (NASBE) has indicated that school leaders should organize, adopt and put into operation a comprehensive plan to encourage healthful eating that includes the following:

- A food service program that employs well-prepared staff that capably serves attractive choices of nutritious foods fare.
- Pleasant areas for students and staff with enough time for leisurely eating.
- A sequential programme of nutrition instruction that is incorporated within the comprehensive school health education curriculum. The formers should be coordinated with the food service programme that is taught by well prepared and well-supported staff and that is aimed at influencing students' knowledge, attitudes and eating habits.
- A proper school environment that encourages students to make wholesome food choices.
- An encouraging opportunity for staff to demonstrate healthy eating habits.
- Services to make sure that students and staff with nutrition-related health problems are referred to proper services for counselling and/or medical treatment.

- Strategies to engage family members in programme development and implementation (NASBE 2005:1).

### **2.6.1 Components of a comprehensive school health programme**

Nutrition services are important mechanisms of a comprehensive school health programme for healthy children. A comprehensive school health programme merges health education, health promotion, disease prevention and access to health services at a school ground in an incorporated, organized way. The National Conference of State Legislatures (NCSL) has indicated that nutrition services are one of the mechanisms of a coordinated comprehensive school health programme. Other components include the school environment, health education curriculum, physical education curriculum; health services programme, family and community involvement activities and a staff health promotion programme. All of these components are co-dependent for a comprehensive health program and environment in schools. Nutrition services should be allied with physical education and health education in schools and are strong components of health services such as counselling, psychological, and social services programs. Families can support and strengthen nutrition education by providing nutritious, attractive meals in an environment that encourages a pleasant, social family time and reinforcing classroom nutrition instruction at home. Schools can build a suitable environment and encourage health among both students and staff. Community environments and services can support and emphasize the healthy school environment with services and promotions (ADA 2003:507; NCSL 2001:2).

### **2.7 Recommendations for school health programmes promoting healthy eating**

School schemes should consider the nutritional needs and concerns particular to their communities, and they need to work with key school and community-based components, including students, in order to develop a largely successful and relevant nutrition education plans for their communities and develop a:

- Policy: implement a co-ordinated school nutrition policy that promotes healthful eating through classroom lessons and a supportive school environment.

- Curriculum for nutrition education: put into action nutrition education from preschool until secondary school as part of sequential, comprehensive school health education curriculum planned to help students take on healthy eating behaviours.
- Instruction for students: supply nutrition education through developmentally suitable, culturally applicable, fun, participatory activities that involve social learning strategies.
- Integration of school food service and nutrition education: organize school food service with nutrition education and with other components of the comprehensive school health programme to emphasize messages on healthful eating.
- Training of school staff: supply staff involved in nutrition education with sufficient pre-service and continuous in-service training that focuses on teaching strategies for behavioural improvement.
- Family and community involvement: engage family members and the community in supporting and reinforcing nutrition education.
- Programme evaluation: regularly assess the efficacy of the school health programme in promoting nutritious eating, while suitably modifying the programme so as to increase its effectiveness (CDC 1996:6; Wechsler et al. 2000:122).

## **2.8 Planning a nutrition education programme**

Accurate planning is vital for the accomplishment of a nutrition education programme. Nutrition education is successful only when it is based on sufficient analysis of the nutritional problems with clear and brief description of the objectives and the methods of communications as indicated in figure 2.3 (FAO 1997a:1).

The first step in planning effective interventions is facts of the problem and the population, both of which can be attained through a proper needs assessment. When designing a nutrition education intervention, it is important to build ample time for the needs assessment. A needs assessment for the population can be gathered through a literature review, an appraisal of data collected previously or baseline data collected particularly for the proposed project. Once a thorough needs assessment has been done,



the overall aims and objectives for the study should be selected (Hoelscher, Evans, Parcel & Kelder 2002:57).

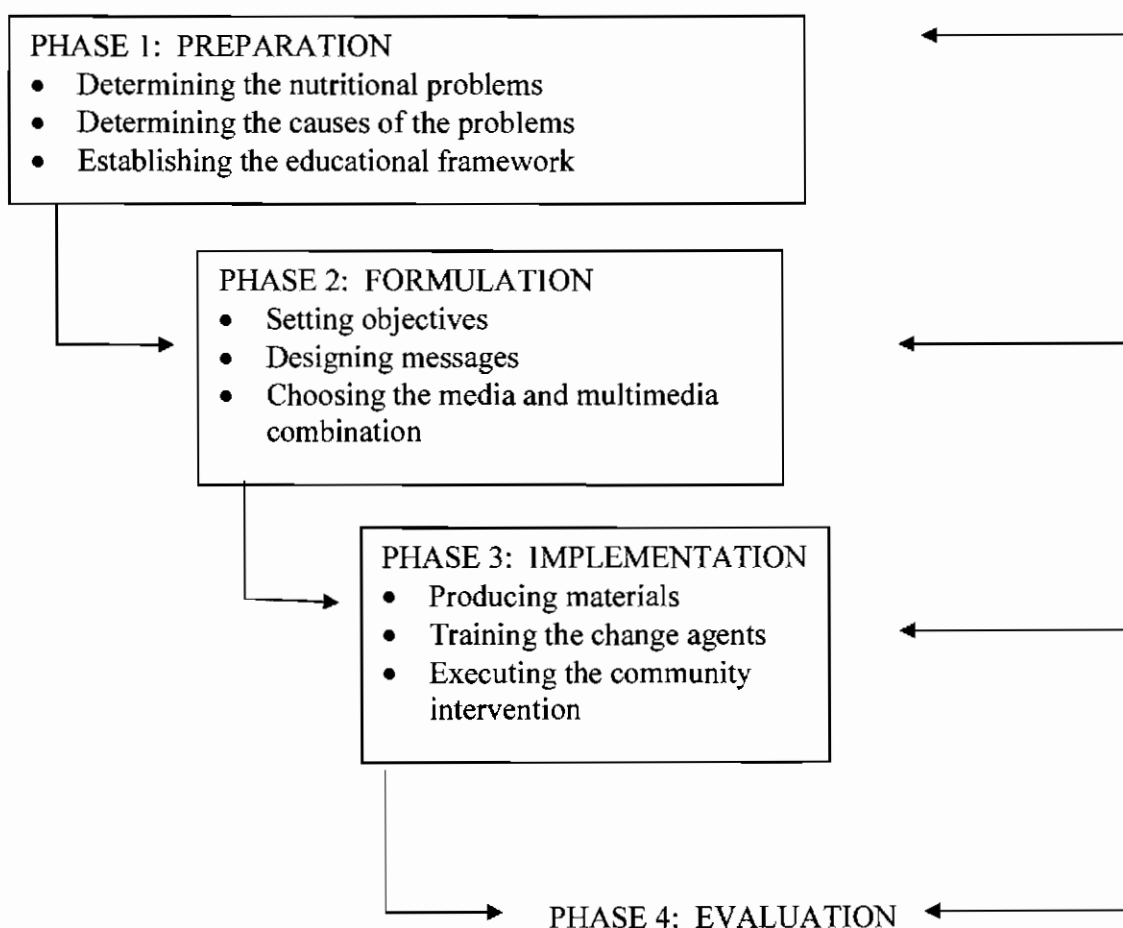


Figure 2.3: A framework for planning nutrition education programmes (FAO 1997a)

Nutritional problems generally fall into two groupings, i.e. those rooting from inadequate intake relative to nutritional needs and those rooting from too much and unbalanced intake of food. The main problems in African and other developing countries pertain to inadequate intake relative to nutritional needs. Nutrition education programmes should have at least three components, which should be aimed at the different social groups:

- Increasing the nutrition knowledge and alertness of the public and of policy makers. This can be accomplished by supplying information on the relationship between diet

and health, that between nutritional and health status and individual efficiency and national development, the nutritional requirements of the population and of individuals, benefits of food labelling and legislation and the origins and costs of nutritional disorders.

- Promoting pleasing food behaviour and nutritional practices: this can be done by supplying information on the nutritional value of foods, the components of a sufficient diet, making suitable food choices and purchases from available resources, hygienic food preparation and handling of food, its storage, processing and conservation and unbiased intra-household food distribution according to the nutritional requirements of family members.
- Increasing the dietary diversification and quantity of family food supplies: this can be accomplished by providing information on means of improving food production, crop selection and diversification and the conservation of nutrients during food preparation (FAO 1997a:1).

The nature of the food supply and people's access to it are evidently essential to nutritional well-being. Cultural practices and traditions influence the selections that people make. Nutrition education programmes need to consider the availability of food, people's access to it and the aspects influencing the choice. A traditional role of nutrition education has been to amplify the ability of the household to use existing food resources to greatest advantage. Education on the methods of producing food at household level and on storage, processing and preparation of those it has also been added into many programmes. However nutrition education also needs to accommodate social and technological improvement (Smith 1997:7).

Planning a nutrition education programmes should be based on an investigation of four major interacting components: the nutrition issues of population sub-groups and special needs groups; which in turn impact the choice of target groups; settings and sectors; and methodological approaches.

- Nutrition issues of population sub-groups: the initial point is the identification of the nutrition issues concerning them. These should be based on data gathered through

regular national monitoring surveillance of the dietary intake and nutritional status of the population. These data can support the development of dietary goals or guidelines. For nutrition education, goals are more likely to be expressed as guidelines and provide required directions for dietary changes. Guidelines can be developed particularly for population sub-groups, such as children (FAO 2000:5).

Other points to consider when addressing the nutritional needs of population sub-groups are the development of environmental, social and intrinsic indicators that affect nutritional status. The environmental indicators include structural aspects such as poverty and income level, employment and educational status. While nutrition education cannot contribute directly to changing such structural factors, facts about these factors and in specifically, how they correlate to nutritional status of the population sub-group, will affect the setting of methods of a programme. Measuring the nutrition issues of population sub-groups using both nutritional status and social health indicators should lead not only to risk declining programmes but also to programmes designed to promote and enhance the health of the population (Smith 1997:8).

- Choice of groups: addressing the nutritional matters of population sub-groups will lead to the identification of appropriate populations. Primary target groups can be determined by applying the life cycle approach: pre-birth and birth, maternal or infant stage, childhood, adolescence, adulthood family or elderly. Identified by special needs, primary target groups can be ethnic communities, newly arrived migrants, urban dwellers, and unemployed and low socio-economic groups or disadvantaged women. Secondary target groups are those who will help to reach the primary target groups. The former can include health workers, teachers and volunteers. Tertiary target groups have the ability to facilitate or support nutrition education activities. They may include decision makers at all levels.
- Settings and sectors: the use of a broader range of settings and organizations supplies positive links to take place across disciplines and encourages a much wider community participation in nutrition issues. It also enables specific focussing on the

population, including the development of methods suitable for a group's measurable and apparent needs.

- Methodological approaches: selection of educational methods should be based on what is suitable for the target groups and the setting. A scrutiny of the determinants of the nutrition behaviour of the particular group, while the usual starting point includes factors that would probably to influence behaviour (FAO 2000:11).

## **2.9 Implementation of nutrition education programmes**

Implementation is normally a slow, complex process. Results of the intervention depend on the level of implementation and reliability of the intended plan (Rodrigo & Aranceta 2001:4). Nutrition administrators have to consider focusing their attention on how to effectively apply appropriate techniques in their contexts. Moreover, the administrators should be reasonable with their inputs and the consequences of the process. The conceptual process entails three major components, i.e. decisions, development and dissemination, which are considered critical for programme effectiveness. The decision-development-dissemination approach is described as a holistic and systematic framework for implementing an action-orientated programme that emphasizes on the decision process essential to lead the work in the right direction, the skilfulness of programme development and the meaning of the dissemination process in order to maximise nutritional change, as well as increase the programme's sustainability (Smitasiri 1997:1).

Policy and decision makers need to make decisions whether nutrition education is a good strategy to improve the nutrition condition of the target population. Once the acceptable decisions have been made so as to put the programmes into practice, their development to the suitable level of commitment and support is required. Through the process of satisfactory evaluation and good analysis, nutrition education programme administrators should be able to develop a sound strategic plan. If well developed, this plan can be a major contribution to the success of the programme. The dissemination process is important for promoting and securing sustainable improvement. One important point of this system is management or control. Efficient management or control relies on good supervision or assessment process (Smitasiri 1997:5).

## **2.10 Evaluation of nutrition education programmes**

Such evaluation includes the compilation, scrutiny and explanation of qualitative and quantitative data to form a judgement or decision on the success of the programme (Oshaug 1997:2). The primary purpose of most evaluations is to supply information about the level to which the programme has been implemented and to establish if the programme has the planned effect. Evaluation offers information about the effect of the programme thus providing a response to those who invest in planning and to establish which parts of the programme may or may not be effective (WHO 2003a:28).

Studies normally show that nutrition education interventions produce sizable, steady and optimistic knowledge gains on the part of program participants. Specifying the results is a key problem in assessing nutrition education programmes. For example, to measure the efficacy of a nutrition education intervention, the evaluator should decide whether or not to look for changes in a target population's way of thinking, knowledge, behaviour and/or health status. It may be difficult for an evaluator to be certain that a detectable adjustment of one's knowledge concerning the relationship between diet and health will result in a suitable adjustment in behaviour (Weimer 1996:4).

Two relevant assessment methods used to assess school nutrition programmes are process evaluation and outcome evaluation. Process evaluation is a tool for supervising progress; it measures how well an intervention has been put into practice. This type of evaluation should be continuous to determine what intervention has in fact been delivered, to whom and whether the objectives were achieved on time. This will assess progress towards the programme's objectives. Evaluation of the planning, development and implementation processes of the programme will supply information on which mid-course modification can be made and documented for others who wish to gain knowledge concerning the process. Methods for process evaluation involve documents kept by the school and consultations with teachers and school administrators (WHO 2003a:29; Oshaug 1997:2).

Outcome or impact evaluation measures are used to assess the effects of the nutrition education programme objectives. In the case of nutrition, these measures usually include

some form of evaluation of dietary intake, food frequency questionnaires, 24 hour recalls and observational methods. Other forms of outcome measures consist of questionnaires to measure nutrition knowledge, self-efficacy, outcome expectations or other psychosocial or cognitive factors. When choosing evaluation instruments, it is important to co-ordinate the questions with the study or programme objectives and to apply tools or methods with established soundness and reliability (Hoelscher et al. 2002:60; WHO 2003a:29; Rodrigo & Aranceta 2001:8).

Outcomes of nutrition education programme differ to the extent to which they are close to the intervention itself, and in turn, have both measurement and policy implications. For example, acquiring curriculum-specific nutrition knowledge in a classroom is a result that occurs and can be measured reasonably soon after the intervention. Outcomes that occur immediately after an intervention are likely to have low policy relevance yet are more likely to illustrate a larger effect resulting from an intervention, while they contribute to the argument that the relationship is contributory (Weimer 1996:4).

Some studies can be successfully evaluated. A nutrition education programme was conducted wherein eight to ten year-old Irish Primary school children participated. The purpose of evaluating this programme was to measure the influence and sustainability of a pilot dietary educational programme intended to build an awareness of the benefits of healthy eating, while bringing about positive behaviour change and boosting the children's knowledge. Results showing major differences were found in the children's behaviour after the programme. Initial knowledge levels were high and some respondents improved. After the education programme, the intake of fruit and vegetables increased, while the children consumed less salty snacks (Friel, Kelleher, Campbell & Nolan 1999:1).

## **2.11 Food based dietary guidelines**

Food-based dietary guidelines (FBDGs) are one of the strategies used by many countries to fight diet-related public health problems. The continuous problems of diet-related diseases have motivated many countries to develop food-based dietary guidelines. FAO encourages the development of FBDGs and developed instruction materials for nutrition educators and trainers. The motive for developing and using FBDG are many, and often include the following:

- Foods form up diets and are more than just a compilation of nutrients.
- Nutrients interrelate differently when presented as foods.
- Methods of processing, preparation and cooking influence the nutritional value of foods.
- There is already good substantiation from studies that some dietary patterns are linked with reduced risk of specific diseases. Diets rich in fruits and vegetables are associated with a range of positive result such as reduced incidence of lung cancer (FAO 1996:1).

### **2.11.1 Characteristics of food based dietary guidelines**

In order to improve eating behaviour effectively, a number of specific characteristics for FBDGs have been based on the FAO/WHO recommendations. These include the following:

- Each guideline should have only one easy, logical simple message. Guidelines should be created or illustrated in such a manner that people from diverse cultures and literacy backgrounds will grasp their meaning.
- Guidelines should be easy to use and not confusing.
- Guidelines should be prepared in a positive way. Messages should not use words or phrases such as avoid, decrease, limit or eat less. The FBDG should not associate guilt or negative connection with foods.
- Guidelines should be well suited to different cultures and eating patterns of the target population.

- Guidelines should be based on reasonably priced foods, which are available broadly consumed.
- Guidelines should be sustainable.
- Guidelines should reinforce agriculture appropriate to the environment.
- Guidelines should lead to assortment of foods that are usually consumed together, in groupings that are well matched with existing dietary practices.
- Guidelines should address both over- and under-nutrition. They should assist people to select the most suitable diet they can afford, encourage undernourished people to choose a more adequate diet and over nourished people to choose one that is more sensible.
- Guidelines should emphasis the enjoyment of eating.
- Guidelines should be devised and communicated to the target population using marketing ability based on the knowledge, perceptions, attitudes and behaviours (Vorster, Love & Browne 2001:4).

#### **2.11.2 South African food based dietary guidelines**

The enormous global load of diet-related diseases and a growing perception that nutrient-based dietary guidelines are not efficient in promoting appropriate diets and healthful lifestyles have encouraged a number of nations and regions to develop FBDGs. The guidelines can be used, as a reliable communication instrument representing expert agreement on how diet-related public health problems should be addressed by dietary recommendations to consumers. The guidelines can also be used as a basis for planning, implementation and assessment of public health nutrition strategies (Gibney & Vorster 2001:2).

The South African Working Group (WG) developed one set of guidelines to help form the best possible nutrition for all South Africans five years or older and who lack special dietary needs. These guidelines were based on existing eating patterns and are appropriate with the various South African dietary customs. The guidelines exhibit the striving towards equity in diet and health, while trying to improve nutritional status in both poor and more secure communities. The South African guidelines have already



been tested for understanding, suitability and applicability in consumer groups of different communities. The working group based the development of the guidelines on existing eating patterns and diet-related health issues (Gibney & Vorster 2001:2).

#### **2.11.2.1 The development of food based dietary guidelines for South Africa**

The guidelines are based on the existing consumption of locally accessible food while the intention is to address recognized nutrition-related public health problems. The South African Food Based Dietary Guidelines (SA FBDGs) have been recommended for use in the Integrated Nutrition Programme as they could be used as the basis of nutrition education there. The SA FBDGs consist of ten short, patent and straightforward messages. The guidelines are as follows:

- Enjoy a variety of foods.
- Be active.
- Make starchy foods the basis of most meals.
- Eat plenty of fruit and vegetables.
- Eat dry beans, peas, lentils and soya often.
- Meat, fish, chicken, milk and eggs can be eaten every day.
- Eat fats sparingly.
- Use salt sparingly.
- Drink lots of clean safe water.
- If you drink alcohol, drink sensibly (Vorster, Love & Browne 2001:3).

#### **2.11.2.2 The process of developing food based dietary guidelines for South Africa**

During the initial meeting of a group of volunteers in Durban in May 1997, the terms of reference, permission, objectives and composition of a representative WG were defined. The WG agreed that their mandate was to develop the basic set of FBDGs to promote health for South Africans older than 5 years of age. The key objectives were:

- To create an agreement within the group concerning the function of nutrients and dietary patterns in the public health profiles of South Africans.

- To investigate consumer understanding, suitability and applicability of the guidelines.
- To write scientific support papers for each guideline, motivating its history formulation and aspirations.
- To write a descriptive text on the FBDGs for the layperson for use by the consumers and health personnel in nutrition interventions.
- To recommend how the guidelines should be integrated into health and agricultural policies.
- To make recommendations on the execution and promotion of the guidelines, the development of suitable education materials and monitoring effect on eating patterns.
- To adapt the guidelines for groups with individual dietary needs.
- To contribute to a manner in which the guidelines were reviewed over a period of five years (Vorster et al. 2001:4).

In 1997, the second meeting was in the form of a workshop to which an improved, more representative WG had contributed. Representatives intensively discussed the solicited reviews on the South African nutritional situation. An agreement was reached on the following realities and assumptions:

- Malnutrition, including under and over nutrition is linked to preventable morbidity and mortality.
- Malnutrition in South Africa contributes to the diverse patterns of morbidity and mortality of various population groups and communities.
- Many South Africans are experiencing rapid urbanisation and acculturation, characterised by nutrition alteration that often results in both over and under nutrition, while a double load of nutrition-related diseases is common in many households and communities.
- Different types of ethnic food choices, including the mixture of certain foods based on traditional African and Western food intakes, are well suited with good nutrition and health.
- Except for infected or contaminated food, there is no bad food, only bad diets.
- Many factors influence food choices and nutritional intake thus being among the controllable daily life factors, which influence health. Therefore, regular food

choices should be assessed in the context of total lifestyle and living circumstances. Socio-economic circumstances in South Africa have the key influence on food choices and dietary patterns.

- Although South Africa produces sufficient food for all its residents, while even exporting provisions, many poor households are food insecure, particularly in rural areas and in informal housing areas occupied by people in development.
- Largely because of an increase in street vendors, food safety may become a growing problem in the future (Vorster et al. 2001:4).

Based on the above discussions, a document was compiled so as to indicate the applicable nutritional issues that could lead to a guideline variety, meals, body weight, exercise and energy, carbohydrates, fibre, vitamins and minerals, proteins, fats and sodium, water and alcohol, smoking and stress. Additional nutritional recommendations were specified and a preliminary FBDG with motivation was formulated. The scientific background in the South African context was outlined for each guideline. Based on these discussions, a modified set of guidelines was compiled during a follow up workshop in August 1998. The guidelines have been developed as one set so as to optimise nutritional status for all South Africans (Vorster et al. 2001:6).

## **2.12. Formulation of each guideline**

### **2.12.1 Enjoy a variety of foods**

This guideline attempts to focus on some of the consequences resulting from a lack of dietary variety. Its purpose is to encourage people to alter their diets where necessary so as to increase the variety of foods eaten and there from deriving pleasure. The guideline needs to be understood in the context of the other FBDGs and to be used with the support of appropriate food information. Variety is considered to include various foods in different food groups as part of the diet, as well as changing the method of food preparation. There are numerous diet-related public health concerns in South Africa. Results of the 1999 National Food Consumption Survey (NFCS) in South Africa

indicated that the diets of many households, especially lower income households, have little dietary variety. The objective of this guideline is to encourage the variety of foods eaten and to enjoy their food (Maunder, Matji & Hlatshwayo-Molea 2001:7).

A lack of dietary variety is thought to worsen low micronutrient intakes, low energy intakes and chronic diseases of lifestyle. The NFCS indicated that children aged one to nine years in South Africa showed that low-income households had only a few foods in the house, that the children ate few foods and that low micronutrient intakes were prevalent. The same survey showed that the average number of foods consumed in low income households nationally was eight and varied from four in the Free State to 13 in the Western Cape, indicating a low dietary range. All listed foods such as chicken, beef, cabbage and squash, were eaten by less than a third of the sample, which is vital in relation to the low micronutrient intakes reported in the survey. There is need for an increased intake of a variety of foods e.g. fruits, vegetables, meat and legumes, which will contribute toward improving micronutrient status (Labadarios et al. 1999:64).

The NFCS showed that there were common low energy intakes in children aged one to nine years. The number of foods eaten by these children was also low. Low energy intakes in developing countries have been attributed to the lack of available foods and types of foods accessible such as the low fat content of many diets in Africa. The increase a variety of foods consumed could add to low energy intake (Labadarios et al. 1999:64).

South Africa experiences over nutrition-related chronic diseases of lifestyle such as hypertension, cardiovascular disease, non-insulin-dependent diabetes mellitus and cancer, which are widespread in all population groups. Many studies have shown that the diets high in fruits and vegetables but low in meats and fats can help protect against the development of chronic diseases of lifestyle. Several investigators have studied the relationship between dietary diversity and disease results and many have found a contrary relationship between increased dietary diversity and mortality, cancer and cardiovascular disease (Maunder et al. 2001:7).

### **2.12.2 Be active**

This guideline provides a general and extensively understood message that regular physical activity promotes good health. When considered in a South African context, where chronic disease and risk factor prevalence are comparatively high and physical activity involvement is unexpectedly low, this guideline is not only suitable, but also can have significant influence on the risks attributable risk to inactive lifestyle. There is little national data available on the prevalence of physical inactivity, particularly in communities in demographic transition. However, in two cross-sectional studies of urban black South Africans living in the Western Cape, between 30% and 40% of men and women reported no physical activity in either occupation or leisure time, and a further 40 – 60% reported minimal to moderate activity. There is now extensive evidence that regular physical activity is related with a lowered risk for chronic disease of lifestyle. The strength of this verification is that it is both consistent and strong, demonstrated to similar effect in a variety of different populations and age groups (Lambert, Bohlmann & Kolbe-Alexander 2001:12).

### **2.12.3 Make starchy foods the basis of most meals**

On a global scale, but especially in developing countries, foods high in starch or carbohydrate such as cereals, grains and some root vegetables, are the major sources of dietary energy and valuable sources of micronutrient and dietary fibre when they are eaten in minimally processed forms. These foods also provide protein. Recent research has indicated that foods rich in carbohydrates in the form of starch, resistant starch, sugars and non-starch polysaccharides or dietary fibre, influence health and prevent chronic diseases through various effects and mechanisms. The guideline recommends that in planning of meals, starchy foods should be the central to the serving of other items. The fundamental nutritional objective is to promote the increased consumption of carbohydrate-rich foods by those people who have low intakes, while sustaining optimal intakes among those currently eating high-carbohydrate diets (Vorster & Nell 2001:17).

Increased intakes of starchy foods can also replace some animal-derived and fatty foods in the diet, leading to a decreased fat and animal protein intake. This step together with

increased intake of fibre, resistant starch and linked plant substances will decrease the risk of many over nutrition related chronic diseases such as coronary heart disease (Vorster & Nell 2001:18).

#### **2.12.4 Eat plenty of fruits and vegetables everyday**

There is growing evidence to support the increased utilization of fruit and vegetables as means of protection against cancers. Verification also supports a defensive role of vegetables and fruits against cardiovascular disease, with particular attention to flavonoid intake, as well as potassium, folate and fibre. South Africans should be encouraged to eat and enjoy the large variety of vegetables and fruits available in this country. However, the majority of South Africans do not achieve the recommended daily intake of five portions of vegetables and fruits. Studies on the difficulty to eating vegetables and fruits reveal that affordability, availability, and taste preference are primary constraints. Vegetables and fruits are vital sources of many vitamins, minerals, fibre and other substances (Love & Sayed 2001:24).

Among South African children, in particular black and coloured children younger than five years, there is an overall pattern of a low occurrence of wasting and underweight, but moderate to high prevalence of stunting and multiple micronutrient (vitamin A, iron and folate) deficiencies which further limit growth. Under nutrition, in particular low vitamin A status is closely related to substandard resistance. Undernourished individuals, especially children, are more likely to develop diarrhoea, respiratory tract infections and tuberculosis, while being affected more severely and for longer periods. This can further compromise status and lead to failing prosperity (Love & Sayed 2001:28).

#### **2.12.5 Eat dry beans, peas, lentils and soya often**

This guideline intends to improve the overall health of all South Africans. The benefits of legumes have been known for a very long time. People have long grown and consumed legumes as a dietary staple. Legumes are exceptional foods due to their rich nutrient content, including starch, vegetable protein, dietary fibre and minerals. Their carbohydrate and dietary fibre contents adds to their low glycaemic indices, which

benefit diabetic individuals and lessen the risks of developing diabetic mellitus (Venter & van Eyssen 2001:33).

Dry beans and soybeans are low in sodium but are exceptional sources of minerals, including calcium, copper, iron, magnesium, phosphorus, potassium and zinc. They are also important sources of water-soluble vitamins, especially thiamine, riboflavin, niacin and folate, but poor sources of fat-soluble vitamins and vitamin C (Venter & van Eyssen 2001:33).

#### **2.12.6 Meat, fish, chicken, milk and eggs can be eaten everyday**

This guideline was formulated to indicate that meat, poultry, fish, eggs, milk and dairy products have an important in a healthy balanced diet. The strongest argument for including foods from animals in the daily diet is that they are the good sources of high-quality protein and excellent sources of important micronutrients such as iron, zinc, calcium, thiamine, riboflavin and the omega-3 fatty acids. Moreover, these micronutrients are more accessible than plant foods. When they are eaten together, animal-derived foods even increase accessibility of micronutrients in plant foods (Scholtz, Vorster jnr, Matshego & Vorster 2001:39).

In addition to its high protein content, fish is a good source of several micronutrients and particularly of calcium if the bones are eaten. Eggs are excellent sources of high quality protein and other nutrients. As they are relatively reasonably priced compared with other animal-derived foods, eggs can play a valuable role in balancing diets of undernourished South Africans (Scholtz et al. 2001:45).

#### **2.12.7 Eat fats sparingly**

Dietary fat plays a vital role in the health and functioning of the human body but over consumption is related with coronary heart disease, obesity and cancers. This guideline is primarily intended to help lower the prevalence of these chronic diseases among South Africans. Cross-sectional studies have indicated a high incidence of overweight and

obesity among South Africans. The majority of these studies have indicated a fat intake of more than 30% of energy (Wolmarans & Oosthuizen 2001:48).

#### **2.12.8 Use salt sparingly**

If taken at all salt should be used in moderation in the preparation of meals and at the table. The intake of processed foods high in salt should be limited. Salt intake leads to an increase in blood pressure in genetically vulnerable persons and, if high intake is sustained over a long term, this leads eventually to sustained hypertension. The message 'eat salt sparingly' will not hinder with the current nutritional and legal requirements regarding iodation of table salt (Charlton & Jooste 2001:55).

#### **2.12.9 Drink lots of clean safe water**

Water is an essential nutrient and is the most persistent compound in the human body. This guideline is a unique and very important for South Africans, who often dwell in a hot and reasonably dry climate. Most biochemical reactions take place in water, and water is an active contributor in those reactions. If nothing is taken in, a person dies of thirst more rapidly than of hunger. Water is vital to life. No other substance is as broadly involved in as many various function of the human body as water. A water deficiency manifests quickly, while symptoms occur with as minute as one percent hypo-hydration. The most easily appreciated functions of water in the human body are to supply a medium for transport of blood components, to liquefy and pass nutrients from blood to cells, supply a medium for intracellular reactions to take place and to transfer metabolic products to the blood for redistribution or removal via the urinary tract (Bourne & Seager 2001:65).

Diarrhoeal disease and linked dehydration are responsible for thousands of deaths per year in South Africa, especially among young black and coloured children. Although a low-cost means of avoidance exists, namely oral rehydration solution (ORS), awareness of using ORS to treat diarrhoea and fighting dehydration is low among those caring for children younger than five years (Love & Sayed 2001:28).



#### **2.12.10 If you drink alcohol, drink sensibly**

The intake of alcohol, particularly in excessive quantities, often has negative health and social consequences. However, recent research findings indicate that reasonable intake of alcohol may benefit health in certain portions of the population. Public health and social problems linked with ingestion of alcohol and its extreme use include the following:

- Harmful effects on health
- Teratogenic effects on the unborn
- Negative social and economic effects

The guideline referring to alcohol intake acknowledges that many South Africans use alcohol. Such use is often excessive and leads to intoxication, which it is negligent in terms of health and social problems and that education and other interventions are needed to change this common practice. The guideline on alcohol is intended to contribute towards encouraging those members of the South African population who abuse alcohol, particularly in the form of binge drinking, rather to enjoy low-risk or sensible drinking. Low-risk drinking is explained as no more than four units of alcohol per day for men and no more than two units for women, with at least two alcohol-free days per week (van Heerden & Parry 2001:71).

#### **2.13 Strategies of fighting malnutrition in schools in South Africa**

Given the deprived and weakening nutritional status of the children in South Africa, the Department of Health tasked the Nutrition Directorate in 1995 to implement the Integrated Nutrition Strategy, which was intended to solve the problems of earlier, mainly food-based and fragmented approaches of the past. The Integrated Nutrition Policy, which functions as the Integrated Nutrition Programme (INP) is intended to assist a coordinated intersectoral approach to solving nutrition problems in South Africa. It attempts to improve the nutritional status of all South Africans by offering a variety of services and interventions directed at solving malnutrition (Witten et al. 2003:3).

The INP provides the framework for transformation of existing programs, namely the National Nutrition and Social Development Programme, the Protein-Energy Malnutrition Scheme and the Primary School Nutrition Programme in order to deliver a more comprehensive and successful service. The community-based nutrition projects of the INP concentrate on household food security and food-based income generation. Seventeen community-based projects are being piloted in four provinces. Given the high dominance of micronutrient deficiencies in the country, the elimination of vitamin A deficiency, iron and iodine deficiency is part of the nutrition objectives of the Department of Health. The Department predicts reducing micronutrient malnutrition through a combination of strategies, for example food fortification, particular micronutrient supplementation and dietary diversification (Witten et al. 2003:5).

The School Feeding Programme (SFP) is one of numerous interventions that can address some of the nutrition and health problems of school-age children. SFP's, and other school-based nutrition and health programs, can also motivate parents to enrol their children in school and to monitor attendance. Research shows that properly designed and successfully implemented SFP's can do the following:

- Lessen short-term hunger in malnourished or well-nourished schoolchildren. This can help to boost the attentiveness of students producing improvement in cognitive function and learning.
- Motivate parents to enrol their children in school and have them attend often. When programs efficiently reduce absenteeism and increase the length of schooling, educational results (performance, dropout, and repetition) progress.
- Address in school-aged children particular micronutrient deficiencies. Most important of these are iodine and iron, which directly affect cognition. Meeting the iron and iodine needs of school-aged children can promote better school performance.
- Increase community involvement in schools, mainly where programs depend on the former to organize and serve meals to children. Schools with their supporting communities are more successful than schools with less involvement (Del Rosso 1999:6).

The school feeding scheme currently reaches 14 000 schools out of its goal of 16 000 schools. The outstanding two thousand schools do not participate because of being unable to meet funding requirements, for example submitting invoices. From the start there has been an enormous problem as there have been signs that the school-feeding scheme has led to reliance. Teachers have reported that parents no longer take responsibility for feeding children at home. However, there is an advantage in that school attendance has increased since commencement of the feeding scheme (Strachan 1999:9).

The ongoing school-feeding component of the INP is intended to contribute to the improvement of education by enhancing primary school children's active learning competence as well as their attendance. In 1997, the national Departments of Health and Education committed on a programme intended to develop and incorporate a nutrition education package into curriculum 2005, supported by on outcomes-based education principles, using 40 primary schools in two provinces. Between September 1994, and December 1998, millions of rands were spent on school-feeding projects for disadvantaged primary school children nationwide. At the end of December 1998, just over four million children were served nationally, with rural and peri-urban received particular attention (Witten et al. 2003:50).

### **2.13.1 Opportunities and challenges of school feeding programmes**

The positive influence of school feeding programmes is not limited to improving nutritional status and education performance. The programme also can assist a means of introducing sound and healthy behaviour and basic food hygiene practices. Some activities such as school gardening, nutrition education and food preservation practices are sometimes related to the school feeding programme and help address common nutrition and health problems, as well as enhancing the overall programme influence. There are some apprehensions related to school feeding programmes. These include the following:

- The phasing out of such programmes is usually associated with a high rate of school dropout, indicating the low sustainability of programme effects.

- Programme involvement depends on school attendance, and the most vulnerable children are not reached, including girls in rural areas and street children who do not attend school (FAO 2000:5).

### **2.13.2 The nutrition education programme in South Africa**

The school feeding scheme remains a very costly intervention and there is constantly the question of how long it can continue. In some areas, schools are anticipating how they will fill the gap if the scheme does reach fulfilment. These schools are part of a pilot project being run in Kimberly and Upington to encourage primary school teachers to take forward the lessons on nutrition. The idea is to encourage teachers to make learning about nutrition a part of all the lessons, to set up food gardens at schools, to get children to take messages home and to encourage children to bring lunchboxes. The Departments of Health and Education are managing this Nutrition Education Programme (NEP) jointly (Strachan 1999:8).

### **2.14 Successful nutrition education programmes**

The Food Guide Pyramid (FGP) has been a good quality nutrition education tool in the previous years. An opportunity exists to educate young children about the function food plays in their health while they are keen to learn and are developing their lifetime eating habits. In response to this necessity, a nutrition education programme was developed and put into practice in an elementary school in the USA. The programme consisted of three 45-minute lessons and one review lesson given by a dietician intern. The FGP formed the basis for each lesson, which concentrated on the importance of eating a variety of foods, as well as fat content of foods and long-term health effect of a high fat diet. Children who took part had answered identical questions for pre- and post-tests. These evaluated the children's knowledge of each of the subjects covered in the lessons. There was statistical variation between the pre and post-test scores. The evaluation of the pre- and post-test results showed that the children's knowledge had increased by ten percent. The programme was also found to be successful in teaching the children which foods were found in both the FGP and a healthful diet (Van Bindsbergen, Bathalon, Hostetler & Meaney 1997:38).

Another study was done to assess the effectiveness of the FGP as a nutrition education tool. The sample consisted of 57 grades five, seven and eight students from an elementary school in the USA. The instruments of this study consisted of a pre- and post- test, 24-hour recall survey and a personal data form. A nutrition lecture of the FGP was presented after the pre-test and the preliminary food recall survey. For all food groups, no major changes were observed before and after nutrition education. A large percentage of students ate less than the recommended number of servings from a majority of food groups of the FGP. When the knowledge was tested, results revealed marked improvements in the test scores following the nutrition education (Wright & Fournet 1997:38).

Another nutrition education programme was conducted in Crete over a three-year period. The purpose of the intervention was to increase the alertness of parents and children primarily on issues related to healthful diet and regular physical activity while encouraging and supporting pupils to improve their dietary habits and physical fitness. Another purpose was to establish an appropriate environment at school and at home in support of the children's likely behavioural adjustment. The preparatory phase of the project involved the development of teaching materials that would be most suitable for the characteristics and culture of Greece. Multicomponent workbooks covering dietary matters, physical activity and fitness, dental health hygiene, smoking and accident prevention were produced for grade one to six learners while each pupil was given with a workbook appropriate for the developmental abilities of the pupils. In addition, teaching aids were provided in order to help class teachers in the presentation of new materials. The teaching aids included posters, workbooks and teaching manuals concentrating on the principles of the intervention. The control group did not receive health education (Manois & Kafatos 1999:2).

A multiple-choice questionnaire with colour illustrations was used to evaluate students' knowledge at the beginning and at the end of the three-year intervention period. The questionnaire concentrated on diet, food products and physical activity. Results indicated that the control group had a better health knowledge at the beginning. Following the

three years of intervention, the total serum cholesterol levels had decreased in the experimental group while they increased in the control group. When compared with the control group, children in the intervention group were found to have had a greater average gain in height over the three-year period. The control group had a notably greater change in the body mass index than the intervention group. With reference to the dietary data, there were no significant differences between the intervention and control group in the weekly food consumption levels. Finally, the significant increase in the knowledge of the intervention group can be attributed mainly to the classroom-based health education. The positive findings of the study can be attributed to both the effectiveness of school-based interventions and the seminars organized for parents with the high parental participation rate (Manois & Kafatos 1999:7).

A study was conducted in the USA and its objective was to assess the effects of a multi-component nutrition promotion program for kindergarten and first grade students attending an urban, under resourced school. Particular consideration was given to the effectiveness of a multi-component intervention in improving students' knowledge about healthful eating and increasing vegetable consumption at lunch. School psychology doctoral students played significant roles with regard to the knowledge change and performance components of the study. Thus, this study demonstrated the role that school psychologists can play in developing, implementing, and evaluating school-based nutrition education programs in partnership with the teaching staff. Two lessons per week were given to students, while the programme took five weeks to complete. To better reinforce circular messages at home, brief newsletters were developed the content of which had been discussed with parents before the intervention had occurred. The newsletter supplemented the ten lessons and provided information on what the children had gained as part of the nutritional lesson. Students in the control classrooms did not receive any specific nutrition education (Blom-Hoffman, Kelleher, Power & Leff 2003:5).

Once the experimental group had received the entire nutrition promotion programme, the post-test was completed. Change in knowledge was assessed using the curriculum-based

measure. The same knowledge test was administered at pre-test, post-test and follow-up phases. With regard to knowledge improvement at post-test, students in the experimental group made significant progress in relation both to students in the control group and their own pre-test scores. The effect size was very large in relation to influence of the intervention on improving student knowledge. Although the children made large knowledge gains after receiving the programme, its effect on actions was variable. Children in the experimental group did not show significant change in vegetable consumption from pre- to post- intervention, while the post-intervention rates of vegetable consumption were similar to those of the control group. However, when the programme was imitated with the control group, there were significant improvements from pre-test to post-test in vegetables consumed during school lunch. The effect size of this improvement was realistic (Blom-Hoffman et al. 2003:5).

### **2.15 Conclusion**

Investing in nutrition reflects an efficient use of resources since the enormous social and financial costs of malnutrition are averted. Moreover, improved nutrition has an enhancing effect on investments in health, education and agriculture sectors. Therefore investing in a wide array of low-cost solutions for malnutrition can be of immense economic benefit to a country. Investing in good nutrition can result in good social and economic returns if it is firmly based on effective community participation. Benefits include good quality of life, increased productivity and good economic returns. In school children the investment leads to an increase in their cognitive ability, attendance rate and intellectual performance in school (FAO 2004b:18).

## CHAPTER 3

### METHODOLOGY

#### 3.1 Introduction

The goal of nutrition education is to motivate participants to eat a healthful diet. Children are a very important audience for nutrition education because a healthful diet is essential for their normal growth and development, while children are establishing food patterns to be carried into adulthood. Good nutrition promotes not only better physical health and reduced susceptibility to disease, but has also been demonstrated to contribute to cognitive development and academic success (PI 2000:1).

Nutrition and health status are powerful influences on a child's learning and on how well he or she performs at school. Those who lack certain nutrients in their diet or suffer from protein-energy malnutrition, hunger, parasitic infections or other diseases, do not have the same potential for learning as healthy and well-nourished children. Weak health and poor nutrition among school-aged children can diminish their cognitive development either through physiological changes or by reducing their ability to learn (Del Rosso 1999:4).

#### 3.2 Objectives of the study

The general aim of the study was to develop and evaluate a passive nutrition education programme for grade seven learners of Setlabotjha Primary School. In order to test the hypothesis empirically, the following specific objectives were identified:

- Determining the current state of nutritional knowledge of Setlabotjha Primary School using a nutrition knowledge questionnaire.
- Developing a passive nutrition educational tool (nutrition education playing cards) to address the problem areas as identified from analysis of the questionnaires.
- Implementing the nutrition education programme (intervention).



- Impact measurement by administering a pre-test and post-test as part of the intervention and comparing the results in order to not improvement in nutrition knowledge.

### 3.3 Conceptual framework of the study

Figure 3.1 illustrates a conceptual framework for the study. Each step has been discussed in detail.

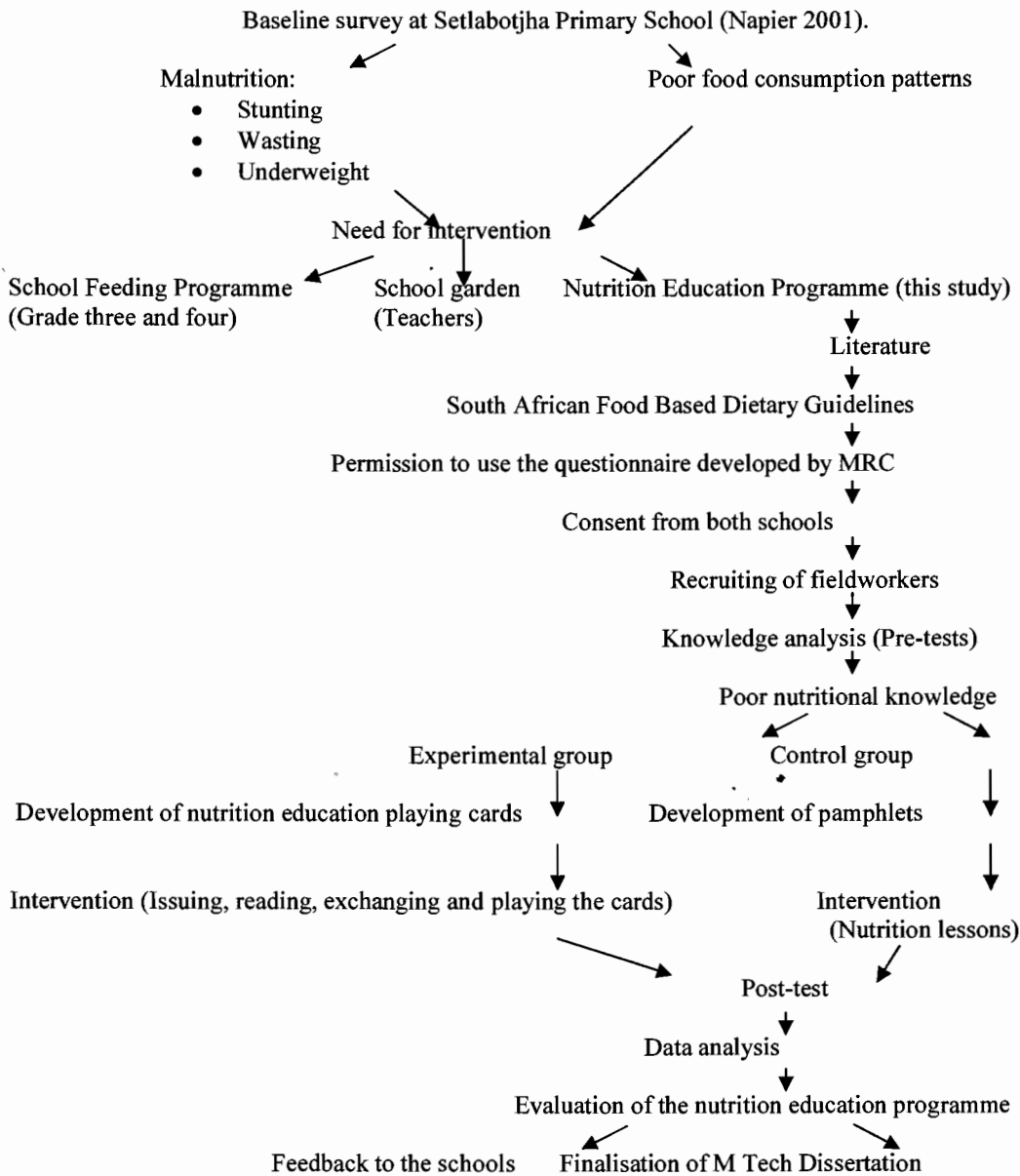


Figure 3.1: Conceptual framework of the study

### **3.4 Literature survey**

As a result of the findings concerning malnutrition, poverty and household food insecurity as determined by the baseline survey in Eatonsiede, a literature survey was undertaken to study the extent of malnutrition and the strategies developed to address the malnutrition problems globally and in South Africa. The latter has been recognized as one of the countries with a malnutrition problem (Labadarios et al. 1999:4). In order to avert malnutrition successfully, the South Africa's integrated nutrition programmes put into practice particular policies, consisting of nutrition education with the purpose of enhancing nutritional status and increasing the quality of life. This study was important as it was in line with one of the major national and provincial priority activities for 2005 and 2006, that being to reinforce the implementation of the food-based dietary guidelines as a tool for nutrition education. The South African Working Group developed Food Based Dietary Guidelines specifically for South Africans. These guidelines were based on prevailing eating patterns and diet-related health issues and intended to address diet-related problems as well as being used as basis in the planning, implementation and evaluation of public health nutrition strategies (Gibney & Vorster 2001:2).

### **3.5 Consent to conduct the study**

Letters requesting permission were written to both schools. Permission was granted by the Head Masters of both schools (Annexure A & B). They both wrote letters to the parents of the children informing them about the study.

### **3.6 Measuring instrument**

A nutrition knowledge questionnaire, including questions on socio-demographic indicators, was used to determine pre-test knowledge of the children from the experimental and control groups (Annexure C). The 60-item questionnaire was developed and tested by researchers from the Medical Research Council and the researcher was given permission to by the authors to use the questionnaire. A summary of the steps followed in the development of the questionnaire is shown in Figure 3.2. Table 3.1 indicates the final nutritional knowledge concepts and number of items developed for each concept. The questionnaire was specifically designed for South

African urban adolescents while relevant nutritional issues concerning South African adolescents were reviewed in the development process of the questionnaire. This study was conducted amongst urban adolescents and it was for this reason that the researcher decided to use this questionnaire, which had been tested for validity and reliability by the MRC. After the intervention took place, the same questionnaire was used again to determine post-test knowledge (Whati, Senekal, Steyn, Nel, Lombard & Norris 2005:76).

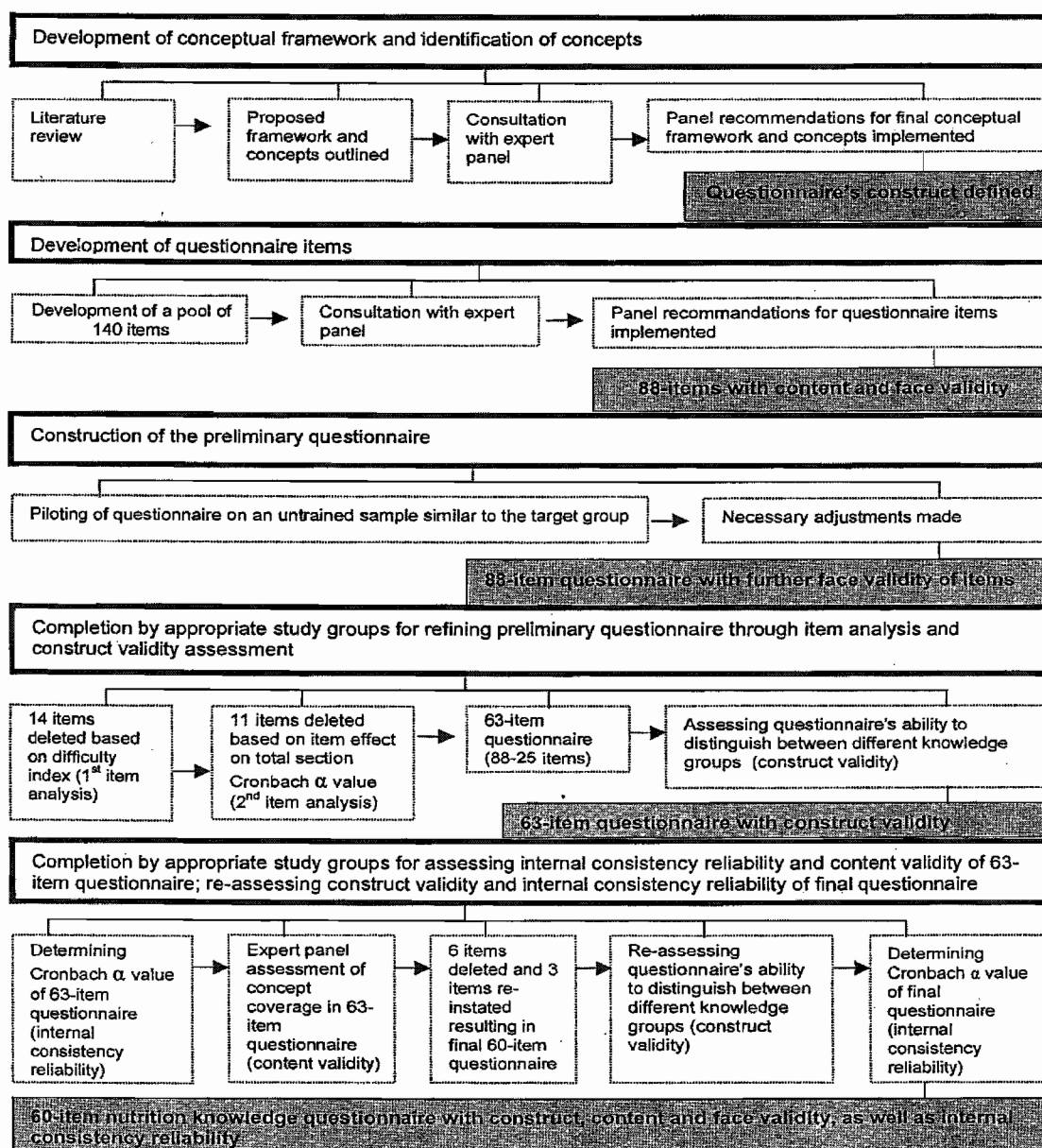


Figure 3.2: Summary of steps followed in the development of a nutritional knowledge questionnaire for urban adolescents (Whati et al. 2005:78).

Table 3.1: Final nutritional knowledge concepts and number of items developed for each concept

GROUP	CONCEPT	NO. OF ITEMS DEVELOPED
A	Recommendations for a healthful dietary lifestyle according to the SA FBDGs.	41
B	Proper dietary lifestyle for the maintenance of good health and weight control.	21
C	Food sources of selected nutrients (carbohydrates, proteins, fibre, vitamin A, iron, iodine and calcium) for prevention of nutrient deficiencies.	11
D	Ways to ensure the safe consumption of selected foods (meat, fish, chicken, water, fruits and vegetables).	5
E	Basic nutritional requirements during pregnancy.	10

### 3.7 Fieldworkers

Five fieldworkers were recruited from the Vaal University of Technology (VUT). The fieldworkers were postgraduate students in Food and Beverage Management. All were Sotho speaking, and three could also speak isiZulu and IsiXhosa. Before the actual fieldwork took place, the researcher trained the fieldworkers as to how the questionnaire should be completed.

### 3.8 Pre-tests

The pre-test for the experimental group took place on the 28 July 2005 and for the control group on 29 July 2005. Fieldworkers assisted at both schools in translating the questionnaire into the relevant languages spoken by the children. Interviewer bias was addressed by ensuring that the same fieldworkers were used for both schools and that they interpreted the questionnaire accurately in the same manner for the pre-test and post-test for both groups (Margetts & Nelson 1997:25). The researcher ensured that the fieldworkers translated the questionnaire from English into all other relevant languages

spoken by the children in order to ensure that all the children had a clear understanding. The researcher was also present in order to assist with the completion of the questionnaire.

After the pre-test were completed, data were captured on an Excel spreadsheet and analysed in order to indicate nutrition knowledge by using graphs to indicate all the selected answers, correct or incorrect, while tables were used to show only the correct answers. Results from the pre-test were used to develop the nutrition education playing cards.

### **3.9 Data analysis**

Data from the completed questionnaires were captured by the researcher and analysed for descriptive statistics using Excel spreadsheets and presented in graphs and tables.

### **3.10 The development process of the nutrition education programme**

The nutrition problems amongst primary school children faced were under nutrition resulting from poverty and household food insecurity (Oldewage-Theron et al. 2005:318; Napier & Oldewage-Theron 2005:1). Thus it was thus decided to proceed with nutrition education in the school. The FAO (1997) framework for developing NEP was used for planning the intervention.

#### **3.10.1 Phase 1: Preparation of the nutrition education programme**

##### **3.10.1.1 Sample population**

Children in primary school were chosen as the sample population since previous studies have shown that school based nutrition education can improve eating behaviour of young people (WHO 2003a:8; CDC 1996:3). Further more, nutrition interventions had already been in place at Setlabotjha Primary School and permission had been obtained from the Department of Education in 2002 for research to be conducted at the Setlabotjha Primary School. Another school, with similar socio-demographic characteristics to Setlabotjha Primary School had to be chosen for the control group. The closest school to Setlabotjha Primary School was Ekujuleni Primary School which was chosen for the control group.

The study population consisted of all grade seven learners, which amounted to a total of 133 children from the two selected primary schools in the Vaal Triangle area. Children from Setlabotjha Primary School (n = 66) formed the experimental group and those from Ekujuleni Primary School (n = 67) the control group. The age group chosen for this study was grade seven learners because a study previously conducted at Setlabotjha Primary School (Napier 2001:78) indicated that 14% of the children were underweight, 39% were stunted and five percent were wasted. Grade seven learners were selected in primary schools because they form part of the adolescent group, for which the measuring instrument had been developed. The lower grades would have been too young as the WHO defined adolescents as individuals between the ages of ten and 24 years (WHO 1995:263). Since the school feeding programme included lower grades, it was decided that interventions should be undertaken in different groups to prevent confounding effects. School-aged children have also been recognized as a priority group since they are one of the groups most vulnerable to malnutrition (UNESCO 2002a:4).

#### **3.10.1.2 Sampling procedure**

Two schools were purposively selected as the area in which they are located is one of the poorest areas in the Vaal Triangle while it also falls within the research focus area for the Vaal University of Technology. Setlabotjha Primary School was chosen because permission had been obtained from the Department of Education in 2002 to undertake research and the baseline survey by Napier (2001) was undertaken at this school. The other school was chosen purposively because the children attending were from the same background as those at Setlabotjha Primary School.

Initially the researcher thought of randomly selecting the respondents, but was advised by the Head Master of the experimental school to use the entire grade sevens, as there were other projects that involved other grades. Randomly selecting the study population would have meant that the participants would be from different grades, thus having different knowledge levels and those not selected would have felt left out, and it would have also been difficult to reach the respondents during the intervention period. Thus all the grade seven learners from both the selected schools were included in this study.

Inclusion criteria included the following:

- All grade seven learners from the two selected primary schools
- Boys and girls

The exclusion criteria included the following:

- Children from other primary schools
- Other learners from either of the schools not in grade seven.

### **3.10.2 Phase 2: Formulation of the nutrition education programme**

#### **3.10.2.1 Objectives**

The objectives of this NEP were based on the FAO proposed aspects that should be included in school based nutrition education programmes (FAO 2000:10; Stuart & Achterberg 1997:1). The main purpose of this NEP was to incorporate the SA FBDGs in the specific objectives that follow:

- Providing information on healthy eating food choices for the prevention of malnutrition in grade seven learners.
- Improving these children's nutrition knowledge on the SA FBDGs as these were specifically developed for the South African population and are feasible in revealing and teaching healthful eating habits to children.
- Motivating the children to alter their behaviour at an early age so as to enjoy healthier lives.

#### **3.10.2.2 Designing the messages**

Because the main aim was to develop a nutrition education tool based on the SA FBDGs, the messages chosen for the NEP were derived from the SA FBDGs for both the experimental and control groups and are as follows:

- Enjoy a variety of foods;
- Be active;
- Drink adequate amounts of clean, safe water;
- Make starchy foods the basis of most meals;

- Eat plenty of vegetables and fruits every day;
- Eat dry beans, peas, lentils and Soya regularly;
- Chicken, fish, meat, milk or eggs can be eaten daily;
- Eat fats sparingly;
- Use salt sparingly;
- If you drink alcohol, drink sensibly.

So as to address each of the above-mentioned SA FBDGs, various messages were developed.

Messages addressing “Enjoy a variety of foods” were:

- Children need vitamin A to resist illness and prevent visual impairments;
- Vitamin A can be found in dark green leafy vegetables, carrots, liver and eggs;
- Lack of vitamin A puts a child at risk of night blindness;
- To grow and stay healthy, children need a variety of nutrients;
- Children need iron-rich foods to protect their physical and mental abilities;
- Poor nutrition during pregnancy can slow a child’s mental and physical development;
- Calcium is found in milk, yoghurt, spinach and maas;
- Iron is essential for healthy blood and the transport of oxygen to cells;
- Eating a healthy breakfast meets the daily nutritional needs;
- Breakfast is the most important meal of the day;
- Brown bread is healthier than white bread;
- Eat plenty of grain products, fruit and vegetables;
- Eat enough calcium and iron to meet the body’s requirements;
- Healthy nutrition is needed to good performance in school;
- Nutrition affects intellectual development and learning ability;
- Adequate nutrition can help prevent health problems;
- Our bodies need a variety of nutrients in order to stay healthy;
- No single food can provide us with all required nutrients;



- It is healthier to prepare meat, chicken and fish without frying;
- 2 cups of milk is required per day in order to provide enough calcium in the diet;
- Vitamin C heals cuts and wounds;
- Whole wheat bread is healthier than white rolls;
- Calcium keeps bones and teeth strong.

Messages addressing “Be active”:

- Physical activity is important for good health;
- To be active keeps our minds and bodies healthy;
- Regular physical activity keeps us in good shape.

Messages addressing “make starchy foods the basis of most meals”:

- A starchy food should form the larger part of mixed meals;
- Starchy foods are rich in carbohydrates;
- Carbohydrates are the main source of energy for the body.

Messages addressing “Eat plenty of fruit and vegetables”:

- Eat five or more fruit and vegetables daily;
- Always wash vegetables and fruit before cooking or eating them.

Messages addressing “Eat dry beans, peas, lentils and Soya regularly”:

- Dry beans, lentils and Soya can be used instead of meat;
- Soya mince is as healthy as meat;
- Beans and peas are healthy as contain fibre.

Messages addressing “Chicken, fish, Maas, milk or eggs could be eaten daily”:

- Iron can be found in liver, lean meats, fish and eggs;
- Protein builds, maintains and repairs body tissue;
- Poultry is an excellent alternative for red meat;
- Offal is rich in protein and iron.

Messages addressing “Eat fats sparingly”:

- Choose a diet low in fat;
- Polony, Vienna’s and sausages are high in salt and fat.

Messages addressing “use salt sparingly”:

- Your body needs a little salt to stay healthy;

Message addressing “drink lots of clean safe water”:

- It is important to drink seven to nine glasses of water daily.

Messages addressing “If you drink alcohol, drink sensibly”:

- Drinking too much alcohol may damage the liver;
- Alcoholic drinks can contribute to people being overweight;
- High blood pressure can result from drinking too much alcohol;
- Breastfeeding women should not drink alcohol.

The following messages were included, as they were found to be more relevant to adolescents:

Messages addressing pregnancy:

- Pregnant women should eat different kinds of food;
- It is important for a pregnant woman to exercise.

Other messages that were included were:

- Too much sugar is not good for our health;
- Choose snacks that are not high in sugar;
- Wash your hands thoroughly with soap and water before touching food;
- Babies who are breastfed are better nourished.

The messages for the control group were similar to those of the experimental group.

### 3.10.2.3 Choosing the medium

- Experimental group: playing cards

When visiting Setlabotjha Primary School on various occasions, the researcher made an observation and realized that the children were familiar with playing cards because they played cards during breaks at school. Therefore it was decided after discussions with the teachers to use playing cards as the medium for the NEP. These playing cards were developed in order to present the nutrition education messages as described in section 3.10.2.2. A graphic designer was consulted so as to assist in the development of the layout of the cards. The designer selected bright colours for card faces in order to draw the children's attention. The colours selected were green, blue, purple and orange while from these selected backgrounds, one was used for spades, one for diamonds, one for the clubs and yet another on for all the hearts. Each playing card had a picture illustrating the message in the card as shown in Figure 4.5. The font used for the lettering of the messages in the cards was "kids". This was selected as children would associate with it, while Arial was used for the numbers on the cards. All the cards had a similar back.

A box was also designed for each pack of cards. The layout of the box cover included the different backgrounds used for the cards. The latter were printed on a carton paper. The reason for developing the cards was to create a tool that would enable the children play and learn at the same time. The nutrition education cards were pilot-tested and were given to ten grade seven learners from the sample population, to read and interpret what they understood from the messages. This was done to ensure clarity, visibility and comprehension of the messages. The children indicated that they found the cards very attractive, readable and interesting. Most of these children understood the messages. However, the children indicated that they would prefer the playing card messages in Sotho, but it was decided to keep the messages in English as the cards can be used in other studies for a wider audience and because of the cost implications as each pack had cost R 130.00.

- Control group:

The pamphlet and the lecture were designed by the researcher, indicating the SA FBDGs and similar messages in the cards. One pamphlet was printed and copies were made for all the children in the control group (Annexure D). The pamphlet and the content of the nutrition education lessons were pilot tested using ten grade seven learners from the sample populations. The learners indicated that they understood the content of the above-mentioned.

### **3.10.3 Phase 3: Implementation**

#### **3.10.3.1 Producing the materials**

- Experimental group:

Once the playing cards were designed and approved to be effective by the pilot testing, the production process begun. It was decided to fit 16 playing cards, with the same colours, on an A3 page. This was done for all the cards. Arrangements were made with the printers and all the cards were printed in full colour. They were then cut by machine in equal sizes, sorted to make a pack of 52 cards and each pack was placed into a box.

- Control group: Lecture on nutrition education

Three 45-minute lectures were presented for the control group as explained in Section 3.10.3.3. A lecture was chosen for the control group as children are accustomed to being taught at school on a daily basis and in order to compare the two methods after the interventions.

#### **3.10.3.2 Training the change agents**

- Teachers

Teachers have been recognized as major influences in the psychological environment and as role models who could encourage students by demonstrating healthy eating (WHO 2003a:27; UNESCO 2001:5). Teachers at the schools were actively involved in the study and made an important contribution to its success. The researcher offered one hour-long training session, whereat the researcher explained to the teachers before the interventions the importance of the research. All the nutrition messages were explained to the teachers

so that they could use the cards in their English lessons as part of the nutrition education programme.

### **3.10.3.3 Executing community intervention**

- **Experimental group**

The children from the experimental group were given playing cards with nutrition messages as the passive nutrition education programme. This was introduced by means of issuing playing cards (the nutrition education programme tool) for children to read, exchange and to play with until a full pack of 52 cards was accumulated. The intervention took place between 1 August 2005 and 19 October 2005, with a one-week break of school holidays that took place between 22 September 2005 and 30 September 2005. During weekends and the school holidays, the children did not receive any cards. The cards were randomly issued out by the teacher, and the children received one card with one message every morning. The intention was that every child has a pack of 52 cards. The reason why the intervention took place over eleven weeks is that in one week, a child received five cards, in ten weeks 50 cards, in addition to two more days in the eleventh week, resulting in 52 cards. The children exchanged cards amongst themselves to ensure that they had not duplicated cards with the same messages and in order for them to receive different messages, while being in contact with the educational tool. The researcher visited the children and played card games with them on three occasions, i.e. once a month, during the intervention period. The children sat in different groups while the researcher alternated playing with each group. The most popular games the children played were craze-eight, five cards, donkey and tens.

Sufficient exposure was not difficult to achieve because a child received, read, exchanged and played the cards on a daily basis. The teacher used the cards for the English lessons over eleven weeks on a daily basis, while the researcher also visited and played card games with the children as explained above. The children had sufficient exposure as research indicates that it takes between seven to eleven touches for the information to be accepted and formed into knowledge (Eathorton 2005:5). It had been vital to the study to

include teachers since they form an important part of the psychological environment in relating to the social and mental environment, which affects education and health (WHO 2003a:27).

- Control group

After the pre-test of the control group, the control group received pamphlets designed and issued out by the researcher and they were expected to read the pamphlets before the intervention took place, designed as short messages stating the SA FBDGs and messages similar to the ones in the cards (Annexure D). The researcher presented three 45-minute lectures (one lecture after every three weeks) based on the SA FBDGs, within the same period as the intervention of the control group. In order to maintain the children's attention and to assist their ability to remember the concepts discussed, pictures from the nutrition education kit developed by the Sugar Association and the MRC were used. All the guidelines were discussed. The exposure of the experimental and control group was similar, when the researcher went to play cards with the experimental group, the control group would get another lecture.

### **3.10.4 Phase 4: Evaluation of the nutrition education programme**

#### **3.10.4.1 Post-tests for impact evaluation**

Impact evaluation was used to evaluate the effectiveness of the nutrition education programme by measuring the change in nutrition knowledge of the subjects after the intervention. The same nutritional knowledge questionnaire that was used in the pre-test was used to assess nutrition knowledge after the intervention took place to indicate the differences in the knowledge level. The post-test took place on the 27 October 2005 for the experimental group and 28 October 2005 for the control group. A week after the third lecture, post-tests were done for the control group, also one week after the experimental group played games for the third time. The same fieldworkers that had assisted in the pre-test, interviewed the children and translated the questionnaire into relevant languages understood by the children and assisted them in completing the questionnaires. The researcher was also present to assist the children and supervise the process.

#### **3.10.4.2 Data analysis**

Data from the completed questionnaires were captured by the researcher and analysed using Excel spreadsheets and presented in graphs, tables and percentages calculated for the change in knowledge.

## CHAPTER 4

### RESULTS AND DISCUSSIONS

#### 4.1 Introduction

The chapter includes results from the pre-test and post-test nutritional knowledge of the experimental and control groups. Data was presented in tables for the true-or-false questions and graphs for the multiple-choice questions.

#### 4.2 Socio-demographic indicators of study population

The study consisted of 66 children from the experimental group, being 48% females and 52% males as indicated in Figure 4.1. The control group consisted of 67 children, 55% females and 45% males, as indicated in Figure 4.2.

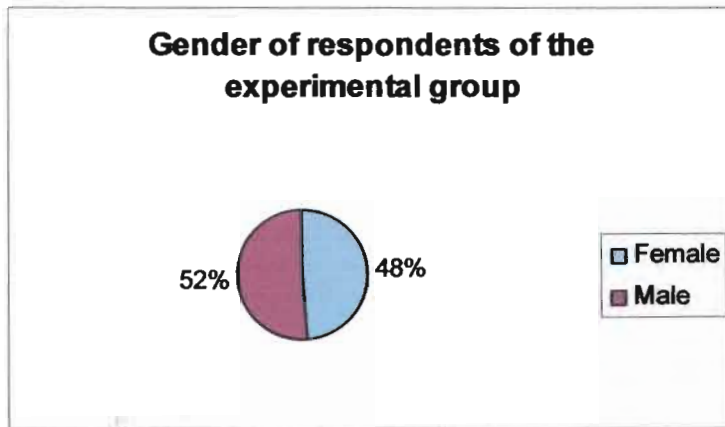


Figure 4.1: Gender of respondents of the experimental group.

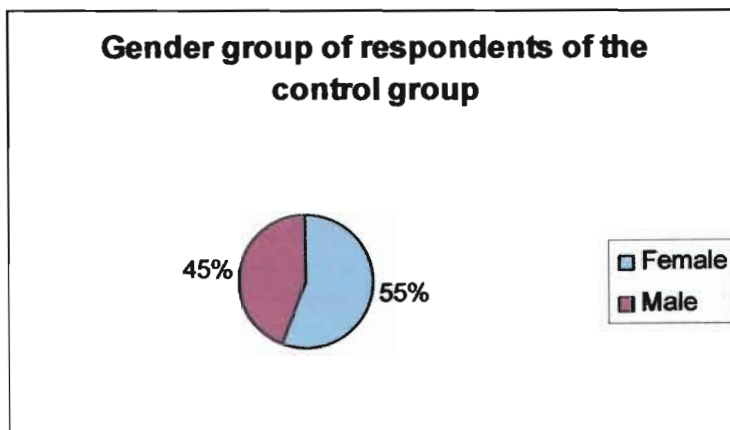


Figure 4.2: Gender of respondents of the control group.



Figure 4.3 indicates the age groups of respondents from the experimental group. Of the respondents two percent were 11 years old, 23% were 12 years old, 36% were 13 years old, 30% were 14 years old, six % were 15 years old and three percent were 16 years old.

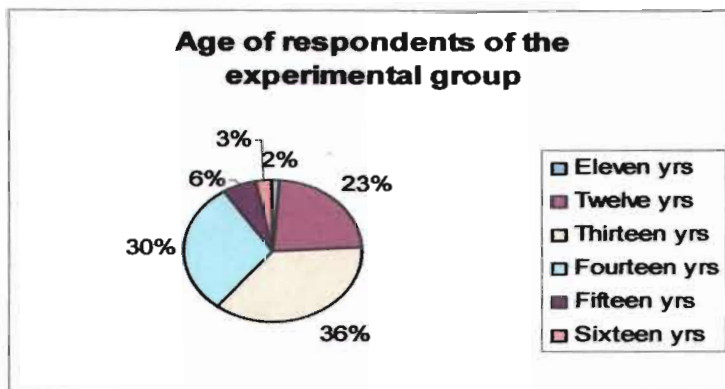


Figure 4.3: Age of respondents from the experimental group.

Figure 4.4 indicates the age of respondents from the control group. 46% were 12 years old, 34% were 13 years old, 12% were 14 years old, 6% were 15 years old, one percent was 16 years old and one percent was 18 years old.

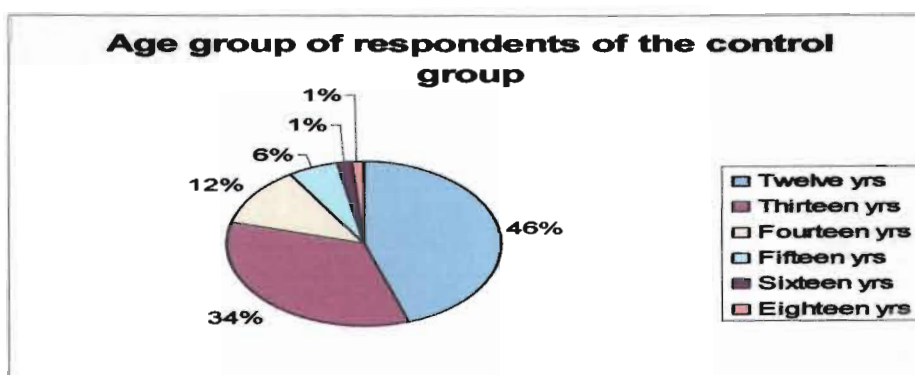
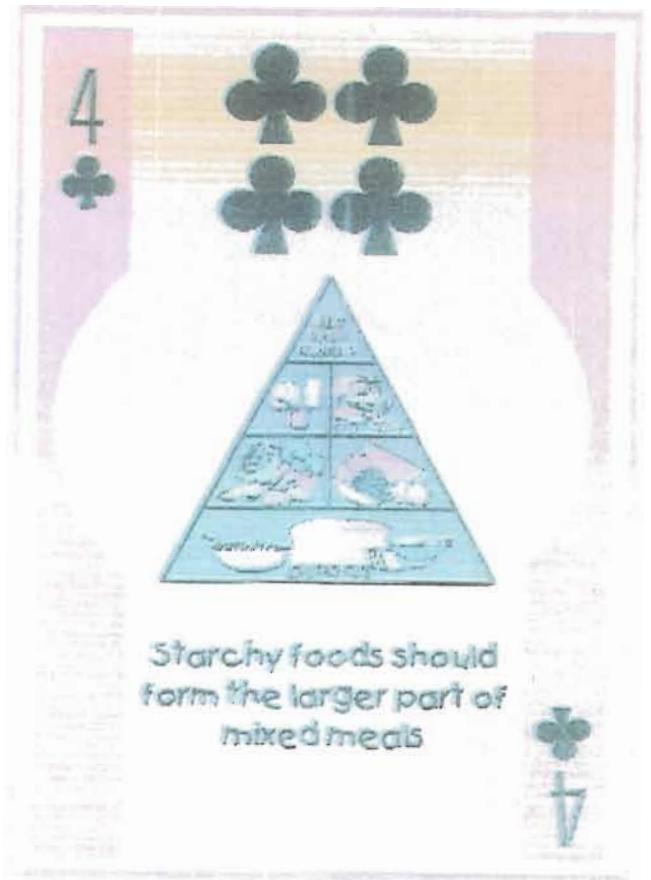


Figure 4.4: Age of respondents from the control group.

### 4.3 Nutrition education tool

Playing cards were developed for the experimental group. An example can be seen in Figure 4.5. Included is the pamphlet (Annexure D) designed for the control group as well as a list of the issues discussed in the nutrition education lessons (Annexure E).



**Figure 4.5 Examples of nutrition education tool (experimental group)**

#### 4.4 Nutrition knowledge concerning issues addressed in the nutrition education playing cards

##### 4.4.1 Nutritional knowledge concerning sugar-related questions for both groups

Table 4.1 indicates that 63% of the respondents from the experimental group correctly answered the question 'Should you eat a lot of sugar to have enough energy?' in the pre-test, while 64% answered correctly in the post-test. There was one percent improvement in the experimental group. The control group had a higher percentage than the experimental group. In the control group, 97% answered correctly in the pre-test while 97% answered correctly in the post-test. There had been neither improvement nor deterioration in the level of knowledge in the control group.

Table 4.1: Responses to the question 'Should you eat a lot of sugar to have enough energy?'

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
You should eat a lot of sugar to have enough energy.	63	64	+1
Control group:			
You should eat a lot of sugar to have enough energy.	97	97	0

Table 4.2 indicates that 93% of the respondents from the experimental group correctly answered the question ‘Should sugar and foods containing sugar it be eaten in small amounts?’ in the pre-test, while 70% answered correctly in the post-test. The level of knowledge had decreased by 23%. In the control group, 89% of the respondents answered correctly in the pre-test and 95% answered correctly in the post-test. The level of knowledge had increased by six percent for the control group.

Table 4.2: Responses to the question ‘Should sugar and foods that containing it be eaten in small amounts?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Sugar and foods that contain sugar should be eaten in small amounts.	93	70	-23
Control group:			
Sugar and foods that contain sugar should be eaten in small amounts.	89	95	+6

Table 4.3 indicates that 91% of the respondents from the experimental group correctly answered the question ‘Is it healthy to snack on foods that contain a lot of sugar?’ in the pre-test and 91% answered correctly in the post-test. The level of knowledge remained the same for the experimental group. Of the respondents in the control group, 99% correctly answered in the pre-test, while 99% answered correctly in the post-test. The level of knowledge also remained the same for the control group.

Table 4.3: Responses to the question ‘Is it healthy to snack on foods that contain a lot of sugar?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
It is healthy to snack on foods that contain a lot of sugar.	91	91	0
Control group:			
It is healthy to snack on foods that contain a lot of sugar.	99	99	0

The results indicated that the subjects were well informed as the majority of both the experimental and control group groups answered correctly all these questions on sugar consumption. Although, after the implementation of the NEP, the experimental group had a poorer response for the amount of sugar that should be consumed, the majority of the subjects answered the question correctly before (93%) and after (70%) the NEP was implemented

#### 4.4.2 Knowledge concerning meat-related questions for both groups

Table 4.4 indicates that 58% of the respondents from the experimental group correctly answered the question ‘Is soya mince are as healthy as meat?’ in the pre-test, while 68% answered correctly in the post-test. The level of knowledge had increased by ten percent for the experimental group. In the control group, 61% of the respondents answered correctly in the pre-test and 33% answered correctly in the post-test. The level of knowledge had decreased by 28% for the control group.

Table 4.4: Responses to the question ‘Is soya mince as healthy as meat?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Soya mince is as healthy as meat.	58	68	+10
Control group:			
Soya mince is as healthy as meat.	61	33	-28



#### 4.4.3 Knowledge concerning pregnancy-related questions for groups

From the options given in 4.6, the correct answer was ‘sleep most of the day’. Of the respondents from the experimental group, 32% correctly answered the question ‘Which one of the following is not healthy for a pregnant woman to do?’ in the pre-test, while 34% answered correctly in the post-test. The level of knowledge had increased by two percent for the experimental group. Of the respondents 46% from the control group answered the question correctly in the pre-test and 55% answered correctly in the post-test. The level of knowledge had increased by nine percent for the control group.

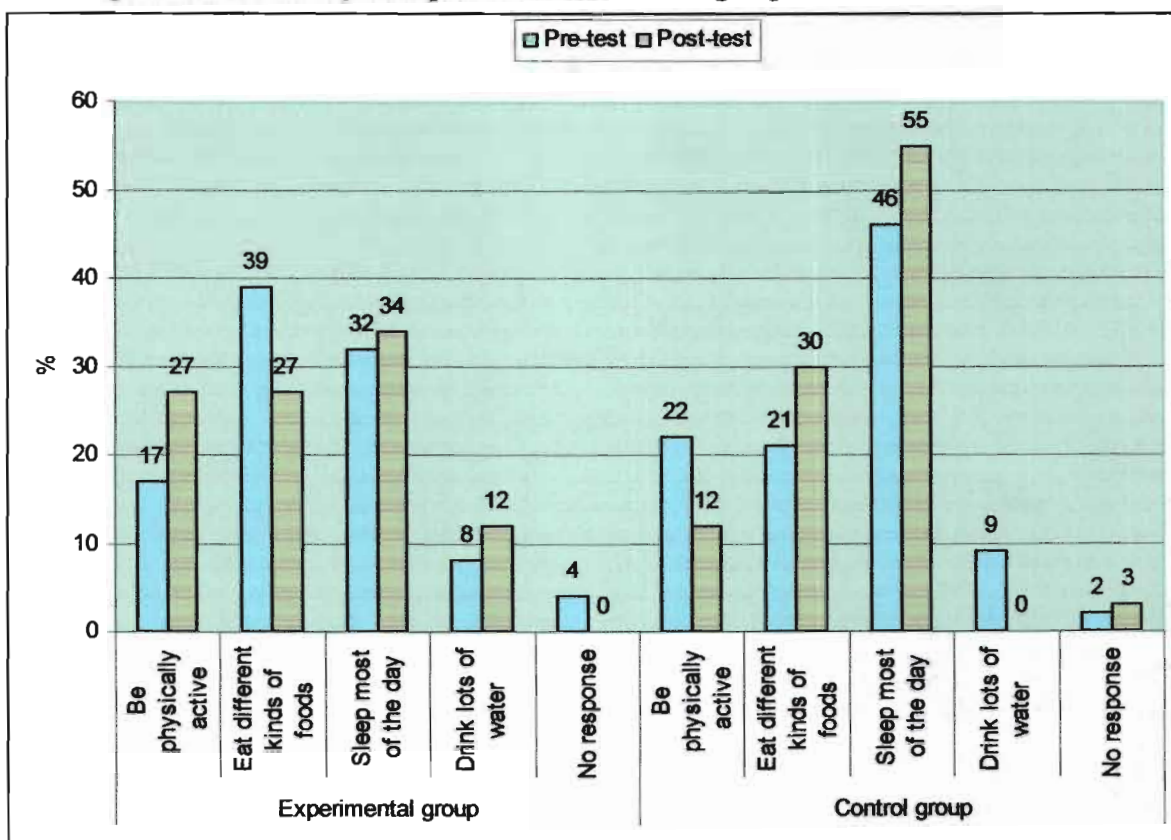


Figure 4.6: Responses of both groups to the question ‘Which one of the following is not healthy for a pregnant woman to do?’

Regarding pregnancy results indicated that the knowledge of subjects in both experimental and control groups were limited. This could be due to their age group and low level of experience of pregnancy. Although knowledge was poor in both groups, it improved in two questions for both, though, not in the same questions. The poor results could also be the result of including only two messages in the nutrition education playing

cards. These messages focused on eating a variety of foods and exercise. There was only two of the total of five variables pertaining to pregnant women. However, the control group had an improved knowledge on eating a variety of foods during pregnancy.

Table 4.5 indicates that 41% of the respondents from the experimental group correctly answered the question ‘Is it not healthy for a pregnant woman to eat foods like milk, cheese and yoghurt?’ in the pre-test, while 61% answered correctly in the post-test. The level of knowledge had increased by 20% for the experimental group. In the control group, 54% of respondents answered correctly in the pre-test and 22% answered correctly in the post-test. The level of knowledge had decreased by 32% for the control group.

Table 4.5: Responses to the question ‘Is it not healthy for a pregnant woman to eats food like milk, cheese and yoghurt?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
It is not healthy for a pregnant woman to eat food like milk, cheese and yoghurt.	41	61	+20
Control group:			
It is not healthy for a pregnant woman to eat food like milk, cheese and yoghurt.	54	22	-32

Table 4.6 indicates that only 12% of the respondents from the experimental group correctly answered the question ‘Is it not healthy for a pregnant woman to drink a lot of wine, beer and cider?’ in the pre-test, while 70% answered correctly in the post-test. The level of knowledge had increased by 58% for the experimental group, compared to only seven percent for the control group.

Table 4.6: Responses to the question ‘Is it not healthy for a pregnant woman to drink a lot of wine, beer and cider?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
It is not healthy for a pregnant woman to drink a lot of wine, beer and cider.	12	70	+58
Control group:			
It is not healthy for a pregnant woman to drink a lot of wine, beer and cider.	75	82	+7



Table 4.7 indicates that 58% of the respondents from the experimental group correctly answered the question ‘Is it important for a pregnant woman to avoid eating different kinds of foods?’ in the pre-test, while 29% answered correctly in the post-test. The level of knowledge had decreased by 29% for the experimental group. Of the respondents in the control group, 26% answered correctly in the pre-test and 60% answered correctly in the post-test. The level of knowledge had increased by 34% for the control group.

Table 4.7: Responses to the question ‘Is it important for a pregnant woman to avoid eating different kinds of foods?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
It is important for a pregnant woman to avoid eating different kinds of foods.	58	29	-29
Control group:			
It is important for a pregnant woman to avoid eating different kinds of foods.	26	60	+34

The correct answer from the options given in Figure 4.7 was ‘all of the above’. Of the respondents from the experimental group, seven percent correctly answered the question ‘Which one of the following should a pregnant woman eat more of?’ in the pre-test, while 23% answered correctly in the post-test. The level of knowledge had increased by 16% for the experimental group. Of the respondents from the control group, 24% answered correctly in the pre-test, while 24% answered correctly in the post-test. The level of knowledge remained the same for the control group.

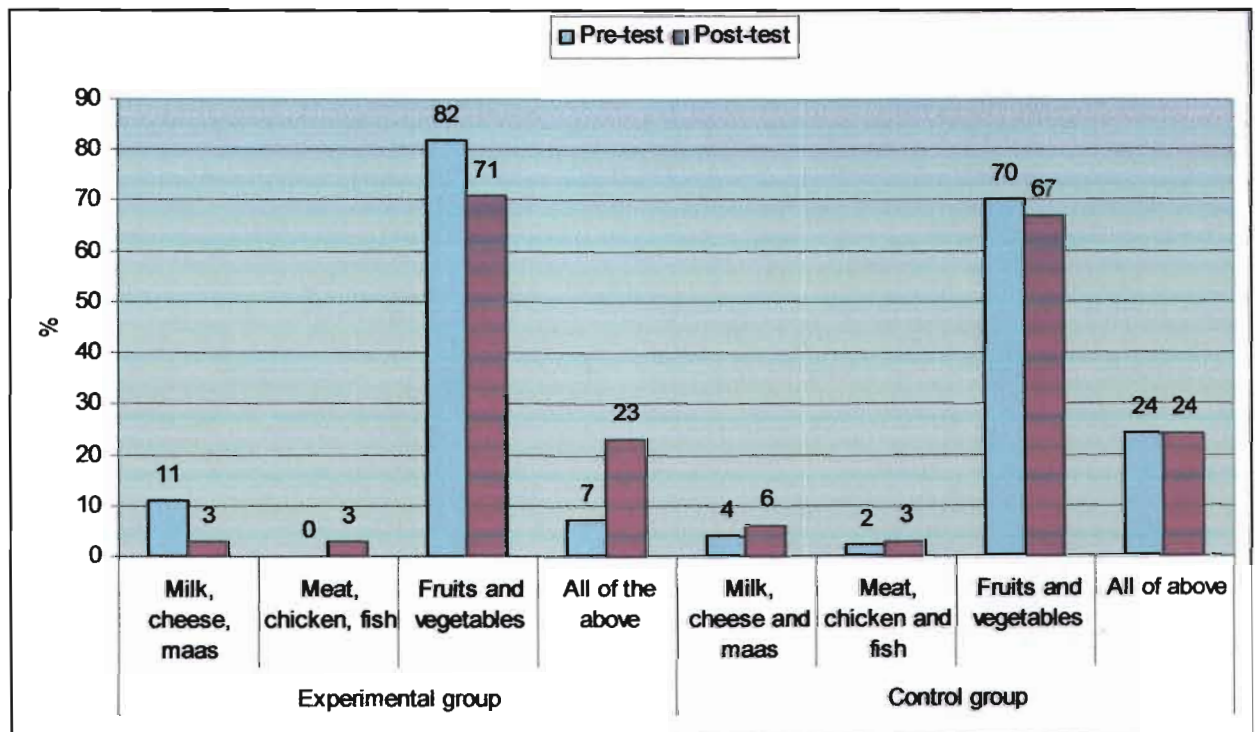


Figure 4.7: Responses of both groups to the question ‘Which one of the following should a pregnant woman eat more of?’

The results for both groups are similar. However, the experimental group showed a 16% improvement after the NEP, whereas the control group showed no difference on the correct answer. Although the experimental group showed an improvement, the majority of subjects indicated the incorrect answers.

#### 4.4.4 Knowledge concerning starch-related questions for both groups

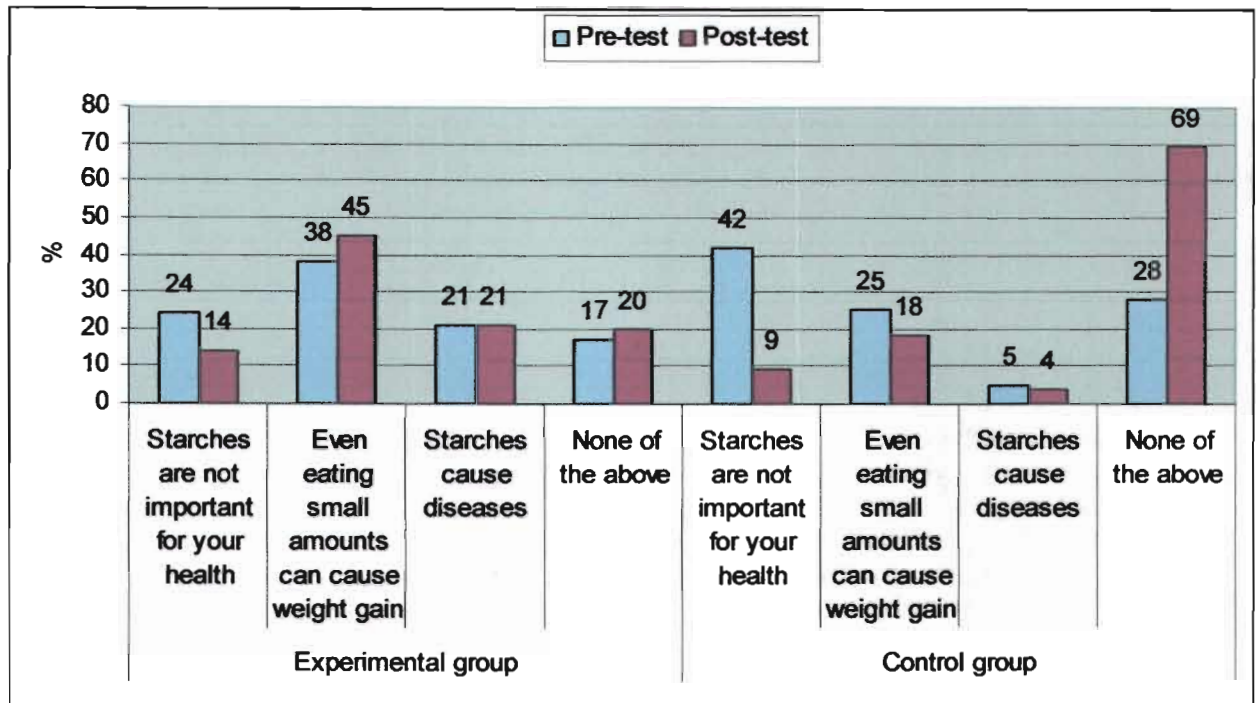


Figure 4.8: Responses of both groups to the question ‘You should not have starches at most meals?’

The correct answer from the options given in Figure 4.8 is ‘None of the above’. The knowledge for both the control and experimental groups was poor. The correct answer showed no significant improvement for both the experimental (three percent) and the control group showed 41% after the implementation of the NEP. The control group showed better understanding and improvement in knowledge as the majority (69%) had indicated the correct answer after the NEP.

#### 4.4.5 Knowledge concerning water-related questions for both groups

The correct answer from the options given in Figure 4.9 was 'seven to nine glasses'. Twenty percent of the respondents from experimental group correctly answered the question 'How much water should you drink a day?' correctly in the pre-test and 65% answered correctly in the post-test. The level of knowledge had increased by 45%. Of the respondents from the control group, answered correctly in the pre-test and 96% answered correctly in the post-test. The level of knowledge had increased by 50%.

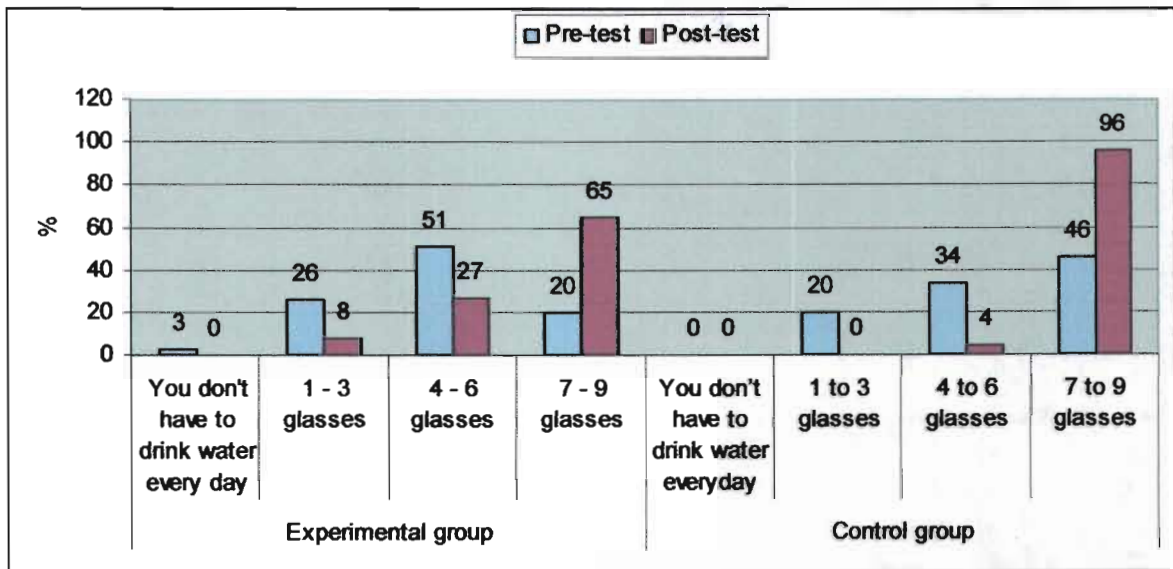


Figure 4.9: Responses of both groups to the question 'How much water should you drink a day?'

The correct answer showed the best improvement after the implementation of the NEP in both the experimental (+45%) and control (+50%) groups. All the wrong answers showed a decrease in percentage, which indicated that the NEP had been effective in both groups. However, the control group had better knowledge in that 96% answered correctly compared to 65% in the experimental group.

#### 4.4.6 Knowledge concerning salt-related questions for both groups

Table 4.8 indicates that 79% of the respondents from the experimental group correctly answered the question ‘Should you add extra salt to your cooked food before you even eat it?’ in the pre-test, while 73% answered correctly in the post-test. The level of knowledge had decreased by six percent for the experimental group. In the control group, 82% of respondents answered correctly in the pre-test and 88% answered correctly in the post-test. There was six percent improvement for the control group.

Table 4.8: Responses to the question ‘Should you add extra salt to your cooked food before you even eat it?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
You should add extra salt to your cooked food before you even eat it.	79	73	-6
Control group:			
You should add extra salt to your cooked food before your even eat it.	82	88	+6

Table 4.9 indicates that 50% of the respondents from the experimental group correctly answered the question ‘Does your body need a little bit of salt to be healthy?’ in the pre-test, while 88% answered correctly in the post-test. The level of knowledge had increased by 38% for the experimental group. In the control group, 79% of the respondents answered correctly in the pre-test and 78% answered correctly in the post-test. The level of knowledge had decreased by one percent for the control group.

Table 4.9: Responses to the question ‘Does your body need a little bit of salt to stay healthy?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Your body needs a little bit of salt to be healthy.	50	88	+38
Control group:			
Your body needs a little bit of salt to be healthy.	79	78	-1

Table 4.10 indicates that 68% of the respondents from the experimental group correctly answered the question ‘Should salt should be added to all foods except fruits?’ in the pre-test, while 36% answered correctly in the post-test. The level of knowledge had decreased by 33% for the experimental group. In the control group, 36% of the respondents answered correctly in the pre-test, while 85% answered correctly in the post-test. The level of knowledge had increased by 49% for the control group.

Table 4.10: Responses to the question ‘Should salt be added to all foods except fruit?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Should salt be added to all foods except fruits	68	36	-32
Control group:			
Should salt be added to all foods except fruits	36	85	+49

With regards to this question, the control group showed better results compared to the experimental group.



#### 4.4.7 Knowledge concerning fruit and vegetable-related questions for both groups

The correct answer from the options given in Figure 4.10 was ‘five or more fruits and vegetables should be eaten daily’. Fourteen percent of the respondents from the experimental group answered the question ‘How many fruits and vegetables should be eaten?’ correctly in the pre-test and 30% answered correctly in the post-test. The level of knowledge had increased by 16%. Of the respondents from the control group, 20% answered correctly in the pre-test and 66% answered correctly in the post-test. The level of knowledge had increased by 44%.

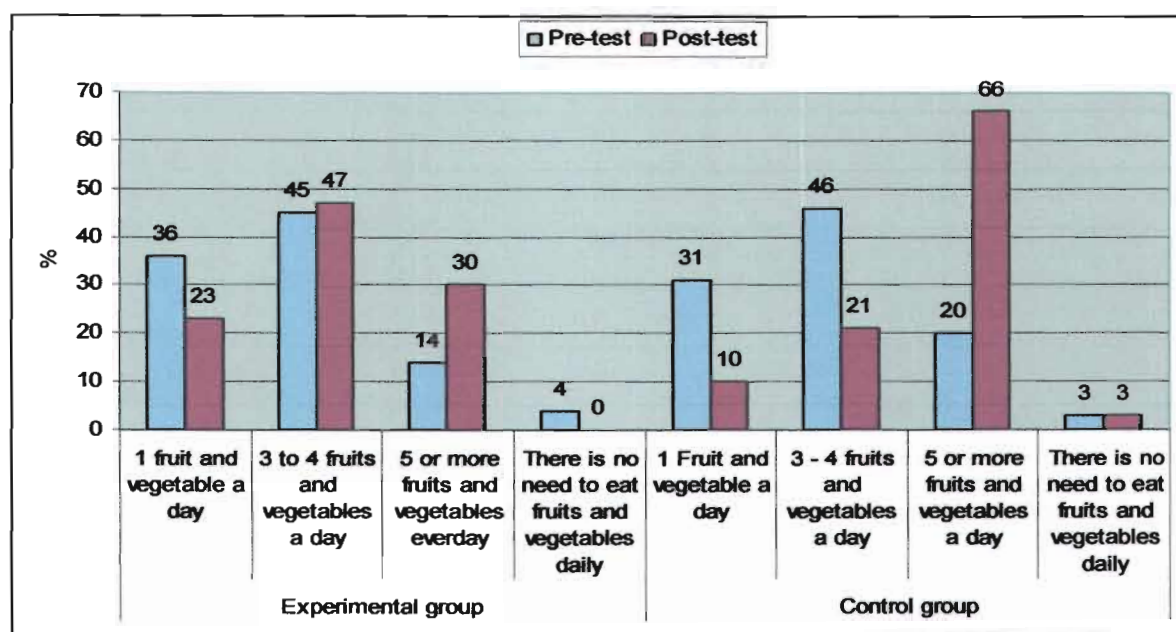


Figure 4.10: Responses of both groups to the question ‘How many fruits and vegetables should be eaten?’

Although both groups had improved results after the NEP had been implemented, the control group showed results of 46% improvement in knowledge of subjects compared to 16% in the experimental group. However, it is encouraging to note that only a small percentage (four percent in the experimental group and three percent in the control group) indicated that there is no need for fruit and vegetables in the diet. After the NEP, the experimental group had 0% of subjects indicating the better.

#### 4.4.8 Knowledge concerning alcohol-related questions for both groups

The majority of the respondents from the experimental group (91%) answered the question correctly in the pre-test, while only 12% of the respondents answered correctly from the control group. Although the level of knowledge had decreased by 18% for the experimental group, the NEP in the control group showed better results.

Table 4.11: Responses to the question ‘Does drinking a lot of beer, wine or cider cause weight gain?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Drinking a lot of wine, beer and cider can cause weight gain.	91	73	-18
Control group:			
Drinking a lot of wine, beer and cider can cause weight gain.	12	67	+55

#### 4.4.9 Knowledge concerning physical activity-related questions for both groups

Table 4.12 indicates that 73% of the respondents from the experimental group answered correctly the question ‘Should people who are overweight not be physically active?’ in the pre-test, while 58% answered correctly in the post-test. The level of knowledge had decreased by 15% for the experimental group. In the control group, 82% of the respondents answered correctly in the pre-test, while 30% answered correctly in the post-test. The level of knowledge had decreased by 52% for the control group.



Table 4.12: Responses to the question ‘Should people who are overweight not be physically active?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
People who are overweight should not be physically active.	73	58	-15
Control group:			
People who are overweight should not be physically active	82	30	-52

The majority of both the experimental (73%) and the control (82%) groups indicated the correct answer, however, the knowledge deteriorated for both groups.

The correct answer from the options given in Figure 4.11 was ‘All of the above’. Thirty-four percent of the respondents from the experimental group answered the question ‘What does being physically active mean?’ correctly in the pre-test and 45% answered correctly in the post-test. The level of knowledge had increased by 11% for the experimental group. Of the respondents from the control group 64% answered correctly in the pre-test, while 75% answered correctly in the post-test. The level of knowledge had increased by 11% for the control group.

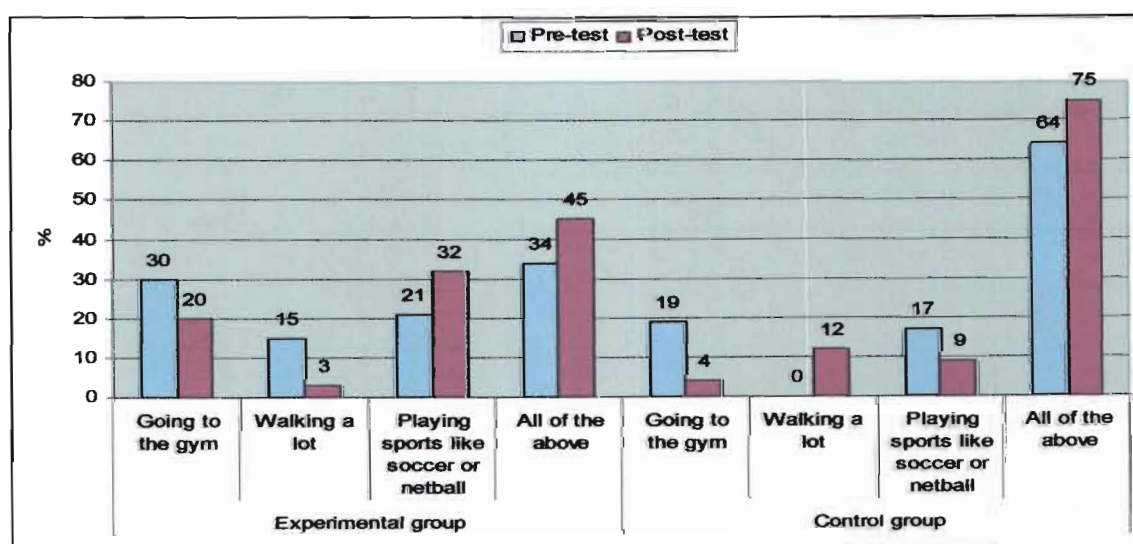


Figure 4.11: Responses of both groups to the question ‘What does physical activity mean?’

Although both groups had improved results after the NEP by (+11%), the control group showed better understanding and knowledge of the question, since the control group had (+75%) and the experimental group had (+45%).

#### 4.4.10 Knowledge concerning healthy eating-related questions for both groups

The correct answer from the options given in Figure 4.12 was ‘Bread, samp, rice, porridge’. Forty four percent of the respondents from the experimental group answered the question ‘Which foods should you eat the most everyday?’ correctly in the pre-test and 27% answered correctly in the post-test. The level of knowledge had decreased by 17% for the experimental group. Of the respondents from the control group, 31% answered correctly in the pre-test, while 54% answered correctly in the post-test. The level of knowledge had increased by 23% for the control group.

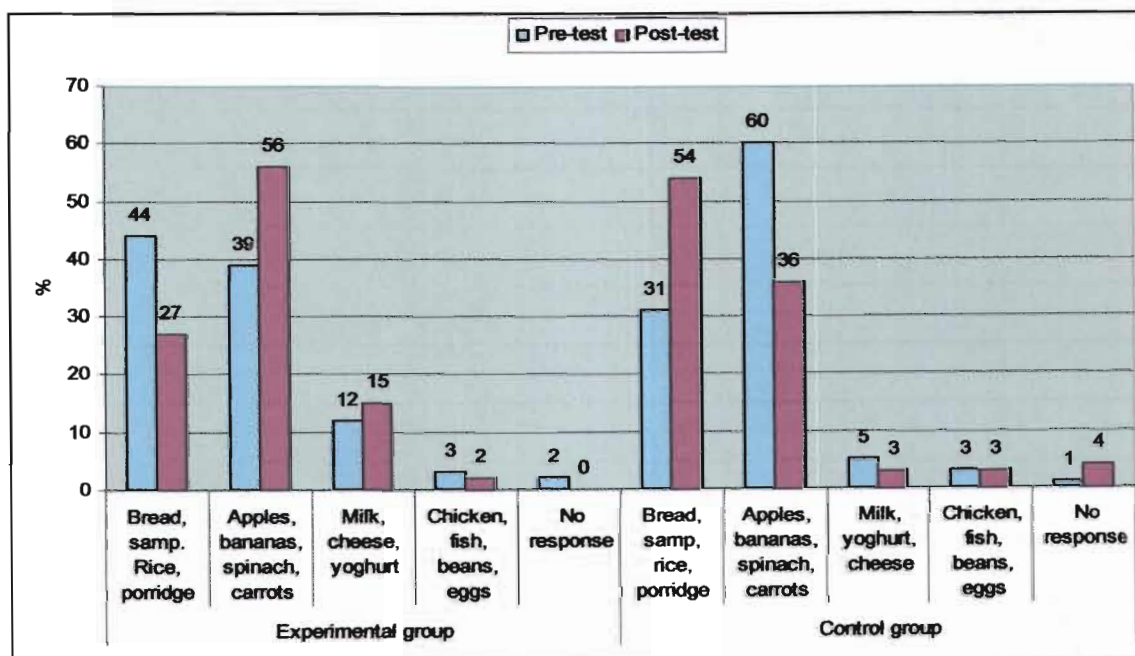


Figure 4.12: Responses of both groups to the question ‘Which group of foods should you eat the most everyday?’

The results indicated that the control group showed an improvement in answering the correct question after the implementation of the NEP (+23%) compared to a decrease in the experimental group (-17%), thus indicating better results.

From the options given in Figure 4.13, the correct answer was 'All of the above'. Only three percent of the respondents from the experimental group answered correctly the question 'The key to a healthy way of eating is to eat which of the following foods?' in the pre-test, while 20% answered correctly in the post-test. The level of knowledge had increased by 17% for the experimental group. Only 19% of the respondents from the control group answered correctly in the pre-test, while 11% answered correctly in the post-test. The level of knowledge had decreased by two percent for the control group.

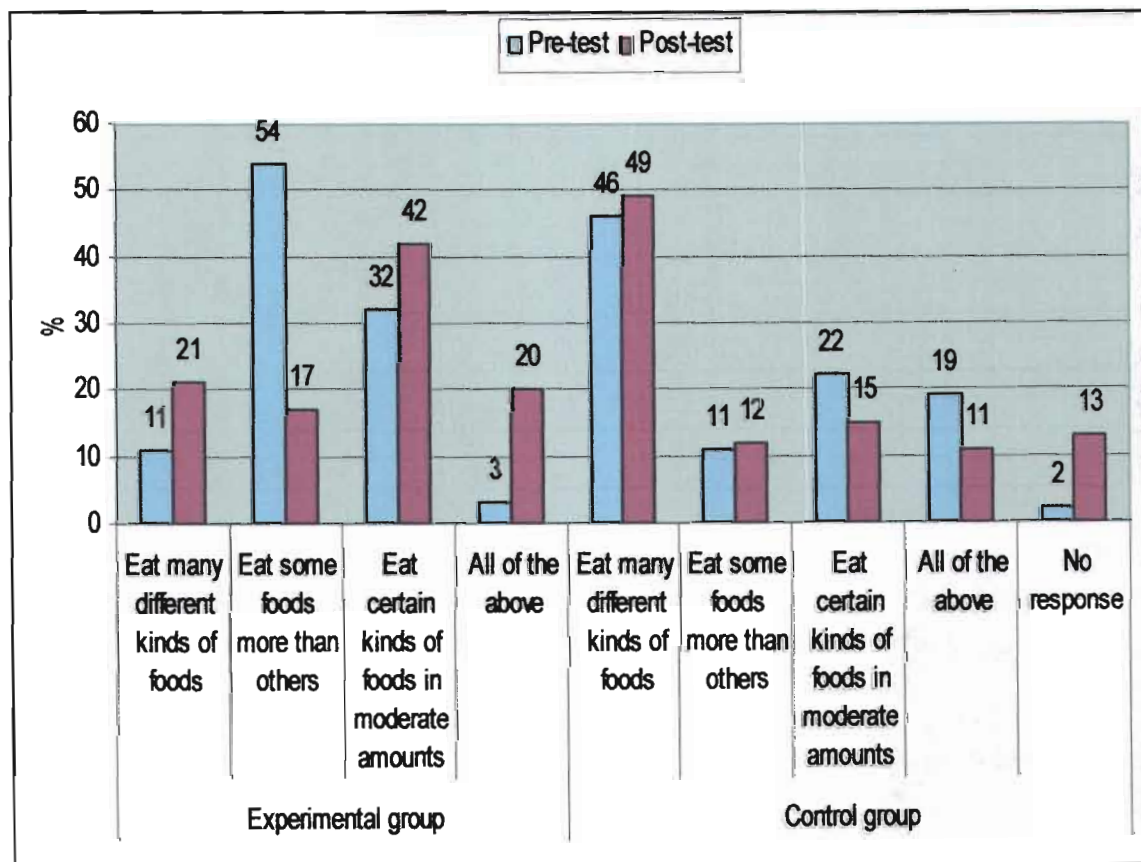


Figure 4.13: Responses of both groups to the question 'The key to a healthy way of eating is to eat which of the following foods?'

Although the experimental group (+17%) showed an improvement after the NEP implementation, the majority of the subjects still indicated the incorrect answer. The level of knowledge of the control group had decreased after the NEP implementation, thus indicating a discouragingly poor knowledge concerning 'the key to a healthy way of eating' for both groups.

Table 4.13 indicates that 48% of the respondents from the experimental group correctly answered the question ‘If you are eating a healthy diet, is there no need to be physically active?’ in the pre-test, while 27% answered correctly in the post-test. The level of knowledge had decreased by 21% for the experimental group. In the control group, 87% of the respondents answered correctly in the pre-test, while 63% answered correctly in the post-test. The level of knowledge had decreased by 24% for the control group.

Table 4.13: Responses to the question ‘If you are eating a healthy diet, is there no need to be physically active?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
If you are eating a healthy diet there is no need for you to be physically active.	48	27	-21
Control group:			
If you are eating a healthy diet there is no need for you to be physically active.	87	63	-24

Both the experimental and control group had shown poorer knowledge after the implementation of the NEP.



The correct answer from the options given in Figure 4.14 was ‘Mostly starches, vegetables and fruits, with smaller amounts of meat and dairy products’. Of the respondents 35% of the experimental group correctly answered the question ‘What does a well balanced diet consist of?’ in the pre-test, while 38% answered correctly in the post-test. The level of knowledge had increased by three percent for the experimental group. Of the respondents from the control group, 19% answered correctly in the pre-test, while 50% answered correctly in the post-test. The level of knowledge had increased by 50% for the control group.

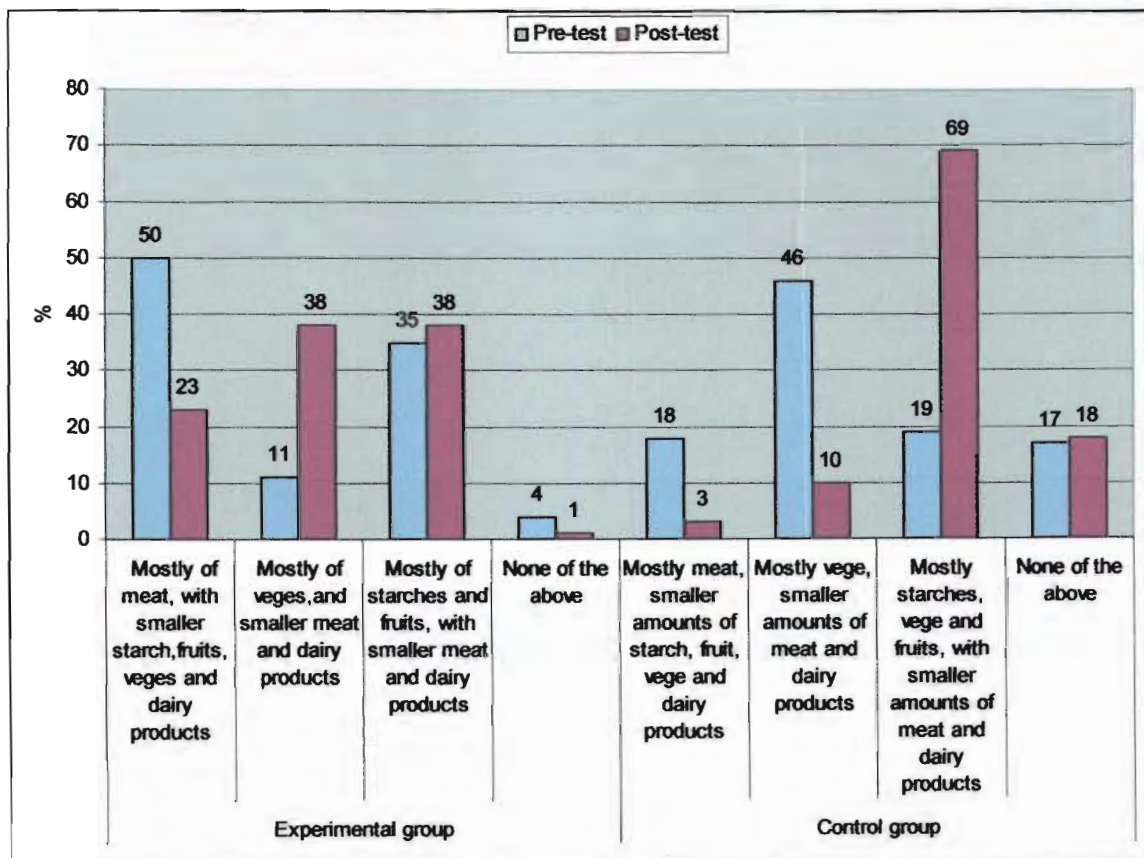


Figure 4.14: Responses of both groups to the question ‘What does well balanced diet consists of?’

The results showed that the control group showed a 50% improvement to the question after the implementation of the NEP compared to only three percent in the experimental group.

Table 4.14 indicates that 36% of the respondents from the experimental group correctly answered the question ‘To protect yourself from disease, should you avoid eating many different kinds of food?’ in the pre-test, while 41% answered correctly in the post-test. The level of knowledge had increased by five percent for the experimental group. In the control group, 67% of the respondents answered correctly in the pre-test, while 81% answered correctly in the post-test. The level of knowledge had increased by 14% for the control group.

Table 4.14: Responses to the question ‘To protect yourself from disease, should you avoid eating many different kinds of food?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
To protect yourself from disease, you should avoid eating many different kinds of foods.	36	41	+6
Control group:			
To protect yourself from disease, you should avoid eating many different kinds of foods.	67	81	+14

Although both the experimental and control groups had shown an improvement in answering the question, the majority of the experimental group still responded incorrectly, while the control group had better results than the experimental group.

The correct answer from the options given in Figure 4.15 was ‘Carrots, spinach, sweet potatoes’. Of the respondents, 42% from the experimental group correctly answered the question ‘Which group of foods has the most vitamin A’ in the pre-test, while 27% answered correctly in the post-test. The level of knowledge had decreased by 15% for the experimental group. Of the respondents from the control group, 34% answered correctly in the pre-test, while 42% answered correctly in the post-test. The level of knowledge had increased by eight percent for the control group.

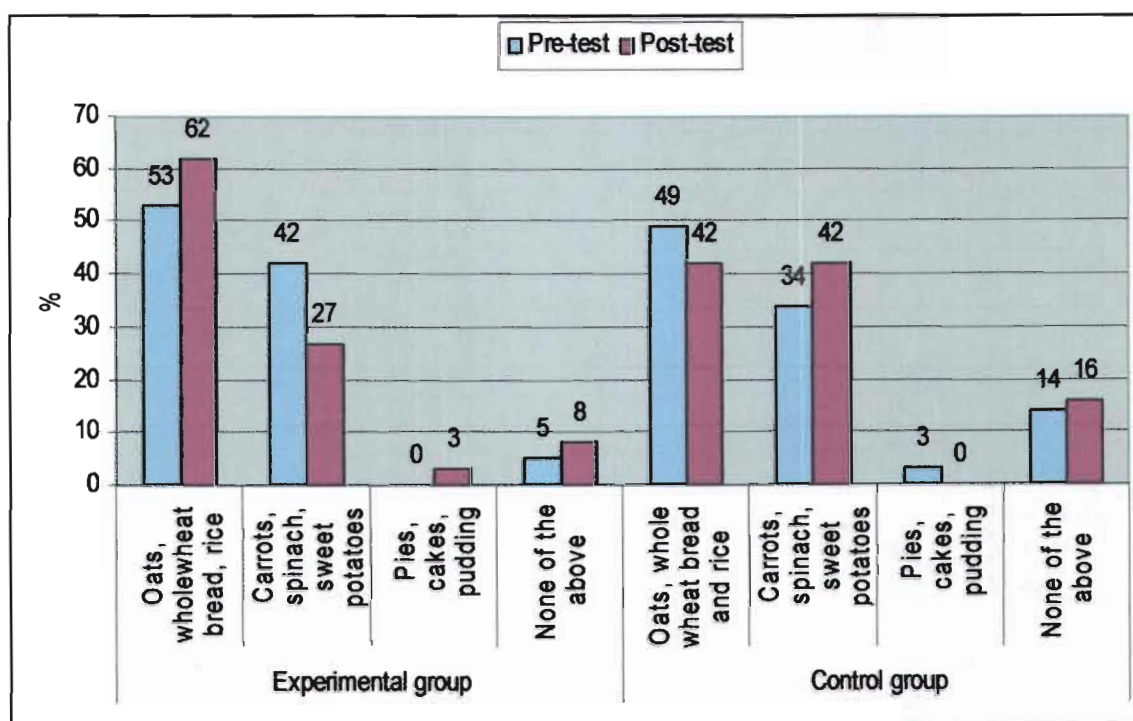


Figure 4.15: Responses of both groups to the question ‘Which group of foods has the most vitamin A?’

Following the NEP implementation, the control group showed an improvement (+8%) in knowledge as to the sources of Vitamin A, when compared to a decrease in the experimental group (-15%). However, the majority of subjects in both groups had failed to answer the question correctly, thus indicating a poor knowledge on vitamin A rich sources, despite the NEP.

Table 4.15 indicates that 32% of the respondents from the experimental group correctly answered the question ‘Is eating a lot of different kinds of food healthier than eating a few kinds of foods?’ in the pre-test, while 64% answered correctly in the post-test. The level of knowledge had increased by 32% for the experimental group. In the control group, 60% of the respondents answered correctly in the pre-test while 57% answered correctly in the post-test. The level of knowledge had decreased by three percent for the control group.

Table 4.15: Responses to the question ‘Is eating a lot of different kinds of food healthier than eating a few kinds of foods?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Eating a lot of different kinds of food is healthier than eating only a few kinds of foods.	32	64	+32
Control group:			
Eating a lot of different kinds of food is healthier than eating only a few kinds of foods.	60	57	-3

The experimental group showed an improvement in answering the question. However, even though the control group showed poorer knowledge after the NEP implementation, the majority of the subjects from the control group answered the question correctly.



From the options given in Figure 4.16, the correct answer was 'Fibre and vitamin A'. Of the respondents, 45% from the experimental group correctly answered the question 'Which of the following groups of nutrients are found in large amounts in fruits and vegetables?' in the pre-test, while 64% answered correctly in the post-test. The level of knowledge had increased by 19% for the experimental group. Of the respondents from the control group, 64% answered correctly in the pre-test, while 33% answered correctly in the post-test. The level of knowledge had decreased by 31% for the control group.

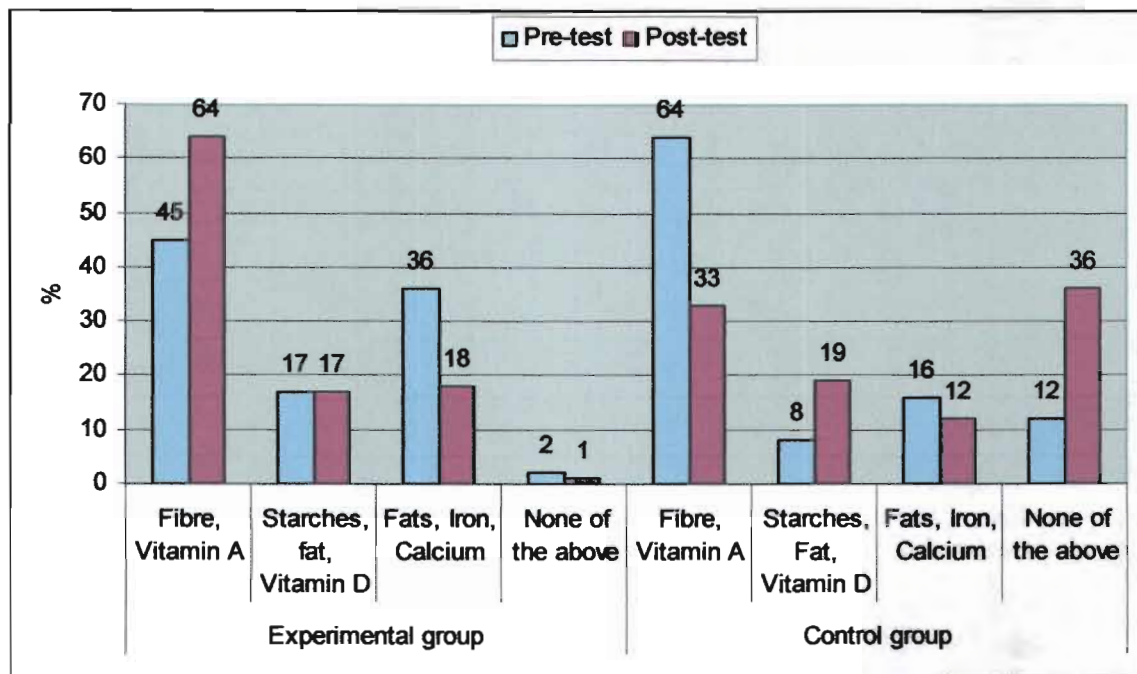


Figure 4.16: Responses of both groups to the question 'Which of the following groups of nutrients are found in large amounts in fruits and vegetables?'

After implementation of the NEP, the experimental group showed an improvement (+19%) in knowledge with regard the nutrients found in fruit and vegetables when compared to a decrease in the control group (-31%).

#### 4.4.11 Knowledge concerning calcium-related questions for both groups

From the options given in Figure 4.17, the correct answer was 'Milk, yoghurt and Pilchards'. Only eight percent of the respondents from the experimental group had correctly answered the question 'Which foods contain a lot of calcium?' in the pre-test, while 20% answered correctly in the post-test. The level of knowledge had increased by 12% for the experimental group. Of the respondents, 22/5 from the control group had answered correctly in the pre-test, while only six percent answered correctly in the post-test. The level of knowledge had decreased by 16% for the control group.

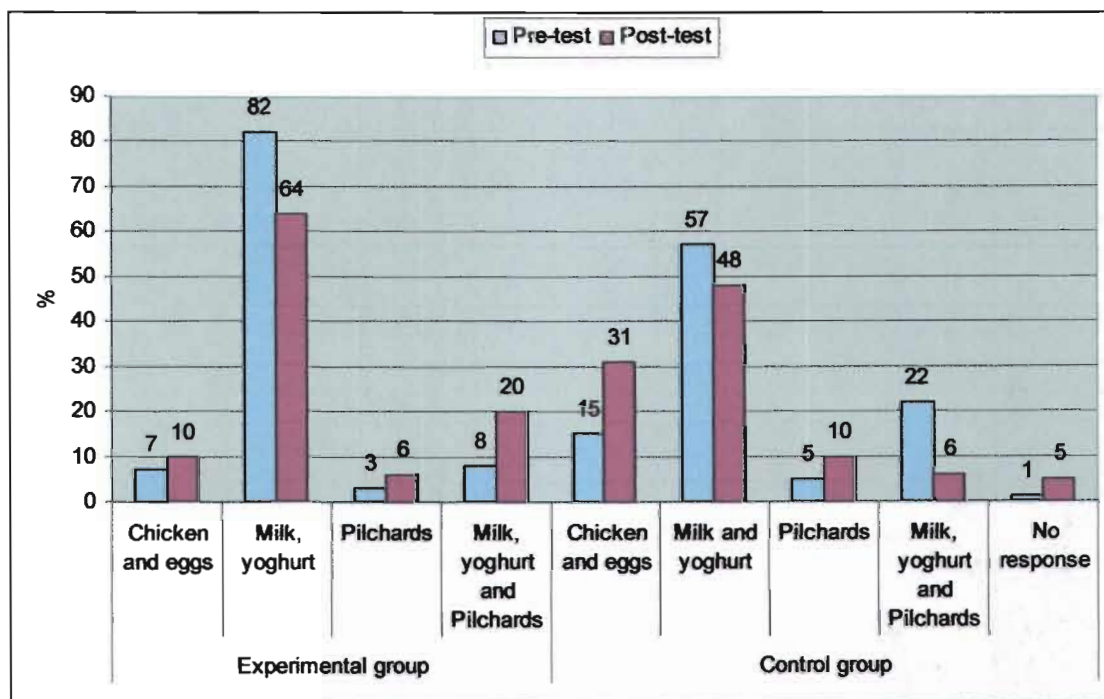


Figure 4.17: Responses of both groups to the question 'Which foods contain a lot of calcium?'

The majority of subjects in both groups indicated that milk and yoghurt are good sources of Calcium. In both the experimental and control groups, the NEP had failed to teach the subjects that pilchards are also a good source of calcium.

The correct answer from the options given in Figure 4.18 was 'Two cups'. Of the respondents, 35% from the experimental group correctly answered the question 'How much milk or mass should you have a day?' in the pre-test, while 32 % answered correctly in the post-test. The level of knowledge had decreased by three percent for the experimental group. Only 13% of the respondents from the control group had answered correctly in the pre-test, while 57 % answered correctly in the post -test. The level of knowledge had increased by 44% for the control group.

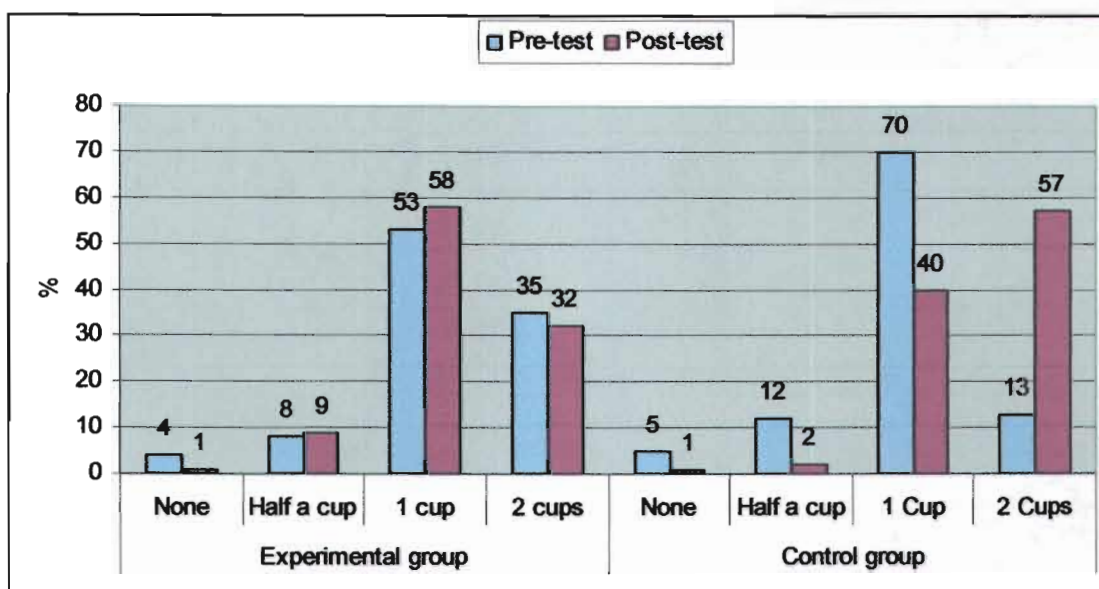


Figure 4.18: Responses of both groups to the question 'How much milk or maas should you drink a day?'

The control group showed a significant improvement (+44%) in the knowledge of the quantity of milk/maas that should be consumed per day when compared to a decrease (three percent) in the experimental group. It is encouraging to see that in both groups, the majority of subjects indicated at least one cup a day and not less.

#### 4.4.12 Knowledge concerning fibre-related questions for both groups

The correct answer from the options given in Figure 4.19 was 'Oats, apples and beans'. Although the level of knowledge had decreased by six percent for the experimental group, 67% of the respondents from the experimental group correctly answered the question 'Which foods contain a lot of fibre?' in the pre-test, while 61% answered correctly in the post-test, compared to the deterioration (-39%) evident in the control group.

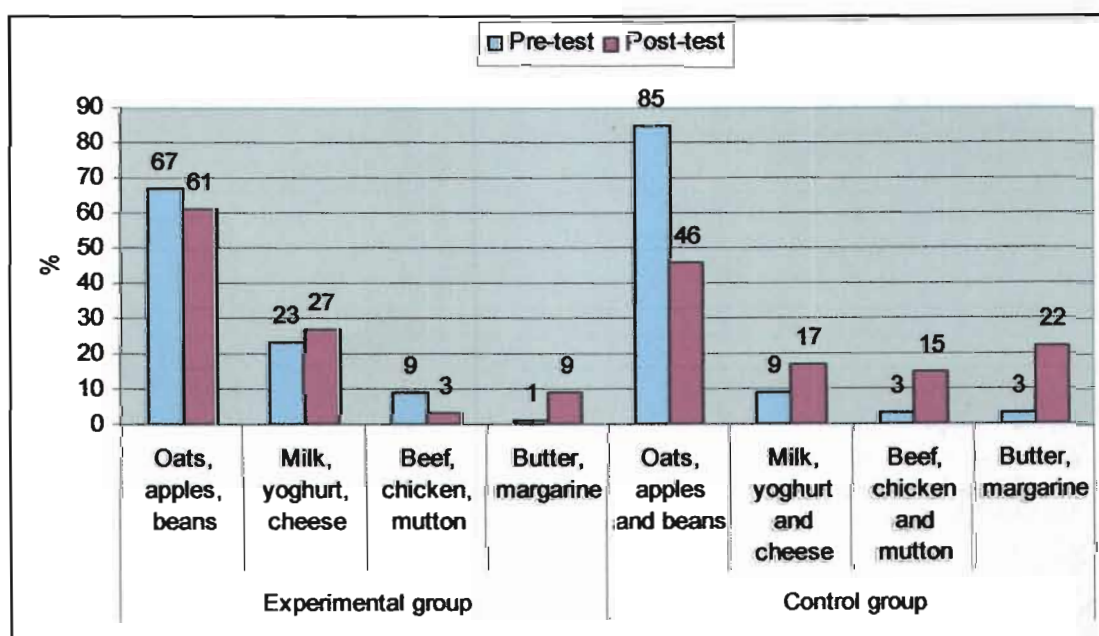


Figure 4.19: Responses of both groups to the question 'Which foods contain a lot of fibre?'

#### 4.5 Nutrition knowledge concerning issues not addressed in the playing cards

##### 4.5.1 Nutritional knowledge concerning sugar-related questions for both groups

Table 4.16 indicates that 12% of the respondents from the experimental group had better knowledge concerning the question of ‘Can a little sugar be eaten when one is trying to lose weight?’ when compared to a decrease of four percent in the control group.

Table 4.16: Responses to the question ‘Can a little sugar be eaten when one is trying to lose weight?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
A little sugar can be eaten when one is trying to lose weight.	65	77	+12
Control group:			
A little sugar can be eaten when one is trying to lose weight.	52	48	-4

Table 4.17 indicates that 55% of the respondents from the experimental group correctly answered the question ‘Does sugar contain a lot of vitamins and minerals?’ in the pre-test, while 44% answered correctly in the post-test. The level of knowledge had decreased by ten percent for the experimental group. In the control group, 79% of the respondents answered correctly in the pre-test, while 72% answered correctly in the post-test. The level of knowledge had decreased by seven percent for the control group.

Table 4.17: Responses to the question ‘Does sugar contains a lot of vitamins?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Sugar contains a lot of vitamins and minerals.	55	44	-10
Control group:			
Sugar contains a lot of vitamins and minerals.	79	72	-7

Even though both groups showed poorer knowledge after the implementation of the NEP, at least the majority of the control group still indicated the correctly answer.



#### 4.5.2 Knowledge concerning meat-related questions for both groups

The correct answer from the options given in Figure 4.20 was 'All of the above'. Of the respondents from the experimental group, 64% correctly answered the question 'Why is cooked meat sold on the street not always safe to eat?' in the pre-test, while 27% answered correctly in the post-test. The level of knowledge had decreased by 37% for the experimental group. Of the respondents, 61% from the control group correctly answered the question in the pre-test, while 64% answered correctly in the post-test. The level of knowledge had increased by three percent for the control group.

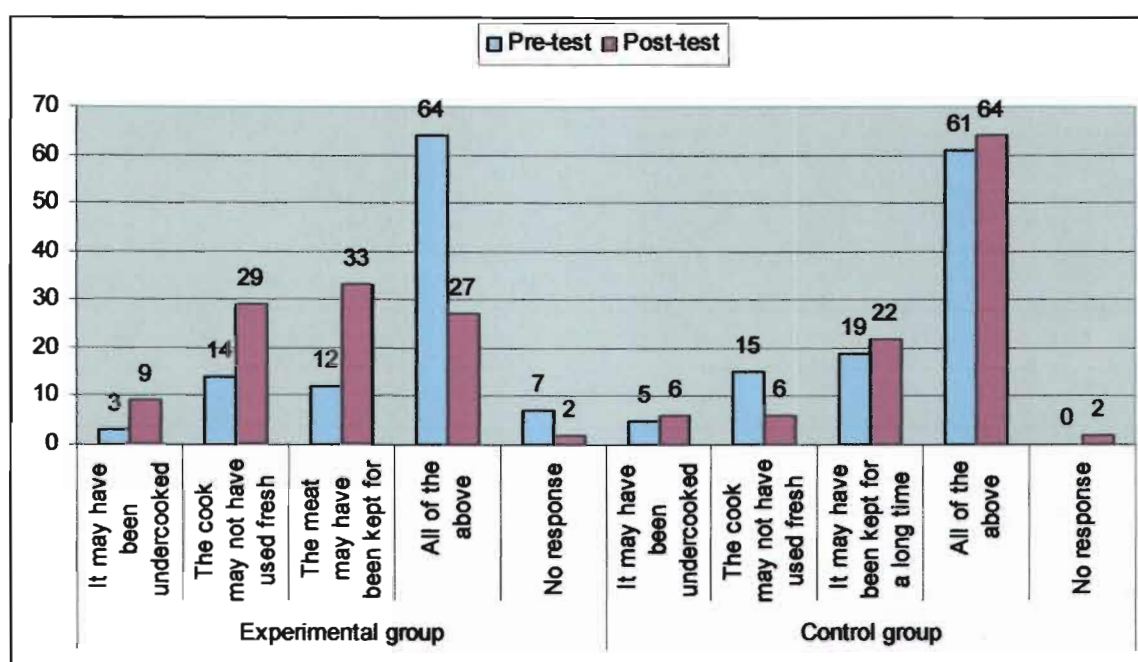


Figure 4.20: Responses of both groups to the question 'Why is cooked meat sold on the street not always safe to eat?'

Although after the NEP implementation the control group had shown a small increase in knowledge (three percent), the majority of the subjects had a good knowledge of meat sold by street vendors. However, the experimental group had a poor knowledge as only 27% answered correctly. This showed a poorer result of 37% from before the NEP.

From the options given in Figure 4.21, the correct answer was 'leave it in the fridge'. Of the respondents 18% of the experimental group correctly answered the question 'Which is the best place to defrost meat?' in the pre-test, while 26% answered correctly in the post-test. The level of knowledge had decreased by eight percent for the experimental group. Of the respondents from the control group, 18% answered the question correctly in the pre-test, while 34% answered correctly in the post-test. The level of knowledge had increased by 16% for the control group.

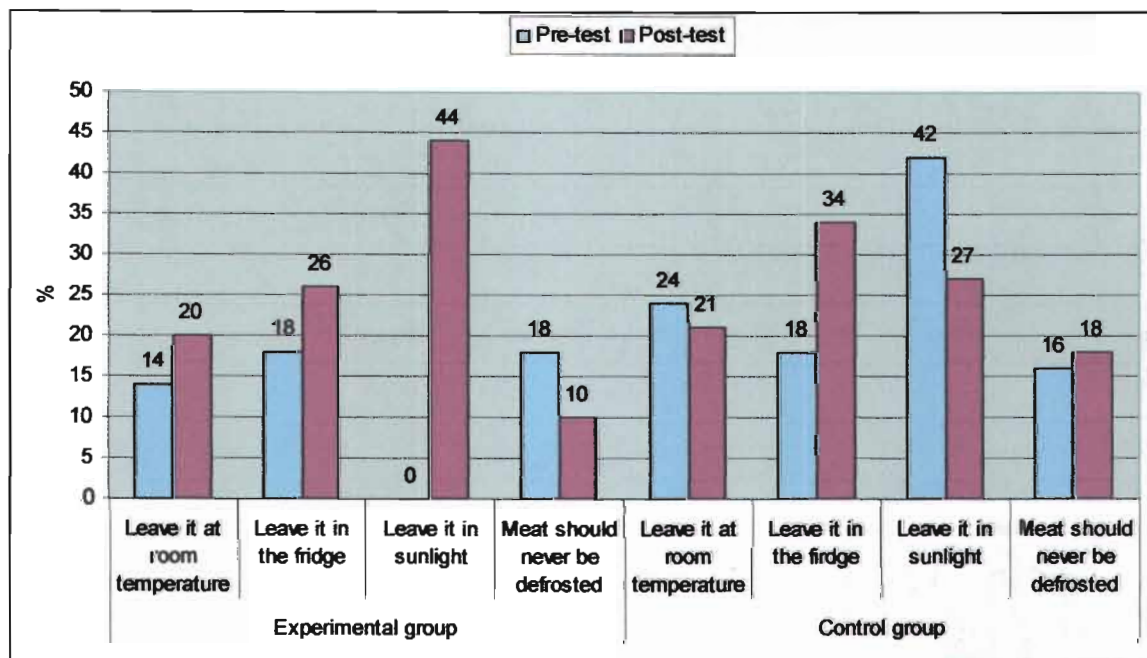


Figure 4.21: Responses of both groups to the question 'Which is the best place to defrost meat?'

Although an improvement had taken place in the knowledge of both groups, the majority in both groups answered the question incorrectly, indicating poor knowledge even after the NEP implementation.



From the options given in figure 4.22, the correct answer was ‘In the fridge for two days only and the freezer for three to four months’. Of the respondents from the experimental group, 18% correctly answered the question ‘From which storage will meat, fish or chicken not spoil?’ in the pre-test while eight percent answered correctly in the post-test. The level of knowledge had decreased by ten percent for the experimental group. Of the respondents from the control group, 42% correctly answered the question in the pre-test, while 38% answered correctly in the post-test. The level of knowledge had decreased by four percent for the control group. Therefore the results show poor knowledge in both groups.

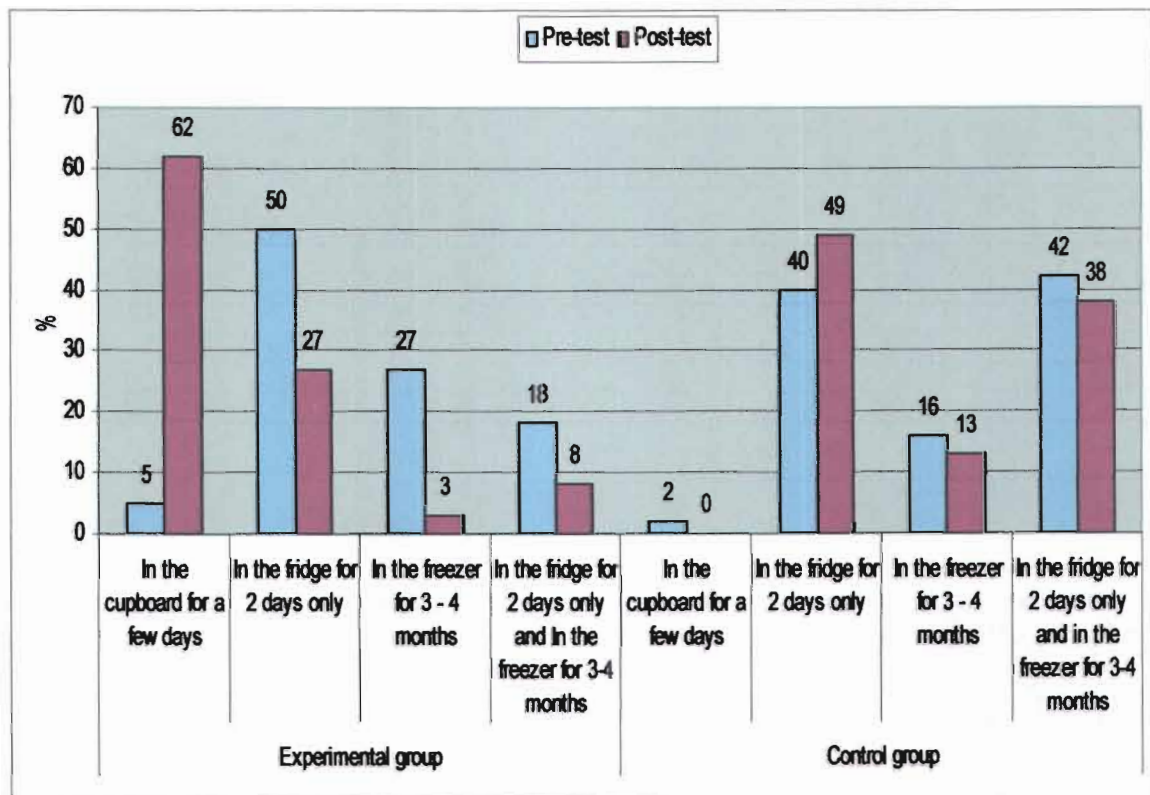


Figure 4.22: Responses of both groups to the question ‘From which storage will meat, fish or chicken not spoil?’

Table 4.18 indicates that 92% of the respondents from the experimental group correctly answered the question ‘Can you eat as much meat as you want everyday?’ in the pre-test, while 86% answered correctly in the post-test. The level of knowledge had decreased by six percent for the experimental group. In the control group, 94% of the respondents answered correctly in the pre-test, while 70% answered correctly in the post-test. The level of knowledge had decreased by 24% for the control group.

Table 4.18: Responses to the question ‘Can you eat as much meat as you want everyday?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
You can eat as much meat as you want everyday.	92	86	-6
Control group:			
You can eat as much meat as you want everyday.	94	70	-24

Although there was a decrease of knowledge percentage in both groups, both groups show good knowledge on the quantity of meat to be consumed per day as the majority answered the question correctly in the post-test, being 86% of the experimental and 70% in the control group respondents.

### 4.5.3 Knowledge concerning pregnancy-related questions for both groups

Table 4.19 indicates that 80% of the respondents from the experimental group correctly answered the question ‘Does what a pregnant woman eat during pregnancy have no effect on her health and the health of her unborn baby?’ in the pre-test, while 35% answered correctly in the post-test. The level of knowledge had decreased by 45% for the experimental group. In the control group, 73% of the respondents answered correctly in the pre-test, while 64% answered correctly in the post-test. The level of knowledge had decreased by nine percent for the control group.

Table 4.19: Responses to the question ‘Does what a pregnant woman eat during pregnancy have no effect on her health and the health of her unborn baby?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
What a pregnant woman eats during pregnancy has no effect on her health and the health of her unborn baby.	80	35	-45
Control group:			
What a pregnant woman eats during pregnancy has no effect on her health and the health of her unborn baby.	73	64	-9

Even though the knowledge deteriorated in both groups, the majority of subjects of the control group indicated the correct answer. However, the experimental group had poorer results as not even half the subjects indicated the correct answer after the NEP implementation.

Table 4.20 indicates that 50% of the respondents from the experimental group correctly answered the question ‘Should women try not to gain weight when they are pregnant?’ in the pre-test, while 55% answered correctly in the post-test. The level of knowledge had increased by five percent for the experimental group. In the control group, 43% of the respondents answered correctly in the pre-test, while 21% answered correctly in the post-test. The level of knowledge had decreased by 22% for the control group. The experimental group thus showed better knowledge.

Table 4.20: Responses to the question ‘Should women try not to gain weight when they are pregnant?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Women must try not to gain weight when they are pregnant.	50	55	+5
Control group:			
Women must try not to gain weight when they are pregnant.	43	21	-22

#### 4.5.4 Knowledge concerning starch-related questions for both groups

Table 4.21 indicates that 44% of the respondents from the experimental group correctly answered the question 'Should starchy foods not be eaten when one is trying to lose weight' in the pre-test, while 38% answered correctly in the post-test. The level of knowledge had decreased by six percent for the experimental group. In the control group, 46% of the respondents answered correctly in the pre-test, while 58% answered correctly in the post-test. The level of knowledge had increased by 12% for the control group, thus indicating a better knowledge of consuming starch when following a weight loss programme.

Table 4.21: Responses to the question 'Should starchy foods not be eaten when one is trying to lose weight?'

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Starchy foods should not be eaten when one is trying to lose weight.	44	38	-6
Control group:			
Starchy foods should not be eaten when one is trying to lose weight.	46	58	+12

Results indicated that both groups had a good knowledge of bread and weight loss, as 85% of the respondents from the experimental group answered the question correctly compared with 79% in the control group.

Table 4.22: Responses to the question ‘Does eating bread always cause weight gain?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Eating bread always causes weight gain.	77	85	+8
Control group:			
Eating bread always causes weight gain.	90	79	-11

#### 4.5.5 Knowledge concerning water-related questions for both groups

Table 4.23 indicates that 61% of the respondents from the experimental group correctly answered the question ‘Is all water safe to drink’ in the pre-test, while only nine percent answered correctly in the post-test. The level of knowledge had decreased by 52% for the experimental group. In the control group, 90% of respondents answered correctly in the pre-test, while 72% answered correctly in the post-test. The level of knowledge had decreased by 18% for the control group.

Table 4.23: Responses to the question ‘Is all water safe to drink’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
All water is safe to drink.	61	9	-52
Control group:			
All water is safe to drink.	90	72	-18

Table 4.24 indicates that 61% of the respondents from the experimental group correctly answered the question ‘Is drinking boiled water a good way to lose weight?’ in the pre-test, while 80% answered correctly in the post-test. The level of knowledge had increased by 19% for the experimental group. In the control group, 49% of the respondents answered correctly in the pre-test, while 76% answered correctly in the post-test. The level of knowledge had increased by 27% for the control group. The results indicate notable improvement after the NEP implementation, as the majority of both groups indicated the correct question.

Table 4.24: Responses for the question “Is drinking water a good way to lose weight”.

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Drinking boiled water is a good way to lose weight	61	80	+19
Control group:			
Drinking boiled water is a good way to lose weight	49	76	+27

#### 4.5.6 Knowledge concerning fruit and vegetables-related questions for both groups

From the options given in Figure 4.23, the correct answer was 'Half a cup'. Of the respondents from the experimental group, 29% correctly answered the question 'What is a portion of cooked vegetables?' in the pre-test, while 24% answered correctly in the post-test. The knowledge level had decreased by five percent for the experimental group. Of the respondents from the control group, 25% answered correctly in the pre-test, while 16% answered correctly in the post-test. The knowledge level had decreased by nine percent for the control group. Thus both groups had a poor knowledge of the size of a portion of cooked vegetables.

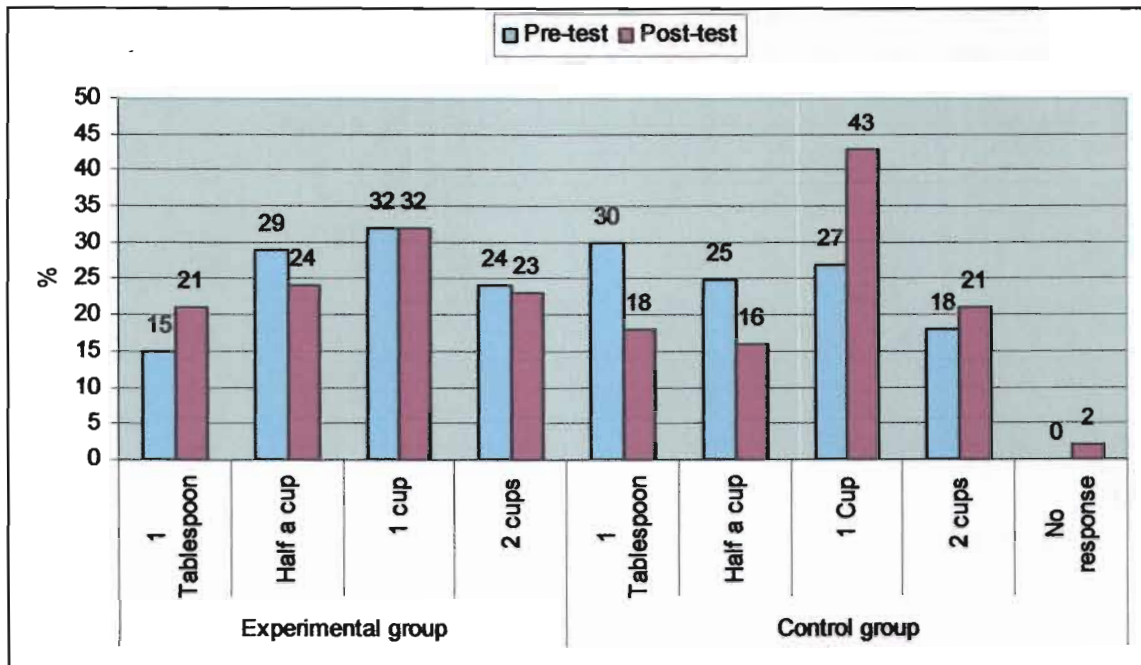


Figure 4.23: Responses of both groups to the question 'What is a portion of cooked vegetables?'



Table 4.25 indicates that 30% of the respondents from the experimental group correctly answered the question ‘Is it usually not necessary to wash vegetables before you cook them?’ in the pre-test, while only six percent answered correctly in the post-test, indicating a decrease in knowledge of 24% for the experimental group. In the control group, 88% of the respondents answered correctly in the pre-test, while 60% answered correctly in the post-test. The level of knowledge had decreased by 28% for the control group.

Table 4.25: Responses to the question ‘Is it usually not necessary to wash vegetables before you cook them?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
It is usually not necessary to wash vegetables before you cook them.	30	6	-24
Control group:			
It is usually not necessary to wash vegetables before you cook them.	88	60	-28

#### 4.5.7 Knowledge concerning fat-related questions for both groups

From the options given in Figure 4.24 was 'Popcorn'. Of the respondents from the experimental group, 45% correctly answered the question 'Which of the following is a low fat snack?' in the pre-test, while 30% answered correctly in the post-test. The level of knowledge had decreased by 15%. Of the respondents from the control group, 45% answered correctly in the pre-test, while 30% answered correctly in the post-test. The level of knowledge had decreased by 15%.

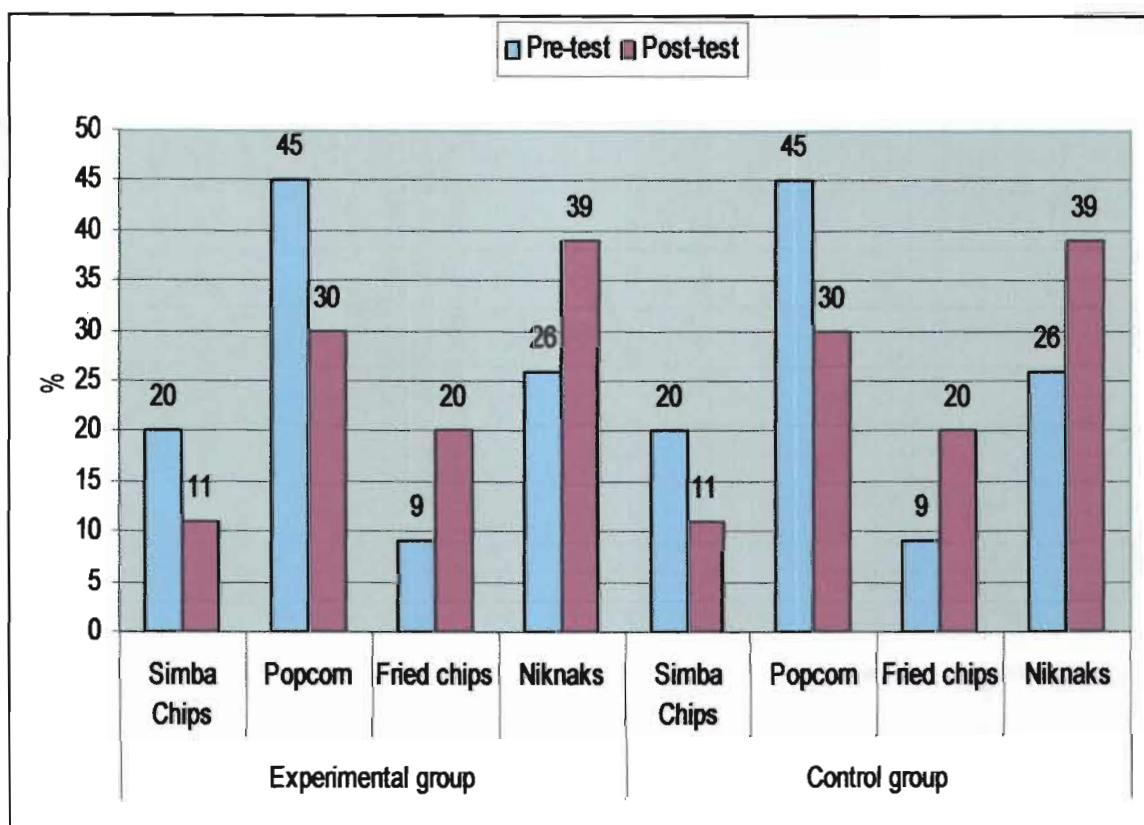


Figure 4.24: Responses of both groups to the question 'Which of the following is a low fat snack?'

After the implementation of the NEP, both groups showed a poorer knowledge, as not even half of the subjects from either group indicated the correct answer.

From the options given in Figure 4.25, the correct answer was 'A tub of unbuttered popcorn'. Of the respondents from the experimental group, 18% correctly answered the question 'What is the healthiest snack?' in the pre-test, while 17% answered correctly in the post-test. The knowledge level had decreased by one percent. Of the respondents from the control group, 31% answered correctly in the pre-test, while 18% answered correctly in the post-test. The knowledge level had decreased by 13%. Both groups showed very poor knowledge despite the implementation of the NEP.

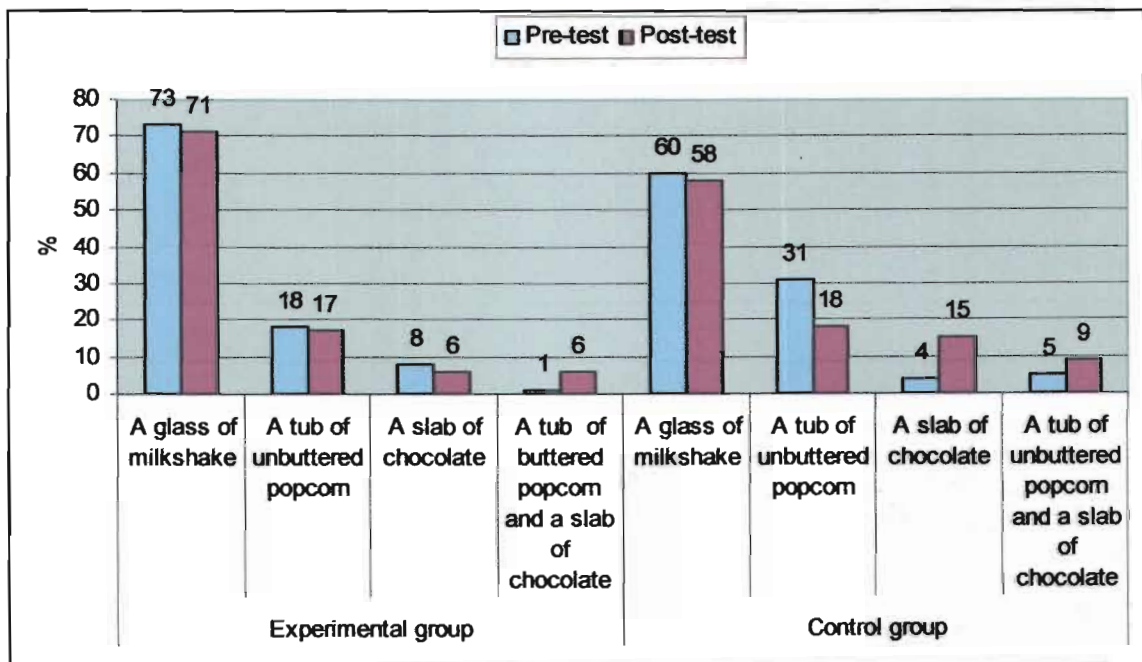


Figure 4.25: Responses of both groups to the question 'What is the healthiest snack?'

From the options given in Figure 4.26, the correct answer was ‘Grilled lean steak and boiled carrots’. Of the respondents from the experimental group, 21% correctly answered the question ‘Which of the following foods are the lowest in fat?’ in the pre-test, while 12% answered correctly in the post-test, thus indicating a decrease of nine percent. However, the knowledge of the control group had increased by 29%, from 19% to 48%.

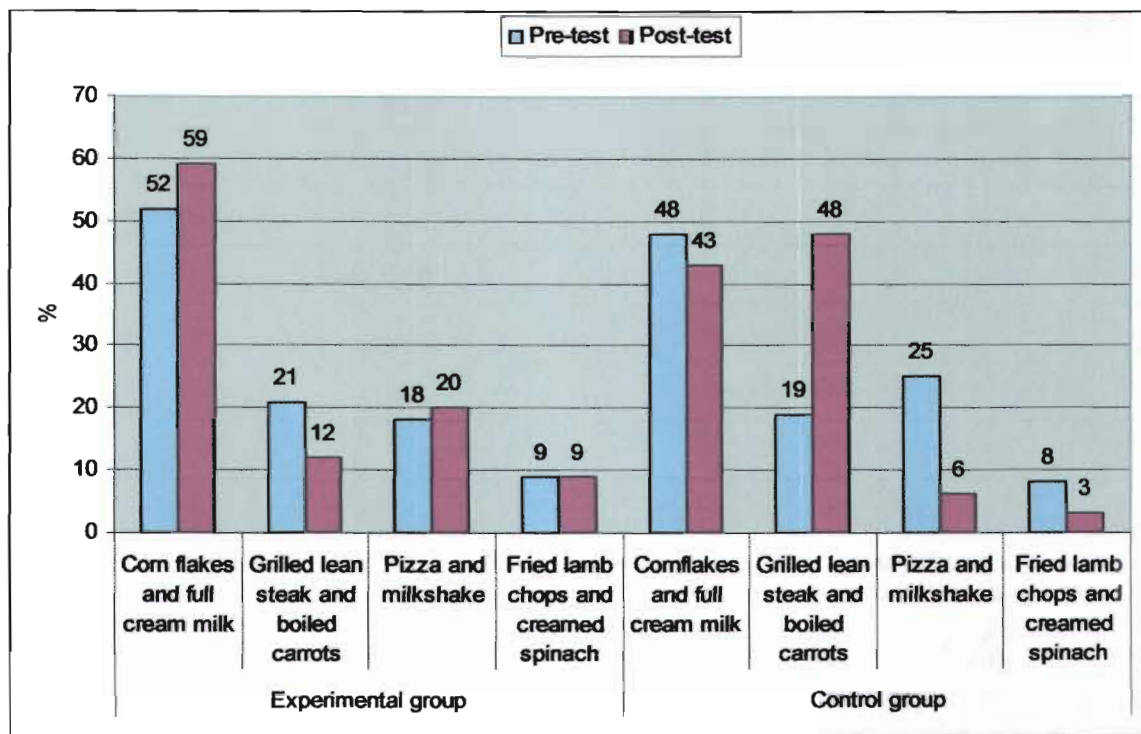


Figure 4.26: Responses of both groups to the question ‘Which of the following foods are the lowest in fat?’

From the options given in Figure 4.27, the correct answer was 'Whole-wheat toast with thinly spread margarine and Weet-bix with 2% fat milk'. Only one percent of the respondents from the experimental group had correctly answered the question 'Which of the following breakfast menus contain little fat?' correctly in the pre-test while 17% answered correctly in the post-test. The level of knowledge had increased by 16% for the experimental group. Of the respondents from the control group, 42% answered correctly in the pre-test, while 39% answered correctly in the post-test. The level of knowledge had decreased by three for the control group. However, a small percentage of both groups indicated the right answer, thus indicating poor knowledge on fat content of breakfast cereals.

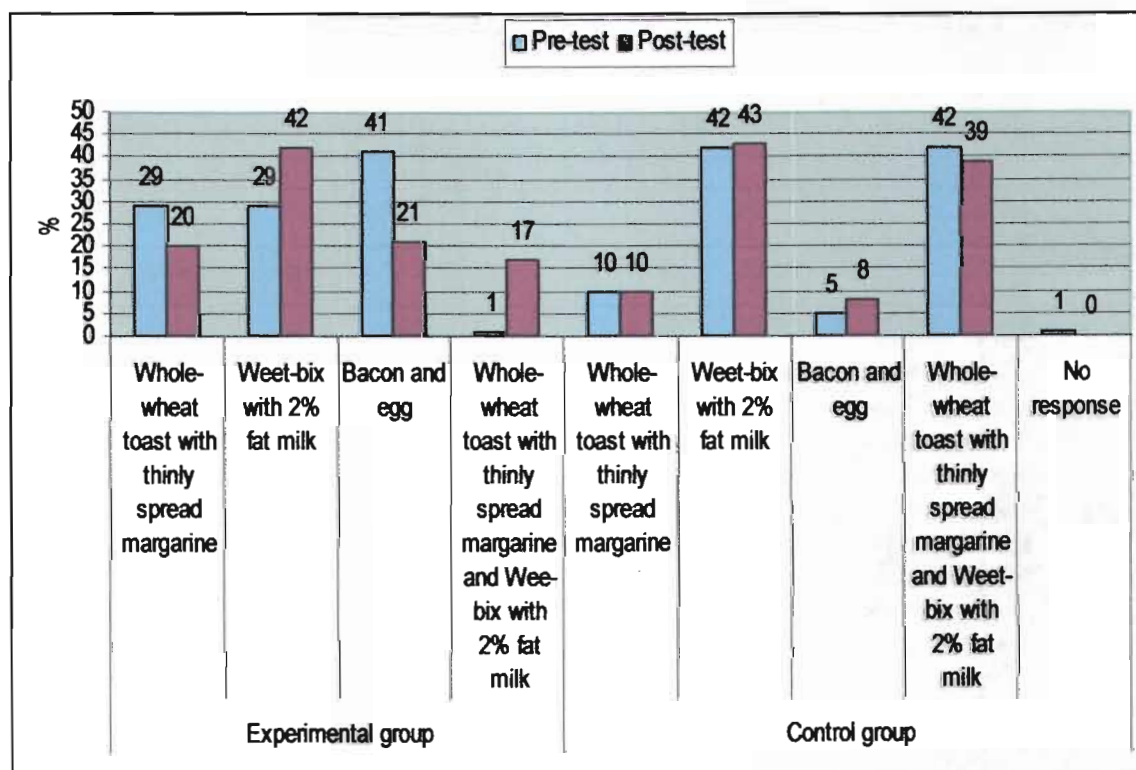


Figure 4.27: Responses of both groups to the question 'Which of the following breakfast menus contain little fat?'

#### 4.5.8 Knowledge concerning alcohol-related questions for both groups

Table 4.26 indicates that 52% of the respondents from the experimental group had correctly answered the question ‘Can you drink as much wine, beer and ciders as you want, provided you have eaten first?’ in the pre-test, while 35% answered correctly in the post-test. The level of knowledge had decreased by 17% for the experimental group. In the control group, 51% of the respondents answered correctly in the pre-test, while 51% answered correctly in the post-test. The level of knowledge remained the same for the control group.

Table 4.26: Responses to the question ‘Can you drink as much wine, beer and ciders as you want, provided you have eaten first?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
You can drink as much wine, beer and ciders you want provided you have eaten first.	52	35	-17
Control group:			
You can drink as much wine, beer and ciders you want provided you have eaten first.	51	51	0



#### 4.5.9 Knowledge concerning healthy eating-related questions for both groups

The correct answer from the options given in Figure 4.28 was 'Fish, chicken without skin, and lean meat'. Although compared with 27% in the control group, only 45% of the respondents from the experimental group answered correctly in the post-test.

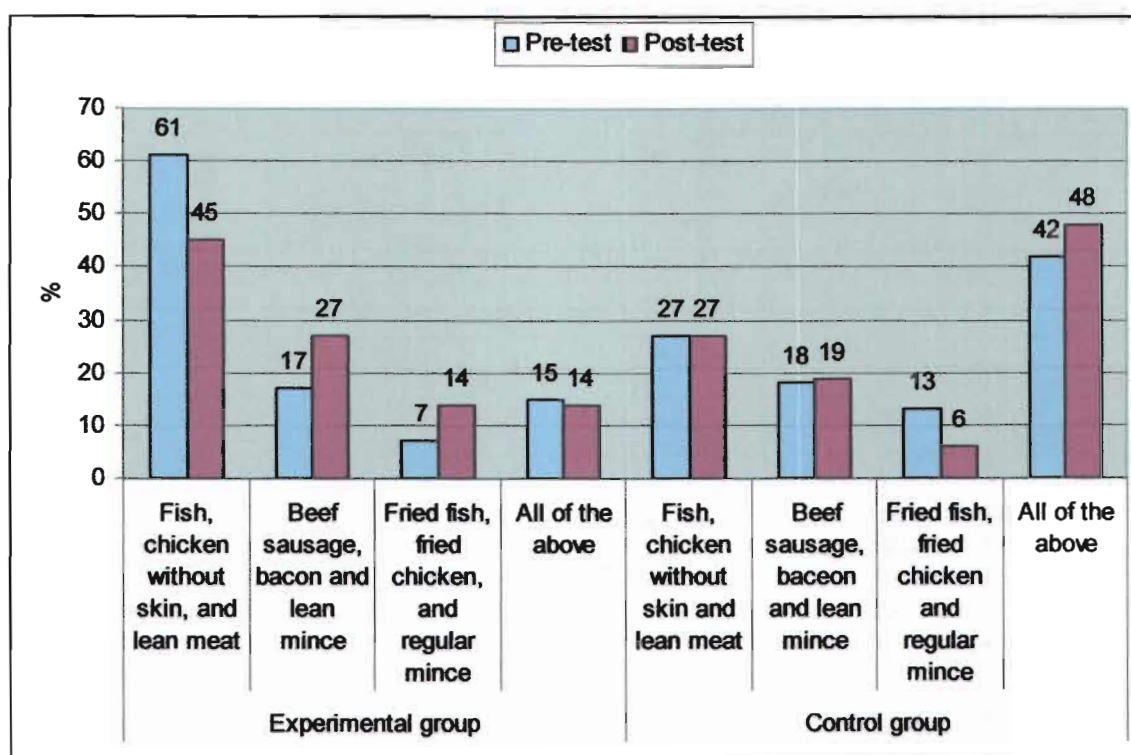


Figure 4.28: Responses of both groups to the question 'Which of the following foods prevent diseases?'

From the options given in Figure 4.29, the correct answer was 'Lean meat, fruits and vegetables, low fat dairy products, breads and cereals'. Of the respondents from the experimental group, 26% correctly answered the questions 'To make sure that you stay healthy, which of the following should you eat?' in the pre-test, while 36% answered correctly in the post-test. The level of knowledge had increased by ten percent for the experimental group. Of the respondents from the control group, 52% answered correctly in the pre-test, while 36% answered correctly in the post-test. The level of knowledge had decreased by 16% for the control group. Thus both groups had a poor knowledge of food choices for healthy living. This compares well with the responses in Figure 4.28.

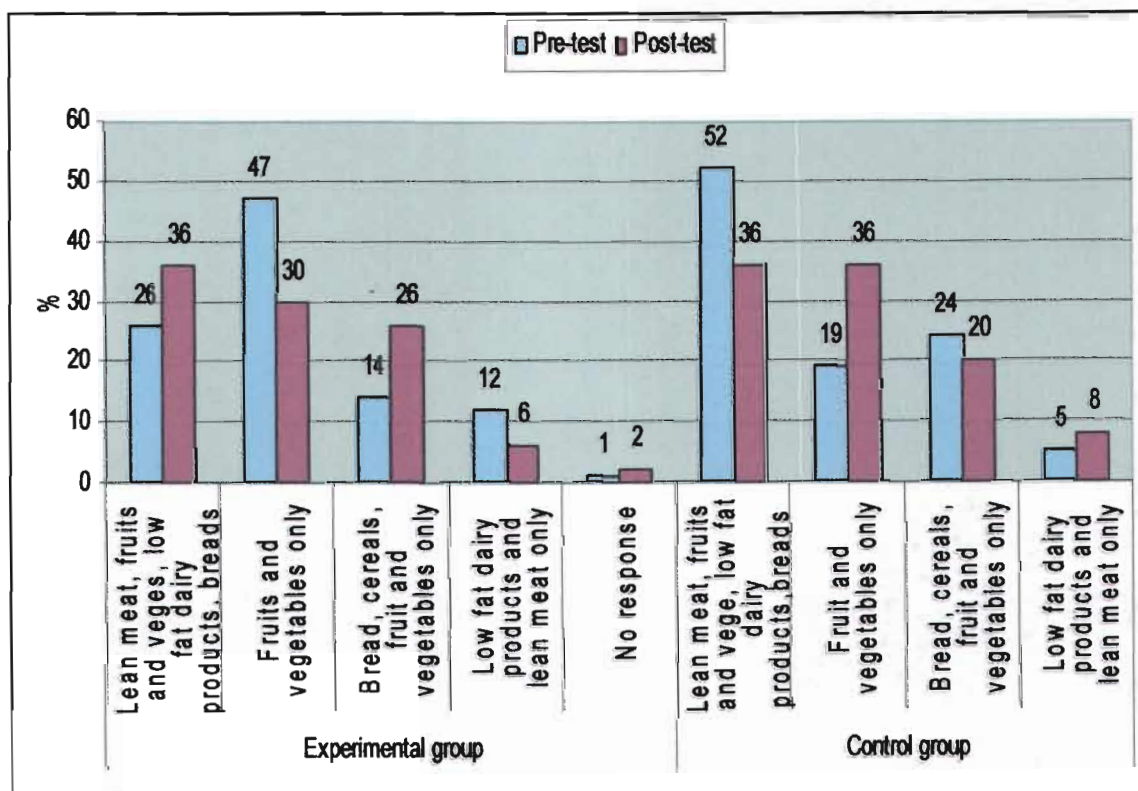


Figure 4.29: Responses of both groups to the question 'To make sure that you stay healthy, which of the following should you eat?'



Table 4.27 indicates that 29% of the respondents from the experimental group correctly answered the question ‘Is it impossible to get all vitamins and minerals you need from food, you need to take a vitamin and mineral pill’ in the pre-test, while 31% answered correctly in the post-test. The level of knowledge had increased by two percent for the experimental group. In the control group, 33% of respondents answered correctly in the pre-test, while 79% answered correctly in the post-test. The level of knowledge had increased by 46% for the control group.

Table 4.27: Responses to the question “Is it impossible to get all vitamins and minerals you need from food, you need to take a vitamin and mineral pill?”

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
It is impossible to get all the vitamins and minerals you need from food, you need to take a vitamin and mineral pill.	29	31	+2
Control group:			
It is impossible to get all the vitamins and minerals you need from food, you need to take a vitamin and mineral pill.	33	79	+46

From the options given in Figure 4.30, the correct answer was 'Table salt'. Only 12% of the respondents from the experimental group correctly answered the question 'From which of the following foods has iodine been added?' in the pre-test, while only seven percent answered correctly in the post-test. The level of knowledge had decreased by five percent for the experimental group. No respondents from the control group correctly answered the question in the pre-test, while 13% answered correctly in the post-test. The level of knowledge had increased by 13%. However, both groups indicated a poor knowledge on iodine fortification.

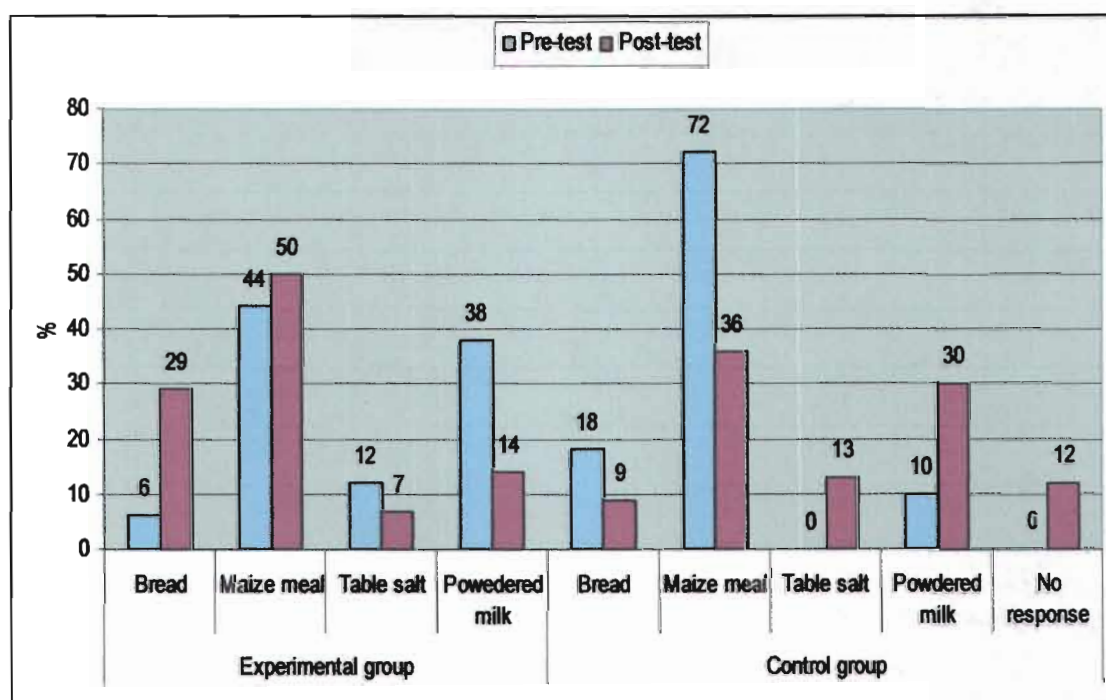


Figure 4.30: Responses of both groups to the question 'To which of the following foods has iodine been added?'

From the options given in Figure 4.31, the correct answer was 'All of above'. Of the respondents from the experimental group, ten percent correctly answered the question 'Why are beans, peas and lentils good for you?' in the pre-test, while 15% answered correctly in the post-test. The level of knowledge had increased by five percent for the experimental group. Of the respondents from the control group, 30% answered correctly in the pre-test, while 42% answered correctly in the post-test. The level of knowledge had increased by 12% for the control group. Although the control group showed an improved knowledge, the majority of both groups chose the incorrect answers, thus demonstrating poor knowledge of pulses or legumes.

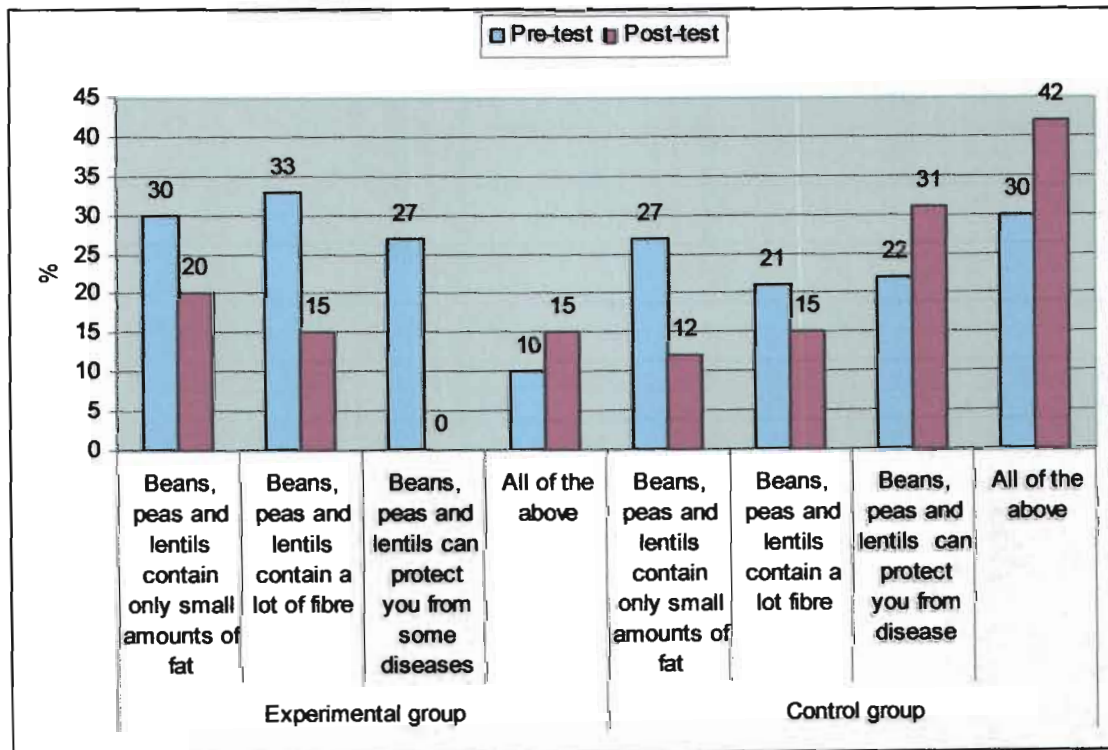


Figure 4.31: Responses of both groups to the question 'Why are beans, peas and lentils good for you?'

#### 4.5.10 Knowledge concerning weight control-related questions for both groups

Table 4.28 indicates that 61% of the respondents from the experimental group correctly answered the question ‘Should overweight women try to lose weight when they are pregnant?’ in the pre-test, while 53% answered correctly in the post-test. The level of knowledge had decreased by eight percent for the experimental group. In the control group, 61% of the respondents answered correctly in the pre-test, while 73% answered correctly in the post-test. The level of knowledge had increased by 12% for the control group.

Table 4.28: Responses to the question ‘Should overweight women try to lose weight when they are pregnant?’

STATEMENT	CORRECT: PRE-TEST %	CORRECT: POST-TEST %	CHANGE IN %
Experimental group:			
Overweight women should try to lose weight when they are pregnant.	61	53	-8
Control group:			
Overweight women should try to lose weight when they are pregnant.	61	73	+12

Even though the knowledge level of the experimental group in the post-test was poorer, just over half of the respondents indicated the correct answer and the majority of the respondents for the control group indicated the correct answer. The level of knowledge regarding this type of question may not be high, perhaps due to the respondent’s limited experience with weight loss and pregnancy.

#### 4.5.11 Knowledge concerning fibre-related questions for both groups

From the options given in Figure 4.32, the correct answer was 'Apples and carrots'. Of the respondents from the experimental group, 59% correctly answered the question 'Which of the following foods should be eaten to increase the amount of fibre in your diet?' in the pre-test, while only 40% answered correctly in the post-test. The level of knowledge had decreased by 19% for the experimental group. Of the respondents from the control group, 39% answered correctly in the pre-test and 84% answered correctly in the post-test. The level of knowledge had increased by 45% for the control group. With regards to this question, the NEP had been very effective for the control group, as the majority of the subjects indicated the correct answer. However, most of the subjects from the experimental group indicated incorrect answers.

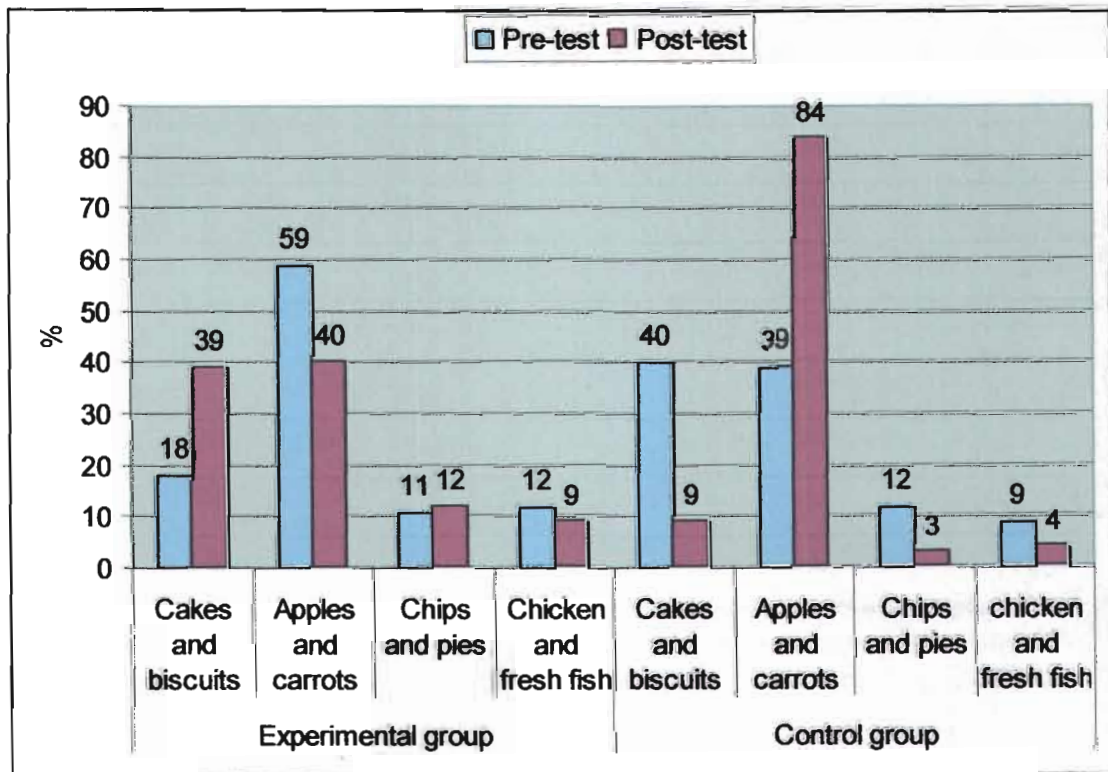


Figure 4.32: Responses of both groups to the question 'Which of the following foods should be eaten to increase the amount of fibre in your diet?'



The correct answer from the options given in Figure 4.33 was ‘Whole-wheat bread’. Twenty percent of the respondents from the experimental group correctly answered the question ‘Which food has the most fibre?’ in the pre-test, while 36% answered correctly in the post-test. The level of knowledge had increased by 16% for the experimental group. Of the respondents from the control group, only one percent answered correctly in the pre-test, while 34% answered correctly in the post-test. The level of knowledge had increased by 33% for the control group.

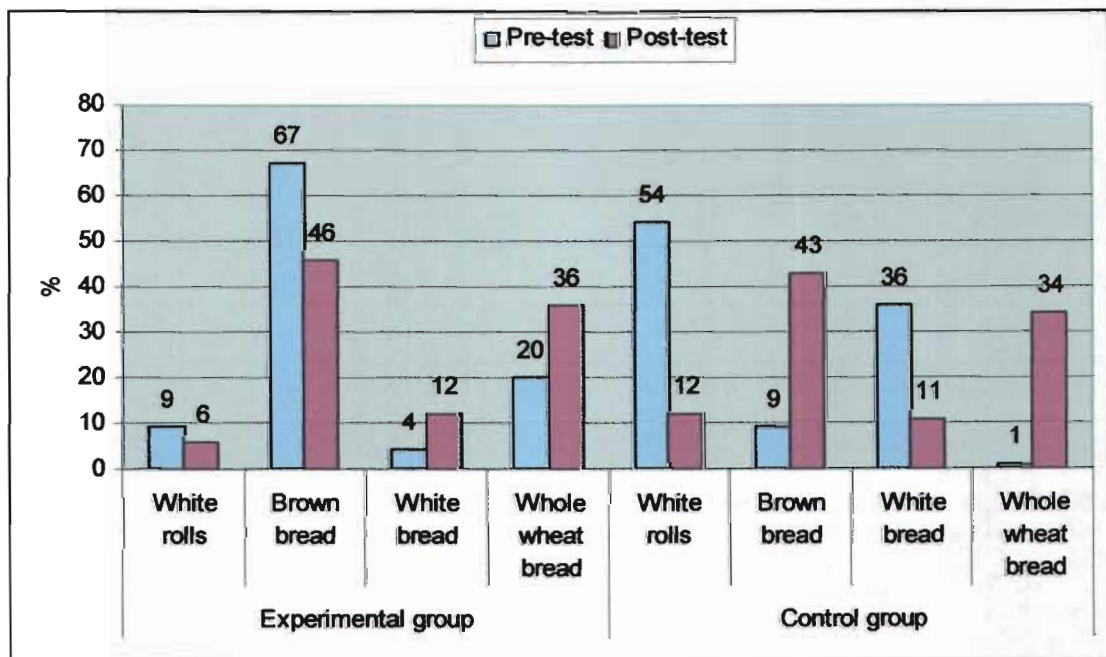


Figure 4.33: Responses of both groups to the question ‘Which food has the most fibre?’

Even though the level of knowledge increased for both groups, the majority of the subjects, from both groups, still indicated incorrect answers after the NEP implementation.

Figure 4.34 indicates that in the pre-test, 82% of the respondents from the experimental group indicated that they receive nutrition information at school, nine percent from friends, 48% get it from their parents, 93% get it from radio/television/magazine. In the post-test, 97% indicated that they receive the information from school, 15% from friends, 88% from parents, 94% from radio/television/magazine, five percent get it from the clinic, one percent from VUT and one percent from the newspapers. In the pre-test, 95% of the respondents from the control group indicated that they receive nutrition information at school, 19% from friends, 95% from their parents, 82% from radio/television/magazines, one percent from the newspapers, three percent from the hospital and on percent from the Department of Health. In the post-test, 92% of the respondents from the control group indicated that they receive nutrition information at school, 19% from friends, 79% from parents, 65% from radio/television/magazine and two percent form the Department of Health

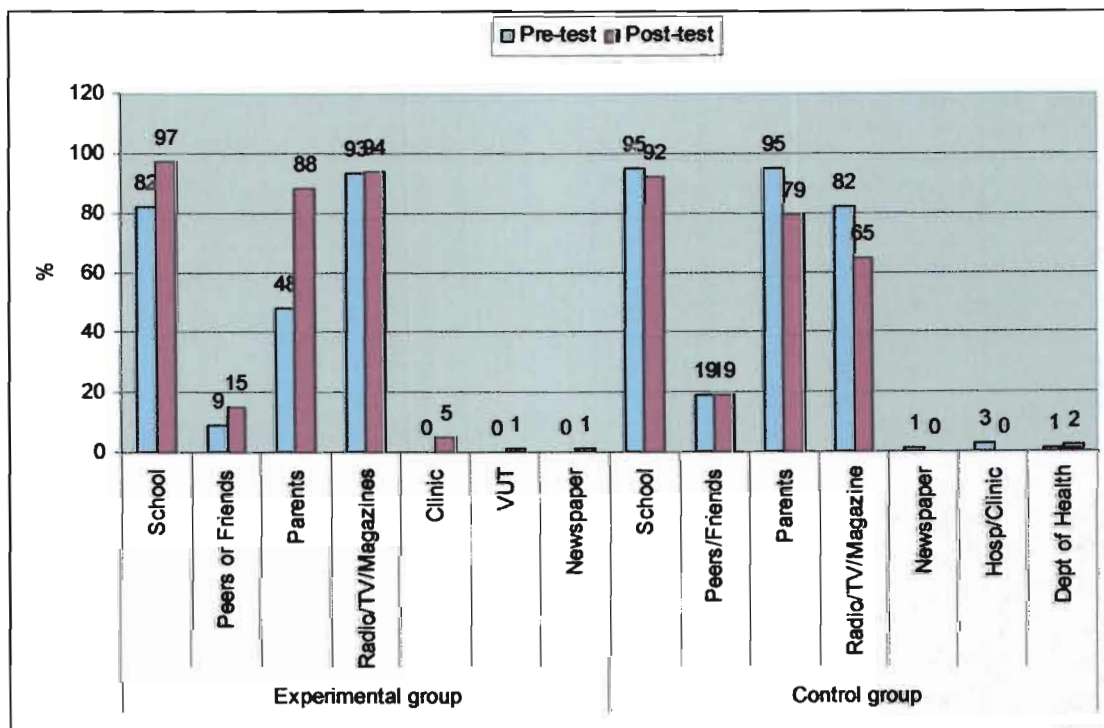


Figure 4.34: Responses of both groups to the question 'Where do you get your nutrition information from?'

Table 4.29: Experimental group ratings in % for selected choices

OPTION	Very Unreliable		Unreliable		Reliable		V. Reliable	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
School	9	14	9	0	12	12	4	70
Peers/Friends	3	1	1	4	0	4	8	6
Parents	4	17	3	3	8	21	26	45
Radio/TV/Magazines	3	9	4	3	4	38	26	41
Clinic	0	0	0	0	0	0	0	4
VUT	0	0	0	0	0	0	0	1
Newspapers	0	0	0	0	0	0	0	1

Table 4.30: Control group ratings in % for selected choices

OPTION	Very Unreliable		Unreliable		Reliable		V. Reliable	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
School	6	7	4	1	16	12	70	71
Peers/Friends	1	3	6	6	9	4	1	1
Parents	3	6	1	16	16	16	75	71
Radio/TV/Magazines	4	13	9	1	33	5	37	31
Newspapers	0	0	0	0	1	0	0	0
Hospital	0	0	0	0	0	0	3	3
Health Dept.	0	0	0	0	0	0	1	0

In Figures 4.29 and 4.30, the majority of subjects from both groups indicated that they find nutrition information that they receive from school to be very reliable. The majority of subjects from the control group indicated that they also find nutrition information they receive from their parents to be very reliable. However, less than half the respondents of the experimental group had found information from parents to be very reliable.



## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

The aim of the study was to develop and evaluate a nutrition education programme for Setlabetjha Primary School children in order to improve existing nutrition knowledge.

#### 5.2 Limitations

- Language fluency had been a problem as the playing cards; lecture and the pamphlet was presented in English, while the children did not understand English properly. However, the teacher assisted in explaining through their home language.
- The implementation of the NEP was also very costly since printing was very expensive and each pack of cards cost R130.00. It is advisable to consider very carefully the cost implications.
- The total 52 messages may have been too large a number for the children to study over the period of eleven weeks. Perhaps the NEP could have been more effective had the messages been kept brief and simple, or if the NEP had focused on one topic.

#### 5.3 Conclusions

Malnutrition remains a persistent problem worldwide, in South Africa, and in the Vaal Triangle where this project had been undertaken. Although dramatic progress has been made in some areas of nutrition during recent years, there are 790 million people in the developing world and 34 million in developed countries who still suffer from hunger and thus under-nourishment (Oldewage-Theron, Dicks, Napier & Rutengwe 2005b:14).

Under-nutrition continues to be one of the most serious nutritional problems facing children in South Africa (Oldewage-Theron et al. 2005a:25). This is true for the Eatonside community as well (Oldewage-Theron et al. 2005a:25). Of the children in the Setlabetjha Primary School, 17.4 were severely underweight, while 58.4% of the children were at risk of malnutrition ( $\geq -2 \leq 1$  SD) (Napier & Oldewage-Theron 2005:2).

Poverty, household food insecurity and malnutrition had been the major problems experienced in this particular Vaal Triangle informal settlement. The strategies implemented as intervention strategies included improved agricultural productivity by means of better farming methods, land expansion and dietary diversification by developing of certain products in order to deal particular nutritional needs, thereby addressing malnutrition resulting from household food insecurity (Oldewage-Theron et al. 2005a:319).

Nutrition education was also recommended as leading principle for these strategies, since the objective of all NEPs is to provide people with knowledge, inspiration or motivation and re-enforcement to allow them to address sufficiently their own long-term food and nutrition problems (FAO 2004:1; Stuart Achterberg1997:1). Thus people can be motivated to change their behaviour and encourage more healthful food choices (FAO 1997a:2; CDC 1996:10). Previous nutrition education studies had a significant effect on fostering healthful eating habits (ADA 2003:506; DCFL 2003:1; WHO 2003a:5). The purpose of this study was to develop and evaluate a nutrition education programme for Setlbothja Primary School children in order to improve and increase current knowledge.

Primary school children were chosen as the sample population because at this age the children are at liberty to make their own food choices and adequate nutrition and knowledge is essential for children to become healthy productive adults (WHO 2003a:6). Healthful nutrition is also important for school performance and cognitive development (UNESCO 2002a:4; WHO 2003a:4).

The results in this study indicate improvement in both the NEP with the playing cards and the lecture with the pamphlet (not necessarily in the same questions or categories). It is difficult to determine which of the two strategies was more effective. The lecture with the pamphlet subjects showed better results than card game when comparing the subjects' increased knowledge regarding starch, water, salt, fruit and vegetable and alcohol consumption, in addition to matters pertaining to healthful living, vitamin A sources and

calcium. The experimental group showed better results in acquiring knowledge on soya, energy and fibre related questions, as well as fruit and vegetable nutrient content, while questions pertaining to pregnancy, sugar and physical activity displayed similar results in both groups.

In general, the subjects of both groups had a good knowledge regarding sugar, water and salt consumption, as well as 'the key to a healthy way of eating' with the inclusion of fruit and vegetables, and variety in the diet. Poor knowledge was evident in both groups with regards to pregnancy, dietary starch, alcohol consumption, physical activity, vitamin A-rich foods and pilchards as a calcium source.

Included in the questionnaire were certain questions that were not dealt with through the playing cards, lecture pamphlet. Results have shown that for the majority of these questions, the knowledge of the subjects in both groups presented no significant changes after the NEP was implemented or even decreased. This has demonstrated that information should be provided before knowledge could improve. In general, a poor knowledge existed about healthful protein choices, iodine fortification and legume consumption.

It has been interesting to note that a large percentage of both the control (42%) and experimental (44%) groups indicated that meat should be defrosted in sunlight or at room temperature (24% and 18% respectively). This habit had not improved much after the NEP and could be the result of the subjects not being familiar with a refrigerator, since only 25% of households in this community owned one (Oldewage-Theron et al. 2005b:23).

The majority of subjects indicated that they received their nutrition information at school (93-94% in the experimental group and 92-95% in the control group). Thus, it can be concluded that the school had been a good venue for pursuing this research, since the children trusted their teachers.

It can be concluded that the implementation of a NEP in a school setting had an impact on nutrition knowledge. Both the lecturing method as well as the passive NEP through the application of playing cards showed some improvement in knowledge in some topics, as the playing cards could have had either a positive or negative result. For this reason, it is difficult to determine which could be the better method. This finding corresponds with Weimer (1996:4) who had indicated that specifying results is a key problem in assessing nutrition education programmes. For example, to measure the efficacy of a nutrition education intervention, the evaluator should decide whether or not to look for changes in a target population's knowledge, behaviour and health. It is usually difficult for the evaluator to be certain that a detectable change in a person's knowledge concerning the relationships between diet and health will result in a suitable transformation in behaviour. In this study, only the impact on knowledge was measured.

#### **5.4 Recommendations**

Confronting nutritional problems requires a holistic approach and interventions should not be planned in isolation. Schools have been recognised as being the most important setting for health programmes in that a large number of children attend school, which have active connections with families and community-based institutions (FAO 2000:10; Napier & Oldewage-Theron 2005:5)..

It is recommended that NEP be implemented and that the nutrition education be applied to educate children with regard to healthful eating and the choice of nourishing foods. When faced with the problem of low income existing in this community, some families may not be able to make better food choices due to available funds. However, nutrition education is designed to offer the children the benefit of awareness of more healthful alternatives when selecting foods. Children can grow with improved knowledge of nutrition, which can be used in procurement patterns as adults. School-aged children in this community have money in hand with which to purchase food items when away from home. Thus, it is vital for them to be able to make informed food selections (Napier & Oldewage-Theron 2005:5). Parents should be actively involved as they make decisions

in their households concerning food procurement. It will also be of help to involve parents in the NEP, since most children rely on what they have been taught by them.

School-based nutrition education should be well thought-out and executed cautiously for an extended period in order to establish good understanding of healthful eating while supporting the FBDGs. More studies should be conducted with the SA FBDGs as their basis, as it can be seen that nutrition messages, based on the SA FBDGs with three nutrition education sessions, had increased the nutritional knowledge of the children over a short period.

The results of this study add to the literature, since this is one of the few studies that apply both the MRC questionnaire and the SA FBDGs in order to determine knowledge adjustments in children as young as those in grade seven.

Nutrition education should form part of the curriculum for school children, so as to include all age groups. It should start early in childhood, since children develop their eating patterns at an early age. Nutrition education should also be conducted in the language of instruction of the school, since some primary school children do not have adequate comprehension of English as it may not be the first language spoken at either school or home. In this study, the playing cards had been printed in English due to production costs and so that it can be used in a larger community. However, printing the messages both in English and the local language may improve the comprehension of the information in subsequent studies.

Recommendations for future research include:

- A more detailed study to evaluate not only the influence on knowledge, but also that on behaviour.
- Periodically measuring such influence over a year to measure knowledge retention.
- Expert testing of the validity and reliability of the measuring tool.

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**ANNEXURE A**  
**VAAL UNIVERSITY OF TECHNOLOGY**  
**FACULTY OF HUMAN SCIENCES**  
**DEPARTMENT: HOSPITALITY AND TOURISM**

**TO:** Mr Rampa: Principal Setlabotjha Primary School  
**DATE:** 15 June 2005  
**FROM:** Miss O. Makanjana: Masters student (072 968 9004)  
C. Napier: Snr. Lecturer and Research Supervisor  
**SUBJECT:** Research study

---

We would like to obtain permission from you to allow your pupils to participate in a Masters study in Nutrition Education. The study involves a pre-test of all grade 7 pupils, thereafter playing cards with nutrition education messages will be presented to them for a period of 11 weeks, where after a post-test will be conducted again.

The fieldwork will take place during breaks and therefore will not interfere with curriculum time.

We would like to commence with this study on the 28<sup>th</sup> of July 2005 and will be completed by the end of the year.

We hope you can accommodate us. Please do not hesitate to contact me if you need more information.

Kind regards

---

C. Napier: Supervisor

---

O. Makanjana: Masters Student

# EKUJULENI PRIMARY SCHOOL



Enquiries: T. P. Njuzi  
Tel/Fax: (016)593-1654

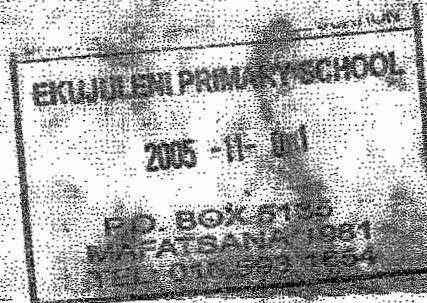
P.O. Box 5135  
MAFATSANA  
1981

ONWABA MAKANTJANE  
VAAL UNIVERSITY OF TECHNOLOGY

RE: ONWABA MAKANTJANE 8308250666087

*Permission had been granted for Onwaba Makantjane to conduct the research at the above-mentioned school.*

Thank you  
*T.P. Njuzi*  
Principal



*Through Thy Light, Power And Wisdom We Shall Prosper!*



ANNEXURE C

NUTRITION KNOWLEDGE QUESTIONNAIRE

INSTRUCTIONS

THE FOLLOWING QUESTIONNAIRE CONTAINS TWO TYPES OF QUESTIONS,  
MULTIPLE CHOICE AND TRUE/ FALSE

1. MULTIPLE CHOICE: CHOOSE ONE THAT YOU THINK IS THE CORRECT ANSWER AND  
TICK ON THE NUMBER THAT IS NEXT TO YOUR ANSWER

2. TRUE/ FALSE: CHOOSE THE TRUE OR THE FALSE AND TICK ONE OF THEM WHICH  
YOU THINK IS THE CORRECT ANSWER

THE QUESTIONS REFER TO A HEALTH PERSON WHO IS NOT ON ANY MEDICATION OR  
SPECIAL DIET

Please answer all the questions before moving on to the next ones.

Do not page back!

DATE

YY	MM	DD

SUBJECT NUMBER

--



1 You should eat a lot of sugar to have enough energy

TRUE	FALSE	11A
------	-------	-----

2 Cooked meat/ fish/ chicken sold on the street may not always be safe to eat because

It may have been undercooked	1	6D
The cook may not have used fresh meat	2	
It may have been kept for a long time before being cooked	3	
All of the above	4	

3 What a pregnant woman eats during pregnancy has no effect on her health and the health of her unborn baby

TRUE	FALSE	12
------	-------	----

4 You should not have starches at most meals because

They are not important for your health	1	3B
Even eating small amounts can cause weight gain	2	
They cause diseases	3	
None of the above	4	

5 How much water should you drink a day

You don't have to drink water everyday	1	9A
1 to 3 glasses	2	
4 to 6 glasses	3	
7 to 9 glasses	4	

6 You should add extra salt to your cooked food before you even eat it

TRUE	FALSE	8A
------	-------	----

7 What is a portion of cooked vegetables?

1 Tablespoon	1	4A
Half a cup	2	
1 Cup	3	
2 Cups	4	

8 Which of the following is a low fat snack

"Simba" Chips	1	7A
Popcorn	2	
Fried chips	3	
"Niknaks"	4	

9 From which group of foods should you eat the most every day?

Bread, samp, rice, porridge	1	
Apples, bananas, spinach, carrots	2	
Milk, yogurt, cheese	3	
Chicken, fish, beans, eggs	4	3A

\* 10 Drinking a lot of wine, beer, cider can cause weight gain 70/100

TRUE	FALSE
------	-------

 10B

11 Which one of the following is not healthy for a pregnant woman to do

Be physically active	1	
Eat different kinds of foods	2	
Sleep most of the day	3	
Drink lots of water	4	12

12 Women must try not to gain weight when they are pregnant 

TRUE	FALSE
------	-------

 12

13 It is not healthy for a pregnant woman to eat foods like milk, cheese, yoghurt

TRUE	FALSE	12

✓ 14 People who are overweight should not be physically active

TRUE	FALSE	2B
------	-------	----

15 It is usually not necessary to wash vegetables before you cook them

TRUE	FALSE	4D
------	-------	----

✓ 16 The key to a healthy way of eating is to

Eat many different kinds of foods	1	
Eat some foods more than other foods	2	
Eat certain kinds of foods in moderate or small amounts	3	
• All of the above	4	1A

✓ 17 The following foods must not be eaten at all when one is trying to lose weight

Bread and rice	1	
Meat and fish	2	
Margarine	3	
None of the above	4	1A

✓ 18 Which foods contain a lot of calcium?

Chicken and eggs	1	
Milk, yoghurt	2	
Pilchards <i>Pilchard</i>	3	
2 and 3	4	6C

19 The healthiest snack is:

A glass of milkshake	1	7A
A tub of unbuttered popcorn	2	
A slab of chocolate	3	
2 and 3 above	4	

20 To which of the following foods has iodine been added?

Bread	1	8C
Maize meal	2	
Table salt	3	
Powdered milk	4	

21 If you were trying to increase the amount of fibre in your diet, which one of the following foods should you eat more of?

Cakes and biscuits	1	4C
Apples and carrots	2	
Chips and pies	3	
Chicken and fresh fish	4	

22 Being physically active means

Going to the gym	1	2A
Walking a lot	2	
Playing sports like soccer or netball	3	
All of the above	4	

23 Which of the following choice of foods prevent certain diseases

Fish, Chicken without skin, and lean meat	1	6A
Beef sausage, bacon, and lean mince	2	
Fried fish, fried chicken, and regular mince	3	
All of the above	4	

24 Which foods contain a lot of fibre?

Oats, apples, beans	1	1C
Milk, yoghurt, cheese	2	
Beef, chicken, mutton	3	
Butter, margarine	4	

25 How many fruits and vegetables should be eaten

1 fruit and vegetable a day	1
3-4 fruits and vegetables a day	2

5 or more fruits and vegetables everyday	3	
There is no need to eat fruits and vegetables daily	4	4A

26 If you are eating a healthy diet there is no need for you to be physically active

TRUE	FALSE	2A
------	-------	----

27 Drinking boiled water is a good way to lose weight

TRUE	FALSE	9B
------	-------	----

28 Salt should be added to all foods except fruits

TRUE	FALSE	8A
------	-------	----

29 If one wants to lose weight there is no need to be physically active, it is better that one simply diets

TRUE	FALSE	2B
------	-------	----

30 All water is safe to drink

TRUE	FALSE	9A
------	-------	----

31 You can drink as much wine, beer, ciders as you want provided you have eaten first

TRUE	FALSE	10A
------	-------	-----

32 A little sugar can be eaten when one is trying to lose weight

TRUE	FALSE	11B
------	-------	-----

33 How much milk or maas should you have a day?

None	1	
Half a cup	2	
One cup	3	
Two cups	4	6A

34 Your body only needs a little bit of salt to be healthy

TRUE	FALSE	8A
------	-------	----

35 A well- balanced diet

Consists mostly of meat, with smaller amounts of starch, fruits, vegetables, and dairy products	1	
Consists mostly of vegetables, and smaller amounts of meat and dairy products	2	
Consists mostly of starches, vegetables and fruits, with smaller amounts of meat and dairy products	3	
None of the above	4	3A

36 Sugar and foods that contain sugar should be eaten in small amounts

TRUE	FALSE	11A
------	-------	-----

37 Eating a lot of different kinds of foods is healthier than eating only a few kinds foods

TRUE	FALSE	1A
------	-------	----

38 Overweight women should try to lose weight when they are pregnant

TRUE	FALSE	12
------	-------	----

39 Sugar contains a lot of vitamins and minerals

TRUE	FALSE	11A
------	-------	-----

40 It is impossible to *get all* the vitamins and minerals you need from food, you need to take a vitamin and mineral pill

TRUE	FALSE	1A
------	-------	----

41 It is not healthy for a pregnant woman to drink a lot of wine, beer, cider

TRUE	FALSE	12
------	-------	----

42 Which one of the following groups of nutrients are found in large amounts in fruits and vegetables?

Fibre, Vitamin A	1
Starches, fat, Vitamin D	2
Fats, Iron, Calcium	3
None of the above	4

4C

43 Which of the following breakfast menus contain little fat

Whole-wheat toast with thinly spread margarine	1
Weet-Bix with 2% fat milk	2
Bacon and egg	3
1 and 2	4

7A

44 It is important for a pregnant women to avoid eating different kinds of foods

TRUE	FALSE	12
------	-------	----

45 Which food has the most fibre?

White rolls	1
Brown bread	2
White bread	3
Whole wheat bread	4

3C

46 The best place to defrost meat from a frozen state is to

leave it at room temperature	1
leave it in the fridge	2
leave it in sunlight	3
Meat should never be defrosted	4

47 Starchy foods should not be eaten when one is trying to lose weight

TRUE	FALSE	3B
------	-------	----

48 To make sure that you stay healthy you should eat

Lean meat, fruits and vegetables, low fat dairy products, and breads and cereals	1
Fruit and vegetables only	2
Bread, cereals, fruit and vegetables only	3
Low fat dairy products and lean meat only	4

49 Eating bread always causes weight gain

TRUE	FALSE	3B
------	-------	----

50 Which of the following foods are the lowest in fat:

Corn flakes and full cream milk	1
Grilled lean steak and boiled carrots	2
Pizza and milkshake	3
Fried lamb chops and creamed spinach	4

51 To protect yourself from disease you should avoid eating many different kinds of foods

TRUE	FALSE	1B
------	-------	----

\* 52 It is healthy to snack on foods that contain a lot of sugar

TRUE	FALSE	11B
------	-------	-----

53 Which of the following should a pregnant woman eat more of?

Milk, cheese, maas	1
Meat, chicken, fish	2
Fruits and vegetables	3
All of the above	4

54 Dry beans, peas, and lentils should be eaten often

TRUE	FALSE	5A
------	-------	----

55 Soya mince is as healthy as meat

TRUE	FALSE	5A
------	-------	----

56 You can eat as much meat as you want everyday

TRUE	FALSE	5A
------	-------	----

57 Which group of foods has the most Vitamin A?

Oats, whole wheat bread, rice	1	4C
Carrots, spinach, sweet potatoes	2	
Pies, cakes, pudding	3	
None of the above	4	

\*58 Dry beans, peas, lentils are a healthy choice to eat in place of meat

TRUE	FALSE	5A
------	-------	----

59 Meat/ fish/ chicken will not spoil if you store them

In the cupboard for a few days	1	6D
In the fridge for 2 days only	2	
In the freezer for 3-4 months	3	
In 2 and 3 above	4	

60 The reason why beans, peas and lentils are good for you is that

They contain only small amounts of fat	1	5B,C
They contain a lot of fibre	2	
They can protect you from some diseases	3	
All of the above	4	

**SELECT YES OR NO FOR ALL THE CHOICES**

1. From where do you get your information about nutrition?

	YES	NO	
School	1	2	13F
Peers/ Friends	1	2	13F
Parents	1	2	13F
Radio/ TV/ Magazines	1	2	13F
Other (Specify)			
	1	2	13F

2. Of the choices you have selected above, how would you rate them as sources of information:

1= very unreliable

2= unreliable

3= reliable

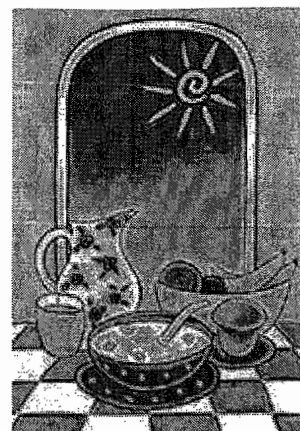
4= very reliable

	very unreliable	unreliable	reliable	very reliable	
School	1	2	3	4	13G
Peers/ Friends	1	2	3	4	13G
Parents	1	2	3	4	13G
Radio/ TV/ Magazines	1	2	3	4	13G
Other (Specify)					
	1	2	3	4	13G



## ANNEXURE D

### THE SOUTH AFRICAN FOOD BASED DIETARY GUIDELINES FOR HEALTHY EATING ARE:



- ❖ Enjoy a variety of foods
  - ❖ Be active
  - ❖ Drink lots of clean, safe water
  - ❖ Make starchy foods the basis of most meals
  - ❖ Eat plenty of vegetables and fruits every day
  - ❖ Eat dry beans, peas, lentils and soya regularly
  - ❖ Chicken, fish, meat, milk or eggs can be eaten daily
  - ❖ Eat fats sparingly
  - ❖ Use salt sparingly
  - ❖ Use food and drinks containing sugar sparingly and not between meals
  - ❖ If you drink alcohol, drink sensibly
- vitamin a can be found in dark green leafy vegetables, carrots, liver and eggs
  - lack of vitamin a puts a child at risk of night blindness
  - to grow and stay healthy, children need a variety of nutrients
  - calcium is found in milk, yoghurt, spinach and maas



- 2 cups of milk is required per day to provide enough calcium in the diet
- pregnant women should eat different kinds of food
- Physical activity is important for good health
- A starchy food should form the larger part of mixed meals
- Eat 5 or more fruit and vegetables daily
- Dry beans, lentils and soya can be used instead of meat

## **ANNEXURE E**

**Wash your hands thoroughly with soap and water before touching food**

### **THE FBDG'S FOR HEALTHY EATING FOR SOUTH AFRICANS**

#### **Enjoy a variety of foods**

##### **What is a variety of foods?**

**A variety of foods means eating more than one type of food at each meal, eating different foods on different days and preparing food in different, healthy ways.**

**Healthy eating means eating a variety of foods to supply nutrients our bodies need.**

**Different foods are composed of different nutrients such as proteins, carbohydrates, fats, minerals, vitamins, water and dietary fibre that help the body to function properly.**

- **children need vitamin a to resist illness and prevent visual impairments**
- **vitamin a can be found in dark green leafy vegetables, carrots, liver and eggs**
- **lack of vitamin a puts a child at risk of night blindness**
- **to grow and stay healthy, children need a variety of nutrients**
- **children need iron-rich foods to protect their physical and mental abilities**
- **calcium is found in milk, yoghurt, spinach and maas**
- **iron is essential for healthy blood and the transport of oxygen to cells**
- **eating a healthy breakfast meets the daily nutritional needs**
- **breakfast is the most important meal of the day**
- **brown bread is healthier than white bread**
- **eat plenty of grain products, fruit and vegetables**
- **eat enough calcium and iron to meet the body's requirements**
- **healthy nutrition is needed to perform well in school**
- **nutrition affects intellectual development & learning ability**

- adequate nutrition can help prevent health problems
- our bodies need a variety of nutrients to stay healthy
- no single food can provide us with all the nutrients we need
- it is healthier to prepare meat, chicken and fish without frying it
- 2 cups of milk is required per day to provide enough calcium in the diet
- vitamin c heals cuts and wounds
- calcium keeps bones and teeth strong

### **Be Active**

**Physical Activity means different kinds of exercises, like playing sports, walking jogging etc.**

#### **Why is it important to exercise:**

- Physical activity is important for good health
- To be active keeps our minds and bodies healthy
- It is important for a pregnant woman to exercise
- Regular physical activity keeps us in good shape

### **Drink lots of clean, safe water**

- One of the main functions of water in the body is to regulate the body temperature.

**Drink seven to nine glasses of water daily**

- Water also removes waste products from the body

### **Make starchy foods the basis of most meals**

- Starchy foods provide the body with energy (they are rich in carbohydrates and other important nutrients.
- Starchy foods, such as maize meal, samp, bread, rice, pasta, potatoes and sweet potatoes should therefore form the central or largest part of each meal.

- A starchy food should form the larger part of mixed meals

### **Eat plenty of vegetables and fruit every day**

- Vegetables and fruit are high in vitamins and minerals, which help to strengthen the body's immune system to resist illnesses such as infections.

**Always wash fruit and vegetables before you cook or eat them**  
**Eat five or more fruit and vegetables a day**

### **Eat dry beans, split peas, lentils And Soya regularly**

- They are not only important for their protein content, but also for providing energy.
- They can be used instead of meat, or added to meat as a meat extender.
- Soya mince is as healthy as meat
- Beans and peas are healthy as contain fibre

### **Chicken, fish, meat, milk or eggs can be eaten daily**

- These are all sources of good quality protein.
- Protein is needed for the growth, maintenance and repair of body tissue.

**Iron can be found in liver, lean meats, fish and eggs**  
**Protein builds, maintains and repairs body tissue**  
**Poultry is an excellent alternative for red meat**  
**Offal is rich in protein and iron**

### **Eat fats sparingly**

- A high intake of fats has been linked to being overweight, high cholesterol levels, cardiovascular heart disease
- Choose a diet low in fat
- Polony, viennas and sausages are high in salt and fat

### **Use salt sparingly**

- Eating too much salt and salty food increases the risk of both coronary heart disease and stroke
- Your body needs a little salt to stay healthy

### **Use food and drinks containing sugar sparingly and not between meals.**

- Too much sugar is not good for our health
- Choose snacks that are not high in sugar

### **If you drink alcohol, drink it sensibly**

- Drinking too much alcohol may damage the liver
- Alcoholic drinks can contribute to people being overweight
- High blood pressure can result from drinking too much alcohol
- Breastfeeding women should not drink alcohol

### **Who should abstain from using alcohol?**

- Children under the age of 18 years should not drink alcohol.
  - Pregnant women should not drink any alcohol since it may have detrimental effects on the unborn baby.
  - Breast-feeding women should not drink alcohol.
  - People on medication should not drink alcohol.
- 
- poor nutrition during pregnancy can slow a child's mental and physical development
  - pregnant women should eat different kinds of food

**wilna oldewage-theron**

---

**From:** wilna oldewage-theron  
**Sent:** Friday, April 21, 2006 11:07 AM  
**To:** 'managingeditor@jneb.org'  
**Subject:** Submssion of manuscript

Dear Dr Wallner

Attached please find a manuscript entitled: The development and evaluation of a nutrition education programme for primary school children in an informal settlement, for your review and publication in the Journal of Nutrition Education and Behavior. We also attached the requested list of possible reviewers. We do not have any problem with any person you may want to appoint as reviewer, and therefore, did not include a list of reviewers to exclude.

We attach Figure 2 as a separate document, should you experience any problems with it in the text.

We would appreciate it if you would acknowledge receipt of this manuscript.

Thanking you in advance

Onwaba Makanjana

&

Prof Wilna Oldewage-Theron Ph.D RD (SA)  
Director: Institute of Sustainable Livelihoods  
Vaal University of Technology  
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## ANNEXURE F

The development and evaluation of a nutrition education programme for primary school children in an informal settlement

MAKANJANA, O.Z., OLDEWAGE-THERON, W.H & NAPIER, C.

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### ABSTRACT

**Objectives:** The aim of this study was to develop and evaluate a nutrition education programme for primary school children in an informal settlement in order to improve existing knowledge. The study included all grade seven learners from two primary schools in one of the poorest areas in the Vaal Triangle. Children from one primary school formed the experimental group and children from another primary school formed the control group.

**Methods:** The initial steps involved a baseline survey (Napier 2001:78) indicating that malnutrition existed in the informal settlement. The baseline survey indicated stunting, wasting, underweight and poor food consumption patterns among the children. Based on the findings of malnutrition, a literature survey was conducted. Pre-tests were conducted to determine existing nutritional knowledge (for both groups) using a nutritional knowledge questionnaire developed by the South African Medical Research Council (SA MRC). A nutrition education tool (nutrition education playing cards), based on the South African Food Based Dietary Guidelines (FBDGs) was developed. The intervention, which involved the issuing, reading, playing and exchanging of the nutrition education playing cards took place over eleven weeks for the experimental group. The control group received pamphlets and nutrition education lessons. After the intervention took place, post-tests were done to compare the difference between the two groups and to determine the effectiveness of the nutrition education programme.

**Results:** The pre-tests results revealed poor nutritional knowledge in both groups. In general, the subjects of both groups had a good knowledge regarding sugar, water and salt consumption, as well as "the key to a healthy way of eating" thus the inclusion of fruit and vegetables, and variety in the diet. Poor knowledge was present in both groups pertaining to pregnancy, the importance of starch in the diet, alcohol consumption, the meaning of physical activity, vitamin A-rich foods and the inclusion of pilchards as a calcium-rich source.

**Conclusions:** The results of this study indicated success in both the nutrition education programme (NEP) with the playing cards as well as the lecture with the pamphlet. It is difficult to determine which of the two strategies was more effective as the lecture with the

pamphlet subjects showed better results than the card game when comparing the subject's knowledge regarding starch-related question, water-related questions, salt, fruit and vegetable and alcohol consumption as well as the questions pertaining to healthy living, vitamin A sources and calcium. The experimental group showed better knowledge on soya, energy and fibre related questions, as well as fruit and vegetable nutrient content, whereas the questions pertaining to pregnancy, sugar and physical activity showed similar results in both groups.

**Recommendations:** more research is needed to determine the impact on behaviour.

**Keywords:** nutrition education, malnutrition, school age children, school based nutrition education programmes.

## INTRODUCTION

The goal of nutrition education is to motivate people to eat a healthy diet. Children are a very important audience for nutrition education because a healthy diet is essential for normal growth and development, and because children establish food patterns that carry into adulthood. Good nutrition promotes not only better physical health and reduced susceptibility to disease, but has also been demonstrated to contribute to cognitive development and academic success (PI 2000:1).

Nutrition and health status are powerful influences on a child's learning and on how well a child performs at school. Children who lack certain nutrients in their diet or suffer from protein-energy malnutrition, hunger, parasitic infections or other diseases, do not have the same potential for learning as healthy and well-nourished children. Weak health and poor nutrition among school-age children diminish their cognitive development either through physiological changes or by reducing their ability in learning experiences (Del Rosso 1999:4).

Globally, malnutrition persists to be a key problem throughout the developing world, especially in southern Asia and Sub-Saharan Africa. Diets in Asia and Sub-Saharan Africa are commonly lacking in macronutrients, therefore leading to protein-energy malnutrition, and micronutrients or combination of the two nutrients (Muller & Krawinkel 2005:3). According to the United Nations Children's Fund (UNICEF), malnutrition is involved in more than half of all deaths globally. Approximately half of Asia's children are malnourished. Malnourished children have reduced resistance to infections and are more expected to die from common childhood sicknesses such as diarrhoeal diseases and



respiratory infections. There are even now several countries, predominantly in South Asia and Sub-Saharan Africa, with hideously high levels of chronic malnutrition (UNICEF 2001:4).

Malnutrition is the most important risk factor for the burden of disease in developing countries. Figure 1 indicates that malnutrition is the major cause of death among children less than five years globally (Muller & Krawinkel 2005:3).

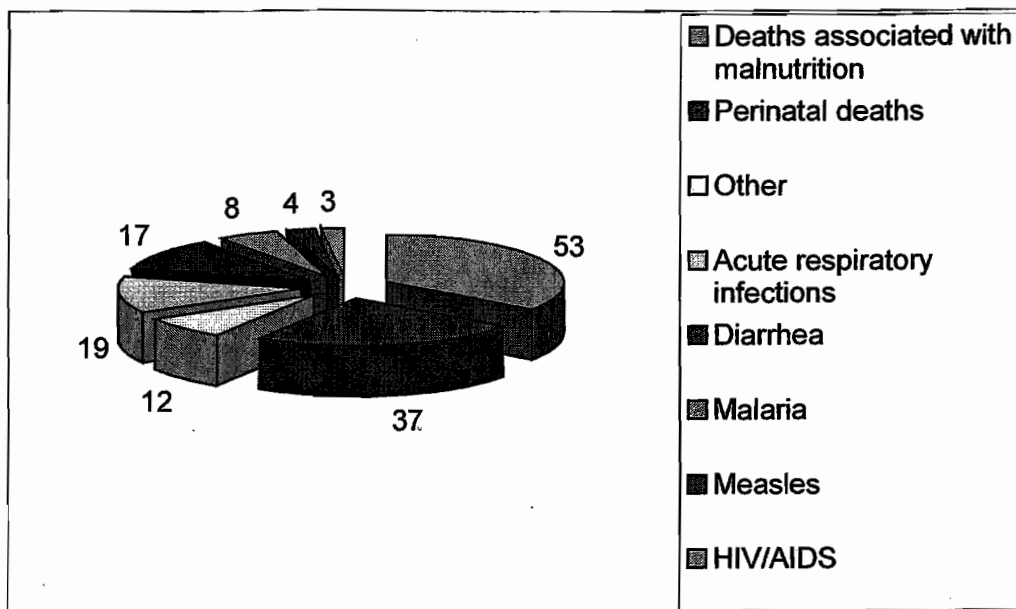


Figure 1: Percentage of the causes of death among children less than five years between the years 2000 –2003 (Muller & Krawinkel 2005:3).

### Malnutrition in South Africa

Nutrition related problems in South Africa evidently reflect the double burden of disease linked with the nutrition transition that can be associated with increasing urbanisation trends. Separate from quick urbanisation, poverty is a major problem in the country with the level estimated at 59% (Love, Maunder, Green, Ross, Smale-Lovely & Charlton 2001:1). Research illustrates that 20-25% of preschool children and 20% of primary school children are chronically malnourished. Severe malnutrition remains the main cause of death amongst young black children in South Africa. It is estimated that 30% of South Africa's population does not have a steady supply of food. All these problems are most awful in the Eastern Cape and Northern Province, two of South Africa's underprivileged provinces (Strachan 1999:5).

Micronutrient deficiencies are widespread in the country and are affecting susceptible groups such as children and women. The national Food Consumption Survey (NFCS) indicated that most children seem to eat a diet low in energy and poor in protein quality. One out of two children has an intake of less than half the recommended level of energy, vitamins A and C, iron, zinc and calcium (Labadarios, Steyn, Maunder, MacIntyre, Swart, Gericke, Huskisson, Dannhauser, Vorster & Nesamvuni 1999:101).

The NFCS revealed that in terms of stunting, the national average prevalence had not changed extraordinarily since 1995 when the South African Vitamin A Consultative Group study was undertaken (Labadarios et al. 1999:178).

The Vaal Triangle is situated about 70 km south of Johannesburg with a population of 1.5 million. Fifty one percent of this population are unemployed and 46.1% of households are poverty stricken. A study conducted in an informal settlement showed that 89% of the respondents lived in zinc shacks with two rooms or less, 41.5% lived in shacks with three or four rooms and only 26.3 lived in shack with four rooms or more. The unemployment rate of the respondents in this informal settlement was 94.2%. Household food insecurity has been identified in this community as 38.1% of the respondents had less than R50.00 weekly food expenditure (Oldewage-Theron, Dicks, Napier & Rutengwe 2005:9).

A baseline survey conducted in an informal settlement in the Vaal Triangle indicated that 14% of the children were severely underweight, 39% were severely stunted and five percent of the children were wasted, thus the prevalence of chronic shortage of food possibly experienced because of low income level (Napier 2001:78). A school-feeding programme was thus implemented and a school garden established to address this malnutrition problem. However, a long-term intervention needed was nutrition education for the learners to increase their nutrition knowledge in order to help them make better food choices for improved nutritional status in youth and adulthood (Oldewage-Theron et al. 2005:318).

The objectives of this study was to develop and evaluate a nutrition education programme with the main aim of incorporating the South African Food Based Dietary Guidelines (SA FBDG's) and the specific objectives were as follows:

- Providing information on healthy eating food choices for the prevention of malnutrition in grade seven learners.

- Improving these children's nutrition knowledge on the SA FBDG's as these were specifically developed for the South African population and are feasible to expose and teach children healthy eating habits.
- Motivating the children to change their behaviour at an early age to live healthier.

## **METHODOLOGY**

Primary school children were chosen as the sample population because previous studies showed that school based nutrition education can improve eating behaviour of young persons (WHO 2003:8; CDC 1996:3). Further more, nutrition interventions were already in place in the informal settlement and permission had been obtained from the Department of Education in 2002 for research to be conducted at this school. Another school, with similar socio-demographic characteristics and closest to this school had to be chosen for the control group. The study population consisted of all grade seven learners, which amounted to a total of 133 children, from the two selected primary schools in the Vaal Triangle area. The age group chosen for this study was grade seven learners because in primary schools, grade seven learners formed part of the adolescent group, for which the measuring instrument was developed.

A validated nutrition knowledge questionnaire, compiled by the SA MRC, was used to determine the pre-test knowledge of the children from both schools.

The pre-test took place on the 28 of July 2005 for the experimental group and on the 29 July 2005 for the control group. For both schools, trained fieldworkers assisted in translating the questionnaire into the relevant languages that the children spoke.

After the pre-test were completed, data were captured on an Excel spreadsheet and analysed to indicate nutrition knowledge, using graphs to indicate all the selected answers, correct or incorrect and tables were used to indicate only the correct answers. Results from the pre-test were used to develop the nutrition education playing cards.

The nutrition problems amongst primary school children faced were under nutrition as a result of poverty and household food insecurity and it was thus decided to do nutrition education in this school (Oldewage-Theron et al. 2005:318; Napier & Oldewage-Theron

2005:1). The FAO (1997) framework for developing NEP was used for planning this intervention.

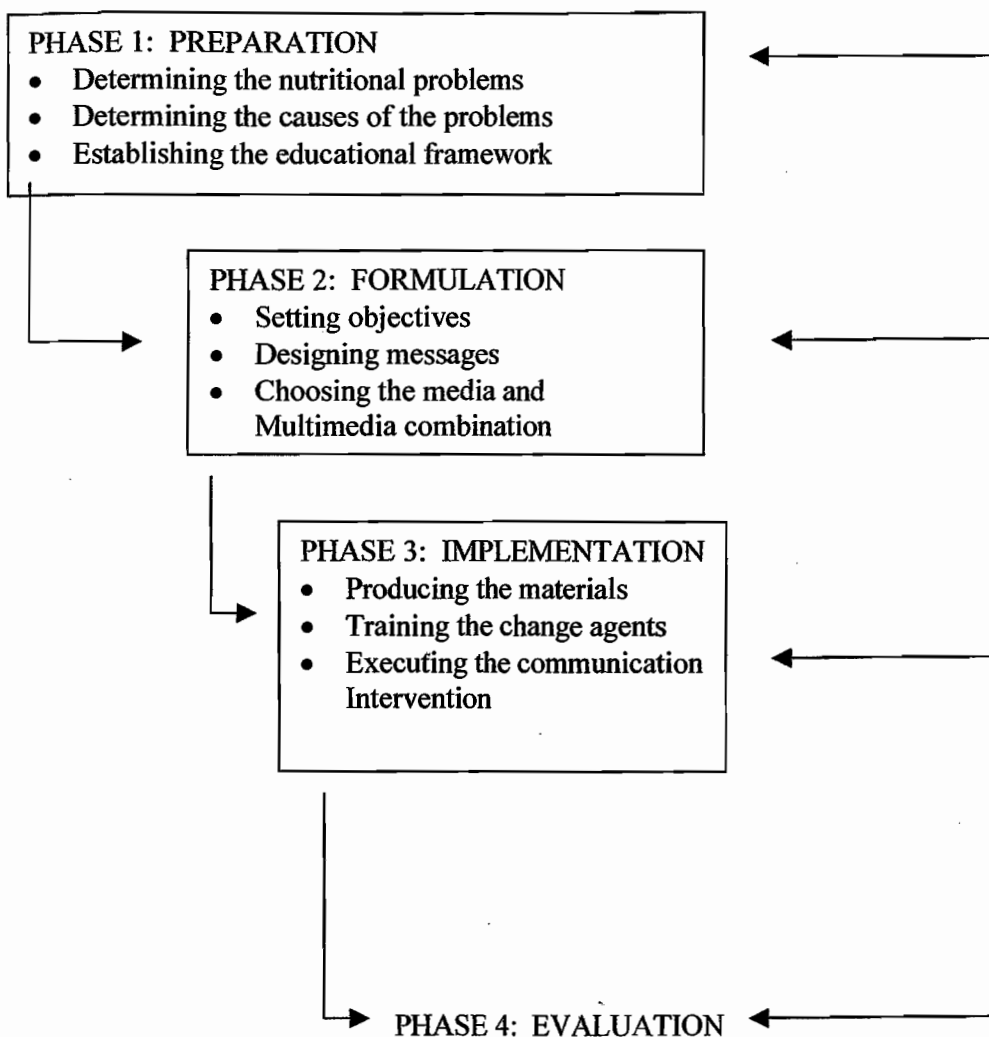


Figure 2: Framework for planning nutrition education programmes (FAO 1997).

#### **Phase 1: Preparation of the nutrition education programme**

The preparation phase of the nutrition education programme included defining nutritional problems of the sample population, determining the causes of the problems and establishing measures to educate the population to correct the problems. The main nutritional problem of the sample population is malnutrition, mainly due to poor food consumption patterns, therefore revealing a need for nutrition education (Napier 2001:78).

#### **Phase 2: Formulation of the nutrition education programme**

The steps in this phase included designing the messages and choosing the media (FAO 1997). Because the main aim was to develop a nutrition education tool based on the SA

FBDG's, the messages chosen for the NEP were derived from the SA FBDG's for both groups. The SA FBDG's are:

- Enjoy a variety of foods
- Be active
- Drink lots of clean, safe water
- Make starchy foods the basis of most meals
- Eat plenty of vegetables and fruits every day
- Eat dry beans, peas, lentils and Soya regularly
- Chicken, fish, meat, milk or eggs can be eaten daily
- Eat fats sparingly
- Use salt sparingly
- Use food and drinks containing sugar sparingly and not between meals
- If you drink alcohol, drink sensibly

At various occasions visiting the schools, the researcher made an observation and realized that the children were familiar with playing cards because they played cards during breaks at school. It was, therefore, decided to use playing cards (for the experimental group) as the medium for the NEP after discussions with the teachers. These playing cards were developed to contain the *nutrition education messages*. The *nutrition education cards* were pilot-tested and were given to ten grade seven learners to read and interpret what they understood from the messages. This was done to ensure clarity, visibility and understanding of the messages. For the control group, a pamphlet and nutrition education lessons were developed by the researcher, indicating the SA FBDG's and similar messages to the cards. The pamphlet was pilot-tested and was given to ten grade seven learners to read. This was done to test clarity and understanding of the pamphlet.

### **Phase 3: Implementation of the nutrition education programme**

Five fieldworkers were recruited from the Vaal University of Technology. All the fieldworkers were Sotho speaking, and three of them could speak isiZulu and IsiXhosa as well. The researcher trained the fieldworkers on how the questionnaire should be completed before the actual fieldwork took place. *Teachers were recognized as major influences in the psychological environment and as role models who could encourage students by demonstrating healthy eating (WHO 2003:27; UNESCO 2002:5)*. The teachers of both the

schools were actively involved in the study and had a tremendous contribution to the success of the study by issuing cards, using the cards in English lessons and assisting in the lectures. The researcher had one training session for an hour, where the researcher explained the importance of the research to the teachers before the interventions and explained all the nutrition messages to the teachers so that they could use the cards in their English lessons as part of the nutrition education programme.

During the executing process, the children from the experimental group were given playing cards with nutrition messages as the passive nutrition education programme. This was introduced by means of issuing playing cards (the nutrition education programme tool) for children to read and exchange and to play with until a full packet of 52 cards was received. During weekends and the school holidays, the children did not receive any cards. The cards were randomly issued out by the teacher, and the children received one card every morning with one nutrition message a day. The researcher visited the children and played card games with them three times, once a month, during the intervention period. The control group received pamphlets designed and issued out by the researcher and they were expected to read the pamphlets before the lecture took place. These were designed as short messages stating the SA FBDG's and messages similar to those in the cards. The researcher presented three 45-minute lectures (one lecture after every three weeks) based on the SA FBDG's, within the same period as the intervention of the control group. All the guidelines were discussed.

#### **Phase 4: Evaluation of the nutrition education programme**

Impact evaluation was used to evaluate the effectiveness of the nutrition education programme by measuring the change in nutrition knowledge of the subjects after the intervention. The same nutritional knowledge questionnaire that was used in the pre-test was used to assess nutrition knowledge after the intervention took place to indicate the differences in the knowledge level. Data from the completed questionnaires were captured by the researcher and analysed using Excel spreadsheets and presented in graphs and tables and percentages calculated for the change in knowledge.

## **RESULTS**

For the purpose of this article, focus will only be placed on the questions where nutritional knowledge of the subjects increased. These included sugar, pregnancy, starch, water, salt, fruit and vegetables, alcohol, physical activity and healthy eating related questions.

Results indicated that 63% of the respondents from the experimental group answered the question "Should you eat a lot of sugar to have enough energy" correctly in the pre-test and 64% answered correctly in the post-test. There was one percent improvement in the experimental group. The control group had a higher percentage than the experimental group as 97% answered correctly in the pre-tests and 97% answered correctly in the post-test. The knowledge level of the control group remained the same.

Ninety three percent of the respondents from the experimental group answered the question "Does sugar and foods that contain sugar should be eaten in small amounts" correctly in the pre-test and 70% answered correctly in the post-test. The level of knowledge decreased by 23% for the experimental groups. In the control group, 89% of the respondents answered correctly in the pre-test and 95% answered correctly in the post-test. The level of knowledge increased by six percent for the control group.

Ninety one percent of the respondents from the experimental group answered the question "is it healthy to snack on foods that contain a lot of sugar" correctly in the pre-test and 91% answered correctly in the post-test. The level of knowledge remained the same for the experimental group. In the control group, 99% of the respondents answered correctly in the pre-test and 99% answered correctly in the post-test. The level of knowledge also remained the same for the control group.

The results therefore indicated that the subjects were well informed on sugar consumption as the majority of both the experimental and control groups answered the questions correctly.

The correct answer from the options given in Figure 3 was "sleep most of the day". Thirty two percent of the respondents from the experimental group answered the question "which one of the following is not healthy for a pregnant woman to do" correctly in the pre-test and 34% answered correctly in the post-test. The level of knowledge increased by two percent for the experimental group. Forty six percent of the respondents from the control group answered the question correctly in the pre-test and 55% answered correctly in the post-test. The level of knowledge increased by nine percent for the control group.

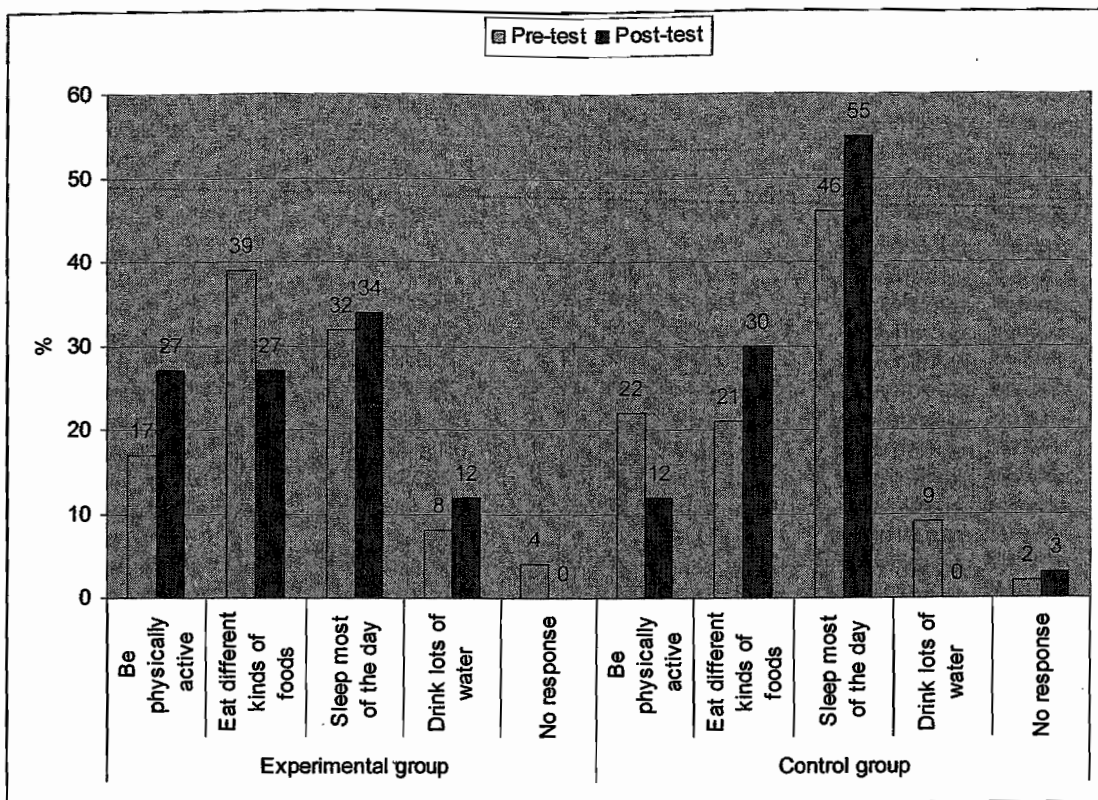


Figure 3: Responses of both groups for the question “Which one of the following is not healthy for a pregnant woman to do”.

Forty one percent of the respondents from the experimental group answered the question “is it not healthy for a pregnant woman to eat foods like milk, cheese and yoghurt” correctly in the pre-test and 61% answered correctly in the post-test. The level of knowledge increased by 20% for the experimental group. In the control group, 54% of respondents answered correctly in the pre-test and 22% answered correctly in the post-test. The level of knowledge decreased by 32% for the control group.

Only 12% of the respondents from the experimental group answered the question “is it not healthy for a pregnant woman to drink a lot of wine, beer and cider” correctly in the pre-test and 70% answered correctly in the post-test. The level of knowledge increased by 58% for the experimental group, compared to only seven percent for the control group.

Fifty eight percent of the respondents from the experimental group answered the question “is it important for a pregnant woman to avoid eating different kinds of foods” correctly in the pre-test and 29% answered correctly in the post-test. The level of knowledge decreased by 29% for the experimental group. In the control group, 26% of respondents answered correctly in the pre-test



and 60% answered correctly in the post-test. The level of knowledge increased by 34% for the control group.

The results indicated that the knowledge of subjects in both the experimental and control group were limited regarding pregnancy. This could be due to their age group and low level of experience of pregnancy. Although the knowledge was poor in both groups, the knowledge improved in two questions for both groups, however not in the same questions. The poor results in this section could also be because only two messages were included in the nutrition education playing cards.

The nutritional knowledge on starch-related questions for both groups was poor. Even though the correct answer showed some improvement for the experimental from 17% in the pre-test to 20% in the post-test, the majority of the subjects indicated the wrong answers after the NEP implementation. However, the control group showed an improvement from 28% to 69% after the implementation of the nutrition education programme, therefore indicating better understanding and improvement on knowledge compared the experimental group.

The correct answer from the options given in Figure 4 was “7 to 9 glasses. Twenty percent of the respondents from experimental group answered the question “how much water should you drink a day” correctly in the pre-test and 65% answered correctly in the post-test. The level of knowledge increased by 45%. Forty six percent of the respondents from the control group answered correctly in the pre-test and 96% answered correctly in the post-test. The level of knowledge increased by 50%.

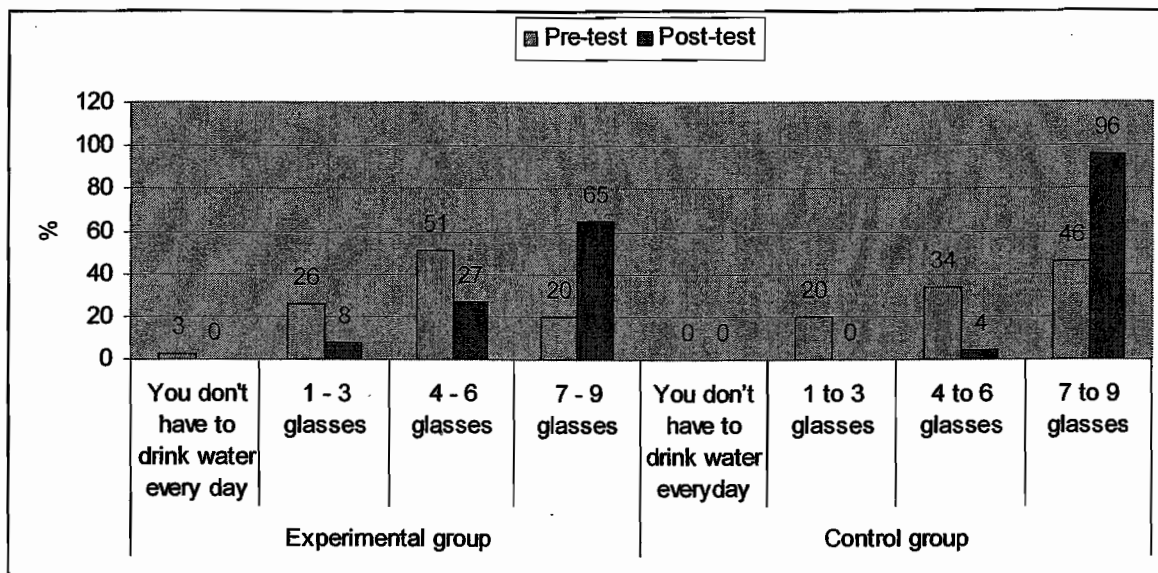


Figure 4: Responses of both groups for the question “How much water should you drink a day”.

Results showed the best improvement after the implementation of the NEP in both the experimental (+45%) and control (+50) groups. All the wrong answers showed a decrease in percentage indicating that the NEP was effective in both groups, however, the control group had better knowledge in the post test as 96% answered correctly compared to 65% in the experimental group.

Results indicated that 79% of the respondents from the experimental group answered the question “should you add extra salt to your cooked food before you even eat it” correctly in the pre-test and 73% answered correctly in the post-test. The level of knowledge decreased by six percent for the experimental group. In the control group, 82% of respondents answered correctly in the pre-test and 88% answered correctly in the post-test. There was six percent improvement for the control group.

Fifty percent of the respondents from the experimental group answered the question "does your body need a little bit of salt to be healthy" correctly in the pre-test and 88% answered correctly in the post-test. The level of knowledge increased by 38% for the experimental group. In the control group, 79% of the respondents answered correctly in the pre-test and 78% answered correctly in the post-test. The level of knowledge decreased by one percent for the control group.

Results also indicated that 68% of the respondents from the experimental group answered the question "Should salt should be added to all foods except fruits" correctly in the pre-test and 36% answered correctly in the post-test. The level of knowledge decreased by 33% for the experimental group. In the control group, 36% of the respondents answered correctly in the pre-test and 85% answered correctly in the post-test. The level of knowledge increased by 49% for the control group. Results indicated that although the control group showed better results in two questions compared to the experimental group (where only one question improved), the majority of both groups answered all questions correctly, thus indicating good knowledge on salt consumption. However, the experimental group showed poor post-test results on the question on whether salt should be added to all foods except fruit.

The correct answer from the options given in Figure 5 was "5 or more fruits and vegetables daily". Both groups showed improved results on the consumption of fruit and vegetables after the NEP was implemented, the control group showed 46% improvement in knowledge compared to only 16% improvement in the experimental group, as indicated in figure 5. It is encouraging however, to note that only a small percentage (four in the experimental and three in the control group) indicated that there is no need for fruit and vegetables in the diet. After the NEP, the experimental group had 0% of subjects indicating the better.

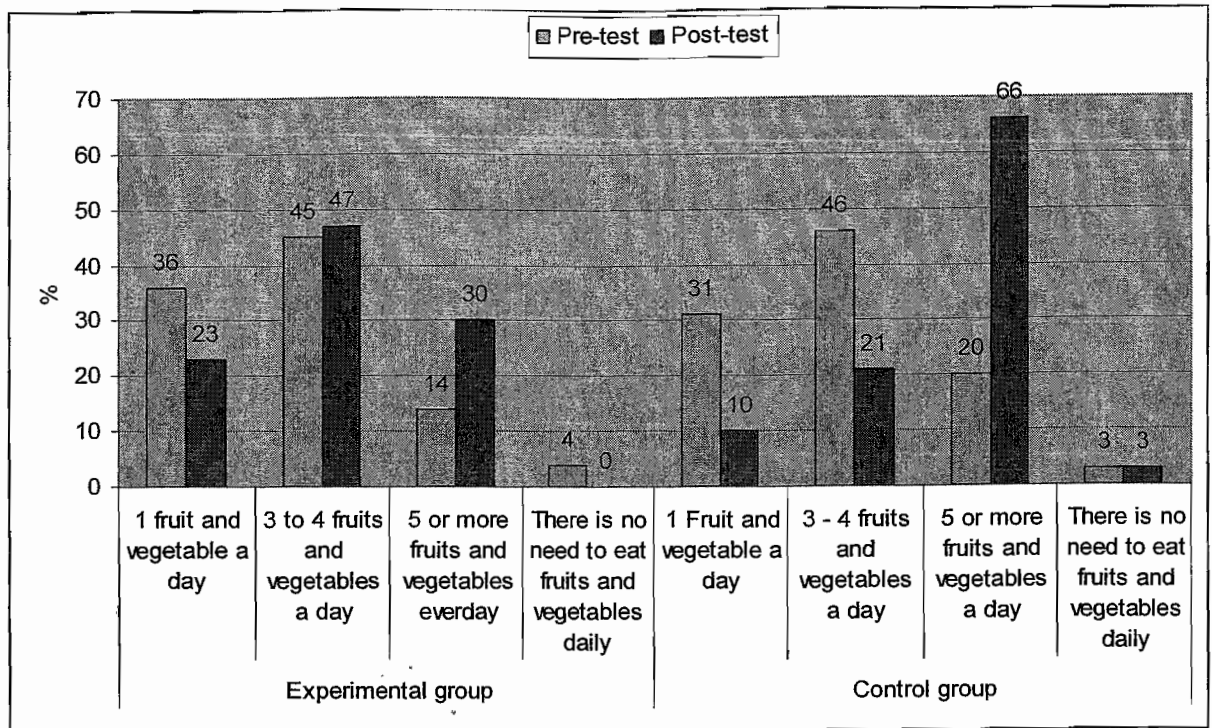


Figure 5: Responses of both groups for the question “How many fruits and vegetables should be eaten”.

The majority of the respondents from the experimental group (91%) answered the question “can drinking a lot of wine, beer or cider cause weight gain” correctly in the pre-test, and only 12% of the respondents answered correctly from the control group. The NEP in the control group showed better results as the knowledge improved by 55%. Even though the level of knowledge deteriorated for the experimental group, the majority of the subjects indicated the correct answer and the control group showed an improvement.

The correct answer from the options given in Figure 6 was “All of the above”. Thirty-four percent of the respondents from the experimental group answered the question “What does being physically active mean” correctly in the pre-test and 45% answered correctly in the post-test. The level of knowledge increased by 11% for the experimental group. Sixty-four of respondents from the control group answered correctly in the pre-test and 75% answered correctly in the post-test. The level of knowledge increased by 11% for the control group. Even though the level of knowledge increased for both groups, the

control group showed a better understanding and knowledge (+75%) as compared to experimental group (+45%).

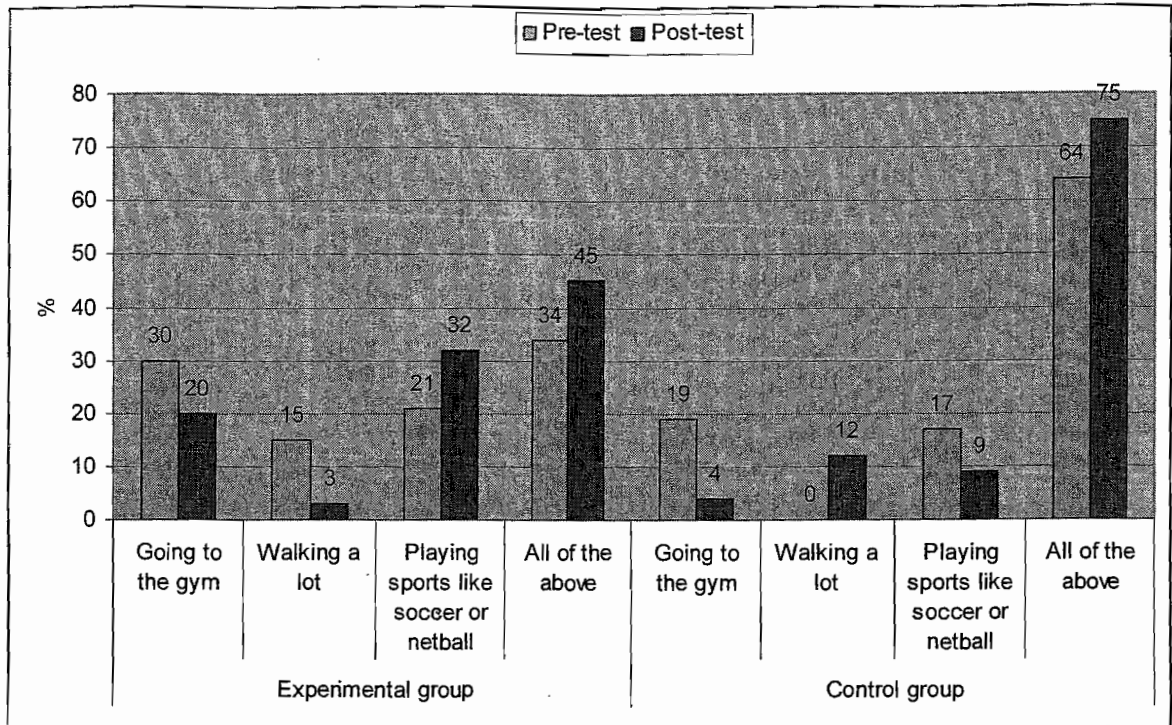


Figure 6: Responses of both groups for the question “What does physical activity mean”.

The results indicated that, after the NEP, the control group showed an improvement (from 39% to 54%) in answering the question “from which group of foods should we eat the most everyday” compared to a decrease of 17% in the experimental group (from 44% to 17%).

The correct answer from the options given in Figure 7 was “Mostly starches, vegetables and fruits, with smaller amounts of meat and dairy products”. Thirty-five percent of the respondents from the experimental group answered the question “What does a well balanced diet consist of?” correctly in the pre-test and 38% answered correctly in the post-test. The level of knowledge increased by three percent for the experimental group. Nineteen of the respondents the control group answered correctly in the pre-test and 69%

answered correctly in the post-test. The level of knowledge increased by 50% for the control group.

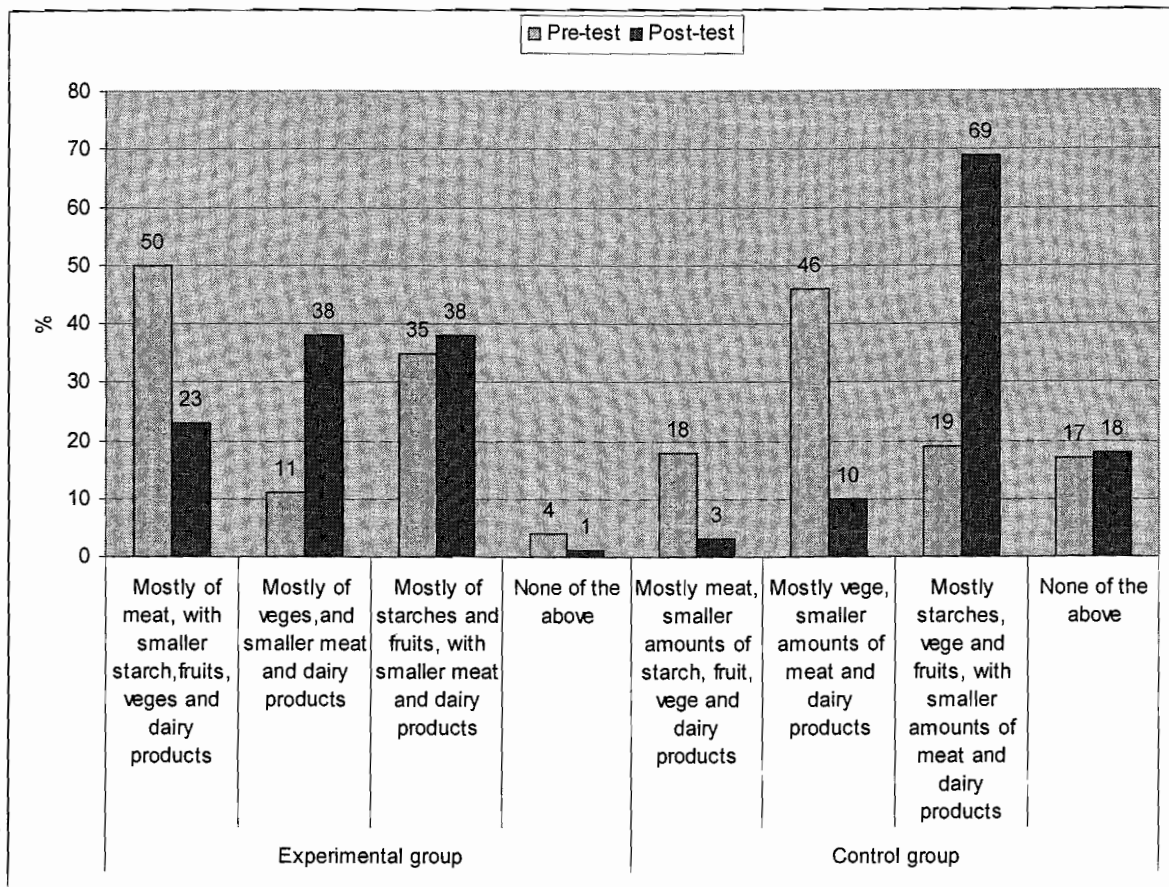


Figure 7: Responses of both groups for the question “What does a well balanced diet consists of”

Results indicated that 36% of the respondents from the experimental group answered the question “to protect yourself from disease, should you avoid eating many different kinds of food” correctly in the pre-test and 41% answered correctly in the post-test. The level of knowledge increased by five percent for the experimental group. In the control group, 67% of the respondents answered correctly in the pre-test and 81% answered correctly in the post-test. The level of knowledge increased by 14% for the control group.

Results indicated that 32% of the respondents from the experimental group answered the question “Is eating a lot of different kinds of foods healthier that eating a few kinds of foods” correctly in the pre-test and 64% answered correctly in the post-test. The level of knowledge increased by 32% for the experimental group. In the control group, 60% of



the respondents answered correctly in the pre-test and 57% answered correctly in the post-test. The level of knowledge decreased by 3% for the control group.

The correct answer from the options given in Figure 8 was “Fibre and vitamin A”. Forty five percent of the respondents answered the question “Which of the following groups of nutrients a found in large amounts in fruit and vegetables” correctly in the post test and 64% of the respondents answered correctly in the post-test. The level of knowledge increased by 19%. In the control group, 64% answered correctly in the pre-test and 33% answered correctly in the post-test. The level of knowledge decreased by 31%.

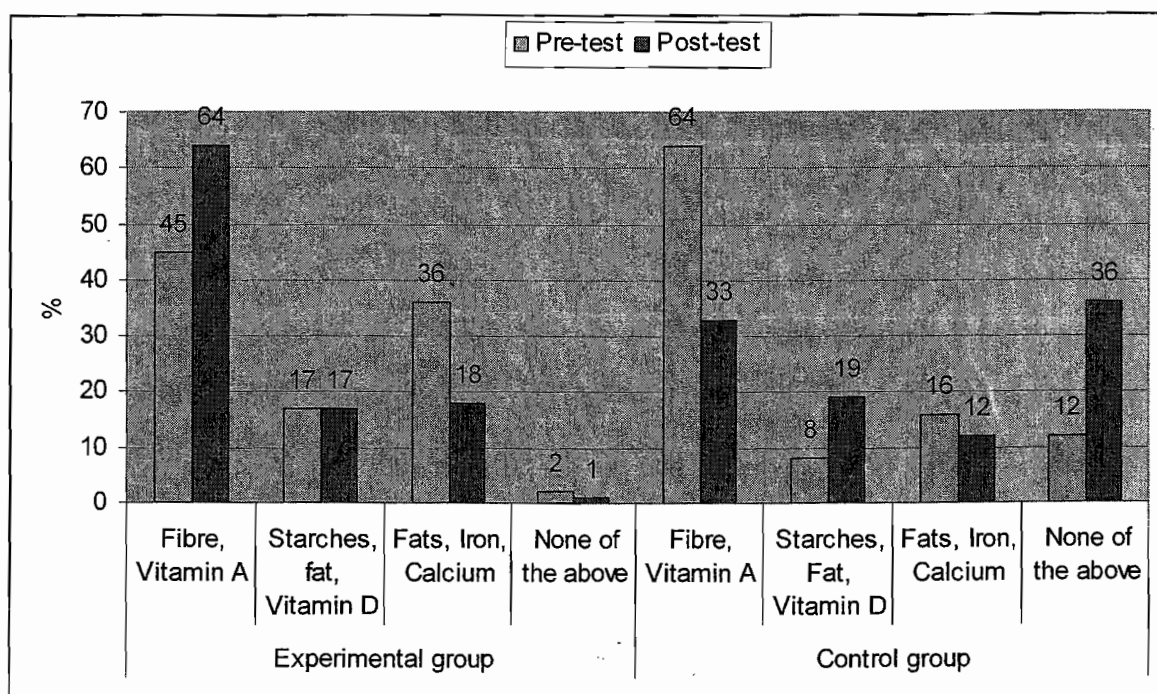


Figure 8: Responses of both groups for the question “Which of the following groups of nutrients are found in large amounts in fruits and vegetables?”.

### Conclusions

Malnutrition, both under and over nutrition remains a persistent problem globally, in the larger South Africa, and in the Vaal Triangle where this project was undertaken (Oldewage-Theron et al 2005:14).

The results in this study indicated success in both the NEP with the playing cards as well as the lecture with the pamphlet. It is difficult to determine which of the two strategies was more effective as the lecture with the pamphlet subjects showed improved results that the card game when comparing the subject's knowledge regarding starch-related question, water-related questions, salt, fruit and vegetable and alcohol consumption as well as the questions pertaining to healthy living, vitamin A sources and calcium. The experimental group showed better knowledge on soya, energy and fibre related questions, as well as fruit and vegetable nutrient content. The questions pertaining to pregnancy, sugar and physical activity showed similar results in both groups.

In general, the subjects of both groups had a good knowledge regarding sugar, water and salt consumption, as well as "the key to a healthy way of eating" thus the inclusion of fruit and vegetables, and variety in the diet. Poor knowledge was present in both groups pertaining to pregnancy, the importance of starch in the diet, alcohol consumption, the meaning of physical activity, vitamin A-rich foods and the inclusion of pilchards as a calcium-rich source.

### **Recommendations**

Addressing the nutrition challenge requires a holistic approach and interventions should not be planned in isolation. Schools have been recognised as the most important setting for health programmes for the reason that a great proportion of children go to school, and schools are situated in neighbourhoods and have active connections with families and community based institutions (FAO 2000:10; Napier & Oldewage-Theron 2005:5).

Nutrition education programmes should be implemented at schools and that the nutrition education be conducted to educate children on healthy eating and on choosing healthier foods. With the problem of low income, some families may not be able to make the correct food choices due to budgetary constraints, however, it is designed to give the children the benefit of awareness on what is the healthier alternative when making food selections and children will grow up with improved knowledge of nutrition which might be used in their procurement patterns as adults. Parents should thus be actively involved



in nutrition education programmes for children as they make food procurement decisions in their households. Involving parents will also help as most children rely on what they are taught by their parents.

School-based nutrition education has to be well thought-out and executed cautiously and be for an extended period to institute excellent insight of healthy eating supporting the FBDGs. More studies should be conducted with the SA FBDG's as the basis, as it can be seen that nutrition messages based on the SA FBDG's and three nutrition education sessions increased the nutritional knowledge of the children over a short period of time.

Nutrition education should be part of the curriculum for school children, in order to include all age groups and should start early in childhood as children develop their eating patterns at a young age. School policies that support student's healthy dietary behaviours must be developed and compulsory as recommended for a comprehensive health programme (ADA 2003:513).

Recommendations for future research include:

- A more in-depth study to evaluate not only the impact on knowledge, but the impact on behaviour as well.
- Measuring impact periodically over a period of one year to measure knowledge retention.
- Validity and reliability testing of the measuring tool by experts in the field

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ANNEXURE G

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To Whom It May Concern:

This is to confirm that I have acted as language editor of the MTech text of Onwaba Makanjana of the Vaal University of Technology.

Best wishes,

Dr Karl Koperski  
Language Editor

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