University of Venda

NUTRITION KNOWLEDGE OF EDUCATORS IN PRIMARY SCHOOLS IN MAKHUDUTHAMAGA MUNICIPALITY IN LIMPOPO PROVINCE

by

MATLOU MARTINA MAGOAI

B.NUTRITION (UNIVERSITY OF LIMPOPO)

The dissertation is submitted in partial fulfilment of the requirements for the degree of Masters of Public Nutrition in the Department of Nutrition in the School of Health Science and Technology, South Africa.

Supervisors: Prof XG Mbhenyane

Division of Human Nutrition, University of Stellenbosch

Co-supervisor: Mr NS Mabapa

Department of Nutrition, School of Health Sciences

University of Venda

2019

DECLARATION

I, **Matlou Martina Magoai**, hereby declare that the dissertation submitted to the University of Venda for the degree of Masters of Public Nutrition has not previously been submitted for a degree at this or any other university; and that it is my own work. The sources that I have used or quoted have been indicated and acknowledged by means of complete references.

Matlou Martina Magoai

Date

DEDICATION

To God Almighty for the strength and direction that He gave me;

To my parents, Joseph and Mary, for the love, encouragement, and support;

To my husband, daughter, and sons for their undying love and support;

To my brother, Peter, and sisters, Leutloana and Matheya, for having confidence in me.

God bless them.

ACKNOWLEDGEMENTS

My special thanks to the following:

- Prof X. G. Mbhenyane my supervisor, for encouraging and supporting me throughout my studies, helping me with proposal writing and for all the sacrifices she made in order to ensure the success of the project.

- Mr S. N. Mabapa my co-supervisor, for his assistance throughout. Thank you for transporting me to the schools from the beginning of the project.

- Mrs H. V. Mbhatsane for her assistance and support.

- The educators, who participated in the study, thank you for the support.

- To school principal, thank you for welcoming me to your school and giving me permission to collect data for the research.

- To the Department of Education, thank you for giving me permission to conduct my research in your schools.

- Friends, colleagues, and family for the love, care, support and encouragement that you gave me.

- My husband, James Khoza, and my children, Maphutha, Mathabo and Ramano Khoza, for their understanding and morals support throughout the study.

ABSTRACT

Introduction: Nutrition education is the change process whereby beliefs, attitudes, environmental influences, and understanding about food lead to nutrition practices that are scientifically sound, practical, and consistent with individual needs and available resources

Design and Methods: The purpose of this study was to assess the nutrition knowledge of educators in Makhuduthamaga municipality, Limpopo Province. Quantitative, descriptive, and exploratory research was conducted to determine the factors that influence the nutrition knowledge of educators and explore the relationship between factors and nutrition knowledge. The simple random sampling technique was employed to select 200 educators in grades 4, 5, and 6. Data collection was done using structured questionnaires. The data was analysed using the statistical package for social science (SPSS), version 21.

Results and Discussion: Of the educators who participated in the study, 66.5% were female, and 33.5% were males. Almost all (94%) of the educators were trained at a college and had teaching experience of between 21-30 years. Most of the educators (60.5%) had a diploma, while 0.5% had a master's degree. Almost one third of educators indicated that children should eat three (3) times during the day, and 32% identified the important meals as breakfast, lunch, and supper. Most (36.5%) failed to give reasons why children should not skip meals. In terms of basic food and nutrition, majority of the educators (75%, 67%, 56%, and 55.5%) responded correctly on the importance of carbohydrates, fat, vegetables, and fruits, respectively. Only a quarter (26%) knew the importance of protein, while 75.5% knew that protein forms part of a balanced diet. Most of the educators knew the rich sources of vitamin A and fibre but did not know the rich sources of iron, iodine, and vitamin C. There was no significant difference between the level of education and nutrition knowledge ($p= 0.129$), and between training institution and nutrition knowledge ($p= 0.534$).

Conclusion: The need to train educators on nutrition was one of the main recommendations that emanated from many research projects. Most educators mentioned that training and level of education were of the factors that affected their nutrition knowledge. Nutrition knowledge is becoming increasingly important in food choices and in this study educators acknowledged that training affected their nutrition knowledge.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

DoE- Department of Basic Education

FAO-Food and Agriculture Organisation

FGD- Food Guide Pyramid

HK- Health Kick

HPS- Health Promoting Schools

INP- Integrated Nutrition Programme

KIE-Kenya Institute of Education

LO-Life Orientation

NE- Nutrition Education

NEP- Nutrition Education Programme

NEPS- Nutrition Education in Primary Schools

NSNP- National School Nutrition Programme

PSNP- Primary School Nutrition Programme

RDP-Reconstruction and Development Programme

RSA- Republic of South Africa

SA- South Africa

SHP- School Health Policy

USDA- United States Department of Agriculture

UNSCN-United Nations Standing Committee on Nutrition

WHO-World Health Organization

DEFINITION OF TERMS

Curriculum: Refers to everything that runs or occurs under the auspices of a learning institution to address key learning areas. These areas are the ideas that focus on learning, learners, content and teaching, and learning materials (Kelly, 2009; Morris et al, 2002)

Nutrition Knowledge: Refers to teacher's knowledge in the following areas covered in the syllabus: food nutrients, balanced diet, deficiency diseases, food preservation, storage hygiene, and nutritional requirements for different groups (Worsley, 2002)

Nutrition Education: The processes by which people gain the knowledge, attitude, and skills necessary for developing good dietary habits and other nutrition related practices conducive to health and well-being (Contento, 1995; FAO, 2005a)

CHAPTER1

INTRODUCTION

1.1 Overview

Nutrition education is the change process whereby beliefs, attitudes, environmental influences, and the understanding about food lead to nutrition practices that are scientifically sound, practical, and consistent with individual needs and available resources (Contento, 2011).Nutrition education aims at imparting knowledge on healthy eating and nutrition behaviours that foster health and well-being, by using a combination of educational strategies and environmental factors (Contento, 2011).Poor nutrition knowledge is one of the main factors in the development of malnutrition and needs to be addressed (Briggs et al, 2010). Furthermore, McNultry (2013) adds that nutrition education is effective in addressing malnutrition of varying degrees in children. Some of the factors that have been noted to influence nutritional status are the lack of education and nutrition knowledge, inappropriate nutrition education, misconceptions and passing harmful dietary traditions and poor nutritional practices from parents to children (Shisanaet al, 2013; Vorster et al, 2001).

In South Africa, few studies on nutrition education have looked into targeting an intervention at teachers in order to influence the dietary behaviours of learners. Learners between the ages of 10 and 12 years present a window of opportunity to influence the dietary behaviours of the next generation of adolescents and adults (Lakshman et al, 2010). Eating habits that children adopt often continue into adulthood (Van Cauwenberghe et al, 2013). Impressing upon children the importance of nutrition in their early years is paramount since they are still determining lifelong food preferences and eating habits (Zarnowiecki et al, 2011). If children can learn what makes up a healthy diet, they should eat, they have a higher likelihood of making healthier decisions by eating more fruits, vegetables, dairy, and bread, and less fat (Baskale & Bahar, 2011).

Despite the school food environment, classroom teachers perceived disconnectedness between what is taught in nutrition at school and the home food environment (Peralta & Cotton, 2016). According to Lytle (1995), family involvement is critical for enforcing learning outcomes in classroom nutrition education (Lytle, 1995). Additionally, in a similar

study conducted by Hammerschmidt et al (2011) at a low income Michigan school, teachers emphasised nutrition messages in the classrooms that were reinforced at students' homes. Parents may not know how to find and prepare healthy meal options on a tight budget. Experiential learning assignments at home are an option to improve the food environment, but one has to consider food insecurity. However, parents may feel resentment towards the teachers who try to influence what they eat (Downs et al, 2012).

Nutrition education should (include all sorts of changes) target a modification in the knowledge, attitude, and behaviour of individuals or populations aiming at rationalising their eating habits. In a study that investigated teachers' perceptions of the impact of nutrition education on eating behaviours of learners, it was revealed how parents boasted about not eating vegetables but rather meat in their home. This situation led to learners from such homes refusing to eat certain vegetables when served with school meals. It was also discovered how peer influences affect the impact of nutrition education in school (Kupolati et al, 2015).

Nutrition education resources should be adequate to prepare teachers to teach, guide, and positively influence learners' eating behaviours (Sherman & Muehlhoff, 2007). The curriculum must be explicit and teachers must receive adequate training on the use of the curriculum. Nutrition training of teachers that has a behavioural change component can lead to effective nutrition education implementation for behaviour change into healthy eating among learners (Hildebrand et al, 2012). The influence of teachers on dietary behaviours of learners can either be helpful or harmful (Senekal et al, 2015). Learners can be influenced by teachers through positive role modelling such as eating healthy foods in front of learners or avoiding unhealthy classroom food practices (Rossiter et al, 2007). Teachers are authority figures and role model to learners and hence can model healthy dietary behaviours. (Rossiter et al, 2007)

1.2 Problem statement

A lack of effective nutrition education in schools is reflected by the low level of nutrition knowledge, attitudes, and practices resulting in a compromised nutritional status among pupils (Lakshman et al, 2010). Nutrition education is one of the most enduring, effective, and economic interventions and one in which schools have the biggest role to play, but it has

unfortunately been neglected (FAO, 2005a).It motivates and enables people to adopt healthy dietary patterns and a healthy lifestyle. Schools are a particularly important when setting for nutritional education because of the reasons discussed above (FAO, 2005c).

Nutrition education is an important element of the Primary School Nutrition Programme in South Africa. However, only the feeding scheme part has been successfully implemented in most primary schools, albeit with logistical problems. The nutrition education part is supposed to be done by teachers with the learners. Currently there are neither nutritional training policies nor training packages that have been developed. Teachers are trained at universities and it is unclear how much of early childhood nutrition is included in the curriculum (as there is no clear specific subject except that of family ecology). This study aimed to provide baseline data on nutrition knowledge of teachers and to identify the content taught during training.

This study was carried out in the Makhuduthamaga Municipality in order to establish the nutrition knowledge of educators in primary schools. The need for training of teachers was confirmed in a South Africa study, where teachers admitted to having limited knowledge about nutrition and healthy habits, which was attributed to them not being experts on the subject (Nguyen et al, 2013). Teachers are an integral part of the school environment which has an important environmental influence on the dietary behaviour of learners. It is therefore important to ascertain teacher's nutrition knowledge; attitude and practices assessments on the part of teachers may transmit unhealthy nutrition behaviours to learners (Senekal et al, 2015; Dalais et al, 2014; Rafiroiu & Evans, 2005). Food and nutrition are taught as an integral part of life skill, natural science, and technology subjects in South African primary schools (United Nations Integrated Children's Emergency Fund (UNICEF) 2008). According to study done by Oldewage-Theron and Napier (2011) at Vaal region in South Africa, no nutrition education resources or tools were available and most teachers recommended an appropriate educational tool for primary school children in all grades where English is the medium of instruction (Oldewage-Theron &Napier, 2011). The critical problems identified from the literature are:

The change agents (teachers) may not be effectively equipped to the extent of imparting desirable nutrition behaviour change (Oldewage-Theron &Napier, 2011). Therefore, there was a need for intervention to improve nutrition knowledge and dietary intake among the primary school educators (Senekal et al, 2015; Dalais et al, 2014).

Nutrition education has not been incorporated into the teaching programme as a subject on its own in primary schools. Topics in food are taught in other subjects (UNICEF, 2012; Department of Basic Education (DoBE), 2011a; DoBE 2011b), which may be inadequate to impart nutrition education (NE) to learners (Nguyen et al, 2013).

1.3 Aim of the study

The aim of the study was to assess nutrition knowledge of educators in primary schools in the Makhuduthamaga Municipality, Limpopo Province.

1.4 Objectives

In order to fulfil the above-mentioned aim, the following objectives had to be achieved:

1.4.1. To assess the knowledge of educators on early childhood nutrition of children up to ten years of age.

1.4.2. To determine the factors that influences the nutrition knowledge of educators.

1.4.3. To explore the relationship between these factors and the knowledge of educators.

1.5 Research questions

1.5.1 What is the level of knowledge of educators on early childhood nutrition of children up to ten years of age?

1.5.2 What are the factors that influence the nutrition knowledge of educators?

1.5.3 What is the relationship between these factors and the nutrition knowledge of educators?

1.6 Significance of the study

The information obtained from the study may assist the Department of Education to develop training material for educators aligned with the curriculum. These will be used to train or

provide in-service training for teachers on nutrition education, especially those teaching life orientations. The results will be submitted to the relevant authority tasked with implementation of nutrition education in schools. This will enable the Primary School Nutrition Programme to be implemented in its complete form. The result may not be significant to the whole of South Africa, as the study population was based on one municipality in Sekhukhune.

CHAPTER 2

LITERATURE RIVIEW

2. Overview

In this chapter, the literature review is organised in the following manner:

Looking at the overview of nutrition education context internationally and in South Africa, constraints related to nutrition education, strategies to improve school-based nutrition education, teachers' knowledge on the educational programme, framework for nutrition education programme, National School Nutrition Programme, and nutrition education curriculum in South Africa.

2.1 Nutrition education

Nutrition education is part of applied nutrition that focuses its resources on learning, adaptation and acceptance of healthy eating habits, according to one's own food culture and scientific knowledge in nutrition. The ultimate aim is to promote the health of the individual or community. Additionally, it is very useful in health promotion and primary prevention to further the acquisition of healthy eating habits in different environments. It is also a useful strategy in the adoption of therapeutic dietary prescriptions and secondary prevention of the diseases (Gil, 2010).

According to Osborne and Forestell (2012), although children understand that nutritious food contributes to a healthy body, they are generally not concerned about their health and children appear to believe that healthy foods are unpalatable. Teaching children about nutrition is one of the most important subjects learned early in life, with evidence suggesting that diet during childhood may have important implications for the development of obesity and other chronic diseases later in life (Ritchie et al, 2011).

Nutrition education is taught in public South African's schools with the focus on knowledge for school performance, rather than with a motivation towards nurturing nutrition behaviours that are consistent with health and well-being. Thus, the potential influence of the school

environment in shaping desirable nutrition attitudes and practices among learners is not realised (Lakshman et al, 2010). Therefore, there is a need to establish whether a context-specific, enhanced curriculum approach of the Nutrition Education Programme for teachers could achieve effective teaching of nutrition and promote healthy eating habits of learners (Kupolati et al, 2015a). The enhanced curriculum approach is a theory-based nutrition education plan based on the nutrition topics in the existing nutrition curriculum of the Department of Basic Education (DoBE) (Dudley, Cotton, & Peralta, 2015).

It is strongly emphasised in the literature that schools are in an excellent position to promote healthy eating, because most children spend most of their time at school. Moreover, school-based nutrition education is ideal as children can be engaged in healthy eating and physical activity programmes that reinforce the messages of nutrition education (Briggs et al, 2010; Gross & Cinelli, 2004; Perez-Rodrigo & Arancenta, 2003; Sallis et al, 2003). Studies have shown that nutrition education offered in primary schools in Kenya was effective in increasing pupils' nutrition and health knowledge (Eboh & Boye, 2006; Mbithe, 2008). It is encouraging that academic performance can be improved with school nutrition education combined with other programmes that promote wellness (Farfan-Ramirez et al, 2011; Shilts et al, 2009).

2.2 International context of nutrition education

The FAO and the Netherlands Nutrition Centre prepared a questionnaire, which was sent to 55 countries in Asia, Africa, Latin America and the Caribbean, and the Near East (Glasauer et al, 2003). Countries with nutrition education policies such as Kenya, and South Africa reported that as part of their general education and health policies, nutrition was not a mandatory school assigned specific time or structure. The methods normally used in primary schools to teach nutrition included conventional lessons, explanations, and group activities or discussion. Less than one-third of the countries used nutrition guides and recommendations in primary school nutrition education. The most critical finding was the lack of training in nutrition education among teachers. Less than half of Latin American and Asian countries reported the inclusion of nutrition in teacher training, with the situation being better in the Caribbean, Africa, and the Near East (FAO, 2001).

According to a study done by Andrade et al (2003) in Chile, the main health problems affecting Chilean schoolchildren were overweight and obesity associated with a lack of physical exercise and a diet rich in saturated fats, sugar, and salts. The education approach was based on the assessment of nutrition status, food consumption habits, and the awareness of nutrition among school children. Outputs from the projects included a book on food and nutrition education in basic schooling, a teachers' guide, five guides for students from third to eighth grade and a CD-ROM. The concepts and practical activities of the projects represent all that schoolchildren needed to know about food and nutrition to improve their dietary habits. The materials could be used as part of a curriculum or in programmes and projects in other school subjects. Interventions may be constant if impacts on the children's knowledge, attitude and food practices are significant (Olivares et al, 2005). Appropriate nutrition is essential for children's growth and the change in eating and physical activity habits must occur at the earliest age possible. Therefore, the school represents the best opportunity to adopt a healthy lifestyle through knowledge, attitude, and behaviour (WHO, 1998). However, the primary school curriculum of the Chilean Ministry of Education does not yet include nutrition education (Republic of Chile, Ministerio de Educacion,2003).The main barriers to implement a nutrition education programme for primary schoolchildren in Chile are the teacher's lack of nutrition knowledge, insufficient education materials, and the difficulty in obtaining government support (Olivares et al,2004).

In order to tackle under-nutrition through education, the government of Zambia, in collaboration with FAO, set up the Nutrition Education in Primary Schools Project in the fishing and farming communities of the Luapula Valley. Before the development of teaching materials began, an analysis was undertaken to assess the nutritional status of primary school children and the situation in the schools. Children in these communities were found to be suffering from the effects of insufficient and poor-quality food, poor hygiene and sanitation, lack of clean water, parasite infections, malaria, and diarrhoea during their school year. Meals were limited, diets lacked variety and household food security was a major issue. Attendance at school was poor and schools lacked teachers, resources were scarce and the school water supply and sanitation were generally inadequate. Few teachers had training in nutrition. Most of the school had gardens or production units, but these were seldom associated with nutrition education, instead children were often seen simply as labour force (Sherma, 2003).

In collaboration with the government of China, health-promoting schools were piloted in the Zhejiang Province. Six primary and secondary schools developed a pilot project to improve

the nutritional and health status of students. A model project was created for nutrition interventions to serve as entry points for the development of health-promoting schools. The pilot projects aimed at improving the food intake and dietary behaviour of students, school personnel, and parents through nutrition. Head teachers, teachers, students, parents, and community leaders carried out the project activities. The importance of a balanced diet, nutritional deficiencies, their effects, and good hygiene were taught. Each pilot school developed its own nutrition materials and resources for students, staff, and parents. Nutrition education activities were supplemented with improvements to health-related school policies and the overall environment, including renovation of school facilities and grounds. Students passed on the information they received at school about good nutrition to their families and the community at large (Aldinger & Jones, 1998).

In Finland the legislation of education has recently been renewed (UNESCO, 2007). Health knowledge has been introduced as an obligatory subject at all school levels. However, this would take several years before sufficient numbers of properly educated teachers on health knowledge would be available. In addition, intensive education of existing teachers would soon start so that they could contribute to the teaching of health knowledge at schools (Finnish National Board of Education, 2004).

2.3 South African context relating to nutrition education

In South African primary schools (intermediate classes), nutrition is taught as part of a subject such as life skills, natural science or technology. Nutrition related topics include dietary habits of children, healthy eating, nutrients in food, food processing, and food hygiene (Department of Basic Education, Republic of South Africa, 2011a; 2011b). The Department of Basic Education (DoBE) has not given nutrition education the necessary emphasis that it needs, despite its importance in South African schools (Oldewage-Theron & Egal, 2012). Nutrition is included as only one of many topics forming part of the life orientation (LO) syllabus. According to Van Deventer (2009), the focus of LO, a compulsory subject offered in South Africa schools, is “life-in society” which assists learners in effective living, learning, and overall well-being. The health kick (HK) curriculum component focused on integrating healthy eating and optimal physical activity (PA) education into the existing LO syllabus. The development of Food-Based Dietary Guidelines for South African by Vorster, Love and Browne (2001) is not essentially a nutrition education curriculum for children. However,

nutrition education curriculum features the South African Food-Based Dietary Guideline that formed a major part of the nutrition topic for Grade 5 in the DoBE curriculum (DoBE, 2011a).

Educators are role models for learners in making healthy food choices and have the potential to play a significant role in an effort to improve, or positively influence, students' dietary behaviours (Kubik et al, 2002).For teachers to effectively perform, they need training on nutrition topics and how to deliver nutritional messages by accommodating learner's circumstances (McNultry,2013). According to the study done by Nguyen et al (2003) in South Africa, only half of the teachers had received training to teach nutrition education and it also reported that the capacity and skills to teach nutrition were lacking among teachers who taught nutrition (Nguyen et al, 2013; FAO 2005a). This needs assessment study revealed the need for nutrition training for teachers as has been confirmed (Dalais et al, 2014; Van Deventer, 2009).When it comes to teaching nutrition education (NE) in the classroom, intrapersonal factors such as knowledge or beliefs about nutrition may be important determinants in whether nutrition is taught.

2.4 Constraints related to nutrition education in schools

Nutrition knowledge, attitudes and behaviour of teachers and prospective teachers could be barriers in promoting healthy food habits among learners (Senekal et al, 2015).The constraints and problems of encouraging schools to encourage children and their families to adopt healthy eating habits and lifestyles continue. Greater efforts are needed if children are to decide for themselves to adopt healthy eating habits. The resource limited setting is characterised by restricted household amenities such as inadequate supply of clean and safe water, lack of household food, lack of toilets, and lack of storage facilities such as refrigerators (Labadarios et al, 2011). The people living in a resource limited setting often have a low level of education and income, resulting in inadequate financial resources for basic needs such as food and clothing (Shisana et al, 2013). Nutrition education in the context of limited resources presents opportunities for the use of local foods and food practices (UNICEF, 2012). Locally available foods have good food value but because they have low social status, their uses are often neglected in the planning of meals in the local communities. Nutrition education in limited resource communities and schools may experience a number of challenges, such as unavailability of resources for illustration, cultural values, and household

food insecurity (David, Kimiywe, & Waudo, 2012). Availability of unhealthy choices of food at low cost also negatively influence the food choices of individuals in limited resource and peri-urban communities. A high level of ignorance is displayed in food choices such as the eating of meat with very little or no vegetables and spending limited financial resources on more costly tinned food instead of fresh produce (Kupolati, Gericke, & MaCintyre, 2015;FAO, 2006). Nutrition education in a resource limited setting may be challenging; however, successful outcomes often result when an appropriately planned nutrition education programme is implemented (Khan et al, 2013; Oosthuizen, Oldewage-Theron & Napier, 2011; Parker et al, 2013; Draper et al, 2010). According to the study done by Peralta et al (2016), the greatest barriers for incorporating nutrition education in a classroom curriculum were competing academic expectations (52%), lack of time (48%), and lack of a suitable curriculum (36%), combined with limited proficiency in nutrition education among educators (21%)(Peralta et al,2016).

According to the study done by Prelip et al (2006), in Los Angeles Unified School District (LAUSD), it was found that there were at least three common barriers that prevented teachers from providing the type and amount of nutrition education that they should provide. These were lack of classroom time, lack of training, and lack of educational materials and equipment (Naylor et al, 2006; Prelip et al, 2012;Stanget al, 1998).In a study conducted by Sherman (2003) in Zambia, dietary advice that was already available, could not be followed because of heavy materials or social constraints. Introducing new pedagogical concepts and promoting nutrition in an environment where there was poor sanitation and hygiene, children with acute malnutrition, a large portion at school, poor school conditions and shortage of teachers were challenges. Where education could have a positive impact, some improvements do not require much time, money or labour. Schools are an ideal setting for nutrition programmes and service nutrition. Education is closely linked with dietary, hygiene, and exercise habits that affect nutritional status that are formed during the school-age years (Aldinger & Jones, 1998).

When it comes to teaching nutrition in the classroom, personal factors such as knowledge and beliefs about nutrition may be important determinants in how nutrition is taught. Lack of nutrition knowledge has been reported to be a barrier in providing nutrition education, yet relatively few studies have examined relationships between nutrition knowledge and classroom nutrition education (Jones & Zudenberg-Cherr, 2015). Previous studies have suggested that nutrition knowledge of teachers is positively associated with teaching nutrition

and self-efficacy to teach nutrition and nutrition related professional development increases nutrition knowledge (Fahlman et al, 2011). However, there are gaps in the literature with regard to factors that may be associated with nutrition knowledge of teachers (Kupolati, 2014).

2.5 Strategies to improve school-based nutrition education

Educational strategies refer to the teaching methods employed in delivering nutrition messages to the target audience (Dudley et al, 2015). Establishing appropriate teaching strategies is vital to achieve healthy eating behaviour outcomes among learners in a school-based nutrition education intervention (Dudley et al, 2015; FAO, 2006). The World Health Organization and the Food and Agriculture Organization have collaborated in promoting and strengthening school-based nutrition education in developing countries. Health and education officials, teachers, students, parents, and community leaders work to foster health and learning through improvements in school environments, policies, and practices (FAO/WHO, 1992).

A survey done in China to establish health promoting schools (HPS) found modest, but significant effects of the intervention among students, school personnel, and parents in terms of knowledge, attitude, and practice. A factor that contributed to the project's success was the enthusiasm with which the participants approached the concept of using nutrition as a point of entry to establish Health Promotion Schools (Aldinger & Jones, 1998).The research showed a low level of knowledge about basic food and nutrition topics prior to the lessons. Students were aware of key topics prior to the lessons, such as energy, protein, fats, micronutrients, and dietary fibre, but they were confused about food sources and their understanding was incomplete and inaccurate. For example, the pupils did not understand the concept of energy value and they confused it with nutrition value. Many pupils had not heard about dietary fibre, its role and sources, and only one third could accurately name a source of dietary fibre (Aldinger & Jones, 1998).

The results were analysed to determine whether there were differences in pupils' knowledge based on gender, parents' education, and participation in meal preparation (Kollajtis-Dolowy et al, 1996).There was an association between accurate knowledge of nutrition and the gender of the pupil. Girls had higher scores on the final test than boys, perhaps because girls

participated in food preparation more often than boys. The learners thought the most interesting lesson was that on nutrients and their main sources, although they thought this was the most difficult topic. Furthermore, the pupils said they obtained new information on food and nutrition in everyday life. Teachers thought there was a need for lessons on similar topics, especially for younger children (e.g. ten years old). According to the teachers, recognition of the importance of nutrition has increased in recent years, as proven by the increased interest of young people in the subject (Kostanjevec et al, 2011).

2.6 Teachers knowledge on educational programmes

Studies on nutrition knowledge in recent years are limited in South Africa and even more so regarding the nutrition knowledge of educators (Peltzer, 2004).Studies have shown that major gaps exist in the health and nutrition-related knowledge and behaviour of educators (Oldewage-Theron & Egal, 2012). A study done on Grade six learners in Solvenia (Shariffet al, 2008) indicated that the level of nutrition and health knowledge was low and dependent on gender, but not on the ethnicity, and the academic major or father's occupation of the Grade six learners. The need for males and for physical education majors to improve their levels of nutrition health knowledge is indicated. An important factor was definitely the teacher managing the programme (Kostanjevec et al, 2011). However, Litchfield (2009) noted that factors influencing behaviour change included the participants' and educators' race, and the educators' experience.

Studies have noted that if teachers are expected to add health and nutrition to their repertoire, they must be adequately trained and motivated (Chen et al, 2009). In South Africa and U.S few studies have assessed school teachers' nutrition knowledge. Yet, in order for teachers to be a valuable source of nutrition information, they must be able to convey accurate nutrition information to students and respond to questions and concerns about diet and nutrition (Chen et al, 2009).The few U.S. studies that have assessed teachers' nutrition-based knowledge found that teachers had fair levels of nutrition knowledge (Rafiroiu & Evans, 2005). A study in South Carolina shows that the teachers had nutrition knowledge. It was found that teachers correctly answered 63.2% of the questions asked, while knowledge scores in studies among teachers from Texas and Kansas were 60% and 70%, respectively (Martin et al, 1998; Soliah et al, 1983).

A study in Los Angeles by Kinsler et al (2012) found that the overall mean nutrition knowledge score of the teachers was 50.4%, while all teachers (100%) knew the importance of breakfast. Only 16% of the teachers selected the correct answer to the question on daily recommended serving of fruits and vegetables. Teachers with 11-15 years of experience were less likely, than teachers with greater than 16 years of experience, to know how to read and interpret a food label ($p<0.005$), teach students about reading food labels ($p<0.001$), and teach students about nutrition ($p<0.005$) (Kinsler et al,2012).

Nutrition training for teachers that has a behavioural change component can lead to effective nutrition education implementation for behaviour change towards healthy eating among learners (Hildebrand et al, 2012). Evidence from previous studies confirms the improvement in dietary behaviour of learners when classroom teachers implement nutrition education intervention to learners (Rosario et al, 2012; Steyn et al, 2009). Teachers are an integral part of the school environment, which has an important environmental influence on the dietary behaviour of learners. It is therefore important to ascertain teachers' nutrition knowledge, attitudes and practices. Little nutrition knowledge and low ratings in nutrition attitudes and practice assessment on the part of teachers may transit unhealthy nutrition behaviour to learners (Senekal et al, 2015;Dalais et al, 2014).

Motivation and interest among teachers (support) provided by programme leaders and the administrators' availability of education materials, can affect the level of nutrition education and implementation within the curriculum (Lytle, Geralch, & Weinstein, 2001). According to a study by Cantrell, Young and Moore (2003), the teachers' sense of self-efficacy is one of the few characteristics consistently related to students' achievement. In addition, teachers who reported high levels of self-efficacy displayed a greater variety in teaching methods, sought new resources, and developed more challenging lessons (Tachannen-Moran, Woolfolk & Hoy, 1998). To enhance confidence in nutrition education there is a need for a staff development programme that emphasises teaching methods and the limitation of curricula specific to adolescent nutrition (Hoelscher et al, 2002). In order to provide comprehensive and sequential nutrition education, teachers should have knowledge of the cultural food practices that children and their families follow (Koplan, Liverman, & Kraak, 2005).

Countries with nutrition education policies such as China, reported that as part of their general education and health policies, nutrition was not a mandatory school subject, assigned a specific time or structure (Glasauer et al, 2003). The methods normally employed in

primary schools that teach nutrition were conventional modules with explanations and group activities or discussion. Less than one third of the countries used nutrition guides and recommendations in primary school nutrition education. Perhaps, the most critical finding was the lack of teacher training in nutrition education (FAO, 2001).

2.7 Framework for nutrition education programmes

Three basic principles have been established in the application of nutrition education in primary schools, namely acquisition and application of nutrition knowledge for daily living, development of positive attitudes and to value food and the formation of good habits relating to skills in food production, selection, preparation, and preservation (Preventative Institute, 2012). These principles are used to modify learners' food behaviours. Nutrition education programmes therefore, need to take into account the availability of food, people's access to food and the factors determining choice and also need to accommodate social and technological change. The food supply of many developing countries is changing rapidly as a result of economic growth. Processed foods become available, frequently bringing both benefits and negative consequences, and they may displace affordable and more nutritious foods (Preventative Institute, 2012). .

The advocacy of raising next generation healthy individuals is particularly relevant for emerging economies such as South Africa, which are significant contributors to the economic growth in the global economy (Anderson & Strutt, 2013). South Africa, as part of the resource-based group of emerging economies, is a major player in, and contributor to global growth (Dittrich et al, 2011). Despite the fact that many emerging economies have witnessed high rates of economic growth, being able to sustain steady economic growth over a long period of time, remains a challenge (United Nations, 2015). School nutrition education is one of the approaches necessary to offer support to economic sustainability in emerging economies such as South Africa. If nutrition education reaches the primary school learners, educators, and caregivers, they will understand and have knowledge on foods, which are good for their health (Kupolati et al, 2015b).

2.8 National school nutrition programme in South Africa

In South Africa, the activities and initiatives of nutrition education reside under the umbrella of the Integrated Nutrition Programme (INP), which was developed from the recommendations of the appointed Nutrition Committee in 1994 [Department of Health (DOH), 2008)].The committee was given responsibility to develop a nutrition strategy for South Africa. The INP had aimed to promote nutrition education in order to ensure optimum nutrition for all, advocate for NE interventions for the youth and adolescents and advocate the inclusion of NE in all school curricula (DOH, 2003). The primary school nutrition programme (PSNP) was introduced in 1994 to complete the efforts of the INP and was later renamed the National School Nutrition Programme (NSNP), following the recommendations of a review (Public Service Commission (PSC), 2008].The NSNP aimed to enhance the learner's capacity, promoting school attendance, and alleviate short term hunger among needy school learners, through the provision of healthy meals (Kloka, 2003). Though school feeding was the main thrust of the project, it had the component of supporting NE through curricula activities in the life orientation (LO) subject. The programme was reported to have improved punctuality, regular school attendance, concentration, and the well-being of the learners, where it had been implemented (DoBE, 2015). In the UNICEF report of NE in South Africa, the objective to strengthen NE was achieved in all provinces through curricular activities in LO. The report was obtained through interviews, school visits, and survey findings. However, subject materials used at the various schools were not assessed (UNICEF,2012).The PSNP was expanded to secondary and high schools and now includes all grades up to Grade 12 (DoE, 2009).

In the Limpopo Province, the PSNP programme started on 1 September 1994 with a number of targeted schools. The province is known to be one of the most poverty- and drought-stricken ones in RSA. Apart from the high unemployment rate, the province has an overwhelming majority of primary schools situated in rural or peri-rural locations and on farms (Stats SA, 2003).More than 1.6 million learners in more than 3800 Limpopo primary schools benefit from the nutrition programme. A few years ago, there were 353328 learners in Sekhukhune District who benefited from the National School Nutrition Programme (Department of Basic Education of SA, 2014).The success of school nutrition education on shaping learners' eating behaviours cannot be guaranteed without the support of the school environment and authority (FAO, 2005b).

School-based nutrition programmes, with access to the nation's children (95%), have the potential to influence children's development of healthy dietary practices. In addition, school children spend over 26 hours in school during a regular week (Sturm & Datar, 2005).Traditionally, the primary promotion of nutrition among school-aged children has been through government regulated child nutrition programmes, such as the National School Lunch Programme (Hoelscher et al, 2002).

According to Vermeersch and Kremer (2004) a school feeding programme in Kenya reported improvements in attendance as a result of the intervention of a cup of porridge for breakfast. The higher participation was believed to have resulted both from the attraction of new children to the school and by the greater attendance of children already enrolled. Indicators of educational performance showed that Uganda has also done well on education access related targets since the introduction of universal primary education in 1997(Global Child Nutrition Forum: School feeding in Uganda, 2006). There are currently over eight million children attending primary school in Uganda and the government requires that the parents and the caretakers of these children take responsibility for feeding their children while at school. According to the Uganda Education Act 13, (2008), the responsibilities of the parents and guardians include providing food, clothing, shelter, medical care, and transport. On the other hand, parents (particularly those who participated in the study by Masembe-Kasirye, (2005)) argued that, since by law all children must attend school from the age of six years, it is the government's responsibility to feed those (Hedwig et al, 2012).

2.9 Nutrition education curriculum

A NE curriculum was developed against the background that many developing countries do not offer NE in schools and where they do; it focuses on increasing learners' knowledge of good nutrition with less emphasis on motivation and establishment of good eating practices. The FAO designed a NE curriculum and schools based on a tripartite approach, involving families, communities, and the school environment (FAO, 2006).Curriculum content were often developed in line with desired goals and sometimes accompanied by physical activity and gardening (Morris &Zidenberg-Cherr,2002).The desire to improve children's attendance and attention in class and to develop a lifelong healthy eating pattern among school age children motivated curriculum development for NE in some sectors (Appleby, 2009).

Nutrition education (NE) should progressively be part of the school curriculum for all ages, from the very early stages through secondary school. In fact, in many cases, educational objectives, contents, and evaluation criteria related to food, nutrition and adequate diet already exist as part of the national curricula in Europe (Perez-Rodrigo et al, 2001a; 2001b). The degree of implementation often depends on the willingness of overloaded teachers to further develop the educational attainments and perform suitable activities through curricular projects (Perez-Rodrigo et al,2001a; Dixey et al, 1999).Likewise, nutrition and education are closely inter linked. It is commonly understood that good nutrition during childhood is important for healthy growth and development. Nutrition education in schools has been shown to be valuable in increasing learners' knowledge of nutrition and healthful eating (Contento et al, 1992). Schools are a particularly suitable setting for practicing nutrition education in a promotion style. All school-based activities related to healthy eating – not only those taking place in the classroom, can be seen as part of an extended nutrition education curriculum, a sort of "macro-curriculum", which puts a health promotion approach into productive action(Sherman & Muehlhoff,2007). Outside the classroom, nutrition and food programmes, school policy, and school rules (for example) are the most direct and obvious means of promoting good nutrition (FAO, 2005a).For education authorities and ministries, reforming the nutrition education in South Africa curriculum will mean a broad multispectral and multi-level approach on several fronts, including:

- Curriculum development;
- Teacher training;
- Materials production;
- Other help and support for schools (FAO, 2005a; Hoelscher et al, 2002).

In countries such as South Africa and Finland, nutrition education is limited and covered only briefly in the home economics syllabus. However, room must be made for nutrition education in its own right (FAO, 2005a). Approximately 62% of the teachers in Finland indicated a lack of instructional materials to teach nutrition, as was confirmed in other South African studies where a lack of quality instructional materials hindered the effectiveness of NE (Oldewage-Theron & Egal, 2012; Nguyen et al, 2013).

According to a study done in the United States of America, 52% of teachers stated that they were not provided with curriculum assistance or a sequence in nutrition, to guide their teaching effort by their district or state office. Almost all teachers (93%) were either

confident or very confident that they had adequate training to teach nutrition and understood the concept well enough to teach. They were confident to teach topics related to the food pyramid and balanced diet (Murimi et al, 2008). A Study done by Lambert and Carr (2006) in USA reported that teachers had limited resources and curriculum materials to support NE (Lambert, Monroe & Wolf, 2010). A host of interventions have taken place within schools aimed at improving youth health, most notably nutrition interventions focused on factors such as school lunches, school-wide policies, vending choices, and nutrition education in classrooms (Harris et al, 1999).Many of these interventions have yielded strong improvements in a host of nutrition-related variables e.g. knowledge, eating behaviours, and efficacy in the USA (Abood et al, 2008).

An evidence-based review of global school nutrition interventions has found that a nutrition-based curriculum and equipping teachers with nutrition knowledge, usually improves the behavioural outcome of learners (Steyn et al, 2009). Recent evidence; however, has found that widespread movements in nutrition education in public schools have proceeded slowly due to under-funded mandates, insufficient resources, lack of accountability, poor staff development, insufficient monitoring of policy implementation, and the marginalised status of health education as a non-core subject (Kann et al, 2007).

Few researchers have examined how nutrition education policies specifically affect the teachers in schools, who they are meant to influence. This is a significant gap in the nutrition education literature because it has been observed that teachers often publicly support wider policies and mandates while privately executing practices in their classroom much differently or even in opposition to the official position (Curtner-Smith, 1999).Teachers can disrupt the trickle-down effect of broader educational policies through a lack of awareness or by ignoring, inaccurately interpreting or subverting them in their instruction with their students (McCaughtry et al,2011).

South Africa still experiences many challenges concerning nutrition intervention in schools. Schools in disadvantaged communities usually have little access to resources; have inadequate facilities and poor parent involvement. Educators, along with the learners, frequently have poor motivation levels with regard to trying new interventions to influence behaviour changes (Van Deventer, 2009). Educators may feel inadequately prepared regarding curriculum changes which incorporate physical activity and nutrition (Shalem & Hoadley, 2009).Implementation is complex and is usually a slow process. Characteristics of

the teachers, educational materials and support provided by programme leaders and staff determine the level of implementation of the curriculum (Baranowski & Stable, 2000; Kealeyet al, 2000; Renaud et al, 1997).

According to Van Deventer (2009), nutrition related content has to compete with a range of other academic subjects. Health related topics can easily be marginalised when competing with conventional academic subjects or other extra curricula activities. Glasauer et al (2003) concluded that in China, quality support materials may not be made available to schools unless nutrition and health education is integrated into the standard curriculum Glasauer et al, 2003).

At the time of the study, the national school curriculum in South Africa included nutrition and healthy lifestyles in the subject life orientation (Van Deventer, 2009). The outcome-based curriculum allowed educators to select their own teaching materials to reach the outcome assessment standards (Van Deventer, 2009). This curriculum has subsequently been revised and the name 'LO' has been changed to 'life skills' with the aim 'to be more specific on what is to be taught and learnt' (Department of Education, 2010). Although, the new curriculum includes FBDG in Grade 5 as part of 'Health and Environmental Responsibility', the time-frame allocated for nutrition is three hours per annum (Department of Education, Curriculum and Assessment policy statement, 2010). Although this time allocation is far less than the minimum 50 hours recommended by school nutrition researchers (Briggs et al, 2010), nutrition information is also provided in other subjects such as natural sciences (seven hours in Grade 6).

The Department of Education, Curriculum and Assessment Policy Statement (2011) provides the opportunity for concepts contained in the FBDG to be reinforced across subjects. Additional concerns include LO (now life skills) which is often taught by educators who are not specialised in the subject (Nguyen et al, 2017; Van Deventer, 2009,) and who also have poor knowledge on nutrition (Dalais et al, 2014).

2.10 Conclusion

Good nutrition is essential for proper growth during childhood. To grow up healthily, with vitality and energy, children need adequate nutrition. Their early experiences of eating nutritious food could have an impact on their long-term eating preferences and habits

(Cosgrove, 1991). This study need to assess nutrition knowledge of educators in primary schools. Studies on nutrition knowledge among teachers in recent years are limited in South Africa and even more so regarding the nutrition knowledge of educators. When it comes to teaching nutrition in classrooms, interpersonal factors such as knowledge or beliefs about nutrition may be important determinants in whether nutrition is taught. Lack of nutrition knowledge and feeling unprepared to teach nutrition have been reported to be barriers in providing nutrition education (Jones & Zidenberg-Cher, 2015). Previous studies suggested that nutrition knowledge of teachers is positively associated with teaching nutrition and self-efficacy to teach nutrition and nutrition related professional development increases nutrition knowledge.(Fahlman et al, 2011) However, there are gaps in literature with regard to factors that may be associated with nutrition knowledge of educators, such as nutrition education in-services, professional development, and resources to use by educators to plan lessons (McCaughtry et al, 2012, Graham et al,2004). The need for nutrition training for teachers was confirmed in a South African study, where teachers admitted to limited knowledge about nutrition and healthy dietary habits which they attributed to not being experts in the subject (Nguyen et al, 2013).

A pilot study that was conducted to gauge the impact of nutrition knowledge of primary school life orientation educators showed that their general nutrition knowledge improved considerably after the programme (Oldewagen-Theron & Egal, 2012). This would be assumed to improve nutrition education provided to the learners and in this way educator's nutrition knowledge also improved. Children are also effective change agents; transferring what they learn at school to the communities they live in. Providing children with nutrition education in schools is therefore, an effective investment that should be supported by governments and funding agents, as this can address the nutritional problems of communities over the short and long term (David et al, 2008).

CHAPTER 3

METHODOLOGY

3.1 Introduction

The aim of this study was to assess the nutritional knowledge of educators in the Makhuduthamaga Municipality. In this chapter, the research methodology that was used to collect the necessary information will be described. It includes the study design, study population, study sample, instrument development, reliability, pilot study, data collection procedure, inclusion and exclusion, ethical considerations, and statistical analysis.

3.2 Study design

The study was quantitative and followed both descriptive and exploratory method. The main focus was on description, rather than the explanation of relationships or associations; it attempted systematically to describe a situation, problem or attitude towards an issue (Kumar, 2011; Terre Blanche et al, 2010; Salkind, 2000).

In this study the researcher described the nutrition knowledge of the educators. An exploratory study is the extension of descriptive research that focuses more directly on the discovery of relationships, and the exploratory researcher focuses on a phenomenon of interest. In this case the phenomenon was the relationship between nutrition knowledge and nutrition education. The researcher attempted to understand the entirety of a phenomenon, in this case, the nutritional knowledge (Terre Blanche et al, 2010). Quantitative research involves the systematic collection of numerical information, often under conditions of considerable control, and the analysis of that information using statistical procedures (Terre Blanche et al, 2010).The study was quantitative since the researcher collected information that was quantified in the form of closed-ended questions. Qualitative research, on the other hand, tends to examine human behaviour in the social, cultural, and political context in which it occurs (Terre Blanche et al, 2010; Salkind, 2000).

3.3 Study population and study area

The study population consists of people whom the researcher wants to investigate. It could be a group of people living in an area, employees of an organisation, and/or a community (Kumar, 2011; Terre Blanche et al, 2010). The study was conducted in Sekhukhune District

in a deep rural area of the Limpopo Province, in which the physical composition is 95% rural and 5% urban. The population is 1 076840, almost equivalent to the Northern Cape Province with 1.1 million people. Sekhukhune's population is divided into four sub districts/regions. The study was mainly conducted in one of the municipalities called Makhuduthamaga, which is the second largest in Sekhukhune district, having 25% (247 488) people living there. This municipality has 189 villages. It is located 189 km southeast of Polokwane. About 38.1% of its population are children aged 0-14 years and there are 151 primary schools. Sepedi is the dominant language (Statistics, SA 2010).The target population comprised of primary school educators teaching grade five, six, and seven learners, in public schools in Makhuduthamaga Municipality.

3.4 Sampling

Sampling refers to taking a portion or a smaller number of units of a population representative or having particular characteristics of that total population (Terre Blanche et al, 2010; Van Zyl, 2014).

3.4.1 Sampling design

Probability sampling was used in this study. In probability sampling(or random sampling) each person in the population has the same known probability to be representatively selected, which permits the researcher to compute an estimate of the accuracy of the sample, even before the study is completed (De Vos et al, 2012; Van Zyl, 2014).

3.4.2 Sampling procedure and size

Schools in the Makhuduthamaga Municipality were selected using simple random sampling. In simple random sampling, all members of the population have an equal chance of being selected (DeVos et al, 2012; Fraenkel et al, 2006). The total number of schools in the Makhuduthamaga Municipality was 151. The researcher assigned numbers to 151 schools and randomly selected 20% of the schools to make a total of 30 schools. The 30 schools were used as a sampling frame for educators. Purposive sampling was used for educators. All educators from the 30 schools teaching grades five, six, and seven were requested to participate in the study, and 200 educators from 30 schools were recruited. The sample included 200 educators in primary schools around the Makhuduthamaga Municipality.

3.4.3 Inclusion criteria

An inclusion criterion refers to an attribute of subjects that is essential for their selection to participate in the study. It considers factors that will enable a homogenous selection of subjects, for example, age and gender. Educators teaching grades five, six, and seven who consented to participate in the study, were included.

3.4.4 Exclusion criteria

An exclusion criterion refers to the response of subjects that required their removal as subjects (Kumar, 2011). Educators, who were not working in Makhuduthamaga Municipality and who were not teaching grades five, six and seven, were excluded from the study.

3.5 Subject recruitment

The researcher visited the schools twice during a month. The first visit was to get permission from the school circuit. The researcher introduced the study and asked for permission to conduct the research. On the second visit the researcher went to schools to explain the aim, objective, and the significance of the study, and to give the consent form to the educators.

3.6 Measurements of variables

3.6.1 Variables to be measured

Variables are characteristics or attributes of a person or subject that varies within the population under study (Kumar, 2011). The variables that were considered in the study were socio-demographic information and nutrition knowledge. Socio-demographic information was obtained in order to understand the characteristics of the study population better. Knowledge on nutrition was measured to determine the level of nutrition knowledge of educators in the schools studied.

3.6.2 Questionnaire development

The instrument was developed based on the objectives and reviewed literature related to the study. The questionnaire was developed in English. The questionnaire was self-administered with an assumption that all educators are English conversant. The questionnaire was filled in the presence of the researcher to avoid partial completion. The self-administered questionnaire was divided into three sections, namely a demographic section, factors

affecting nutrition knowledge and social factors, and nutrition knowledge. The questionnaire (see Appendix A) consisted of three sections namely: section A (demographic section), section B (factors affecting nutrition knowledge and social factors), and section C (nutrition knowledge).

3.6.3 Validity

The questionnaire was presented to the department of Nutrition for peer review and submitted to the supervisors for inputs. It was also submitted to the Research and Ethics Committee of UNIVEN for approval before data collection. The questionnaire was pretested and piloted before data collection. The researcher carried out the piloting and pretesting exercises in three schools of Makhuduthamaga Municipality. Questions which were confusing to the participants were modified and educators who participated in the pilot study did not form part the final simple. The questionnaire was given to the supervisor and the lecturers in the school of nutrition in University of Venda for expert content validity.

3.6.4. Reliability

Reliability is a way of assessing the quality of the measurement procedure used to collect data in a study (DeVos et al, 2012). In this study reliability was achieved by interviewing the same persons repeatedly under the same condition using the same questionnaire.

3.6.5 Pretesting

Pretesting of the instrument is an important way to pinpoint problem areas, reduce measurement error, reduce respondent's burden, determining whether respondents are interpreting questions correctly and ensure that the order of questions is influencing the way a respondent answer (Leedy and Ormrod, 2014). Pretesting was carried out by the researcher to test appropriateness and completeness of the questions it is necessary to make sure that both the researcher and participants understand questions the same way. A total of 20 educators sufficed for this exercise.

3.6.6 Pilot study

A pilot study is a procedure for testing and validating an instrument by administering it to a small group of participants from the intended test population (De Vos et al, 2012). Three schools were randomly selected and used for the pilot study. The research was piloted at three schools for accuracy and validity purposes, and 20 educators participated in the pilot study.

During the pilot study the feasibility of the project and procedures of data collection were determined. The purpose of this exercise was to test the content of the questionnaire if understandable and restructuring of the study instrument obtaining information for improving the project. It also helped the researcher to determine whether respondents understood the questions and time taken to complete questions. The result of the pilot study informed the researcher about the next step relating to the questionnaire and the study plan. After the pilot study, some changes were made to section B questions 34, 35, 36,37,38,39 and 41 where the participants had a list of functions of carbohydrates, protein, and fats. The questions were reframed in a table form where they could choose the functions of carbohydrates, protein, fats, water, dried beans, fruit and vegetables. The other question was reframed on table form and chooses food that form balanced diet (Appendix A). The self-administered questionnaire (Appendix A) was used to assess nutrition knowledge of educators. The questionnaire was given to educators on lunch time or knock off time and it was filled immediately in the presence of researcher. The questionnaires were collected immediately after completion. The educators were ordered to put away their phones and bags when completing the questionnaire. They were also told not to discuss the answers with other colleagues.

The researcher delivered the questionnaire by herself, introducing the study and the informed consent form to educators. Educators were required to complete the questionnaire in the presence of the researcher during lunch time or closing time. The researcher collected the questionnaires immediately after the educators completed it. Educators were not allowed to take the questionnaire home. The researcher was not allowed on the school premises during the lessons, only during lunch time or knock off time. The meeting was held on the first visit with principals and educators in selected schools, where the researcher presented both written and verbal explanations of the research activities. The Department of Basic Education (Appendix C) approval for the study to be carried out in the schools was presented to the principals. The date and time for data collections were discussed with the principals in the schools.

3.7 Data collection procedure

Data was collected using a self-administered questionnaire by the educators. The researcher handed each educator of grade five, six, and seven learners a questionnaire and explained the questionnaire to the educators. The research was conducted during consecutive weekdays

Monday-Friday between 10h00-16h30. All educators of the grade five, six, and seven learners were explained the purpose and objective of the study and consent form was provided and signed by participants before they can be handed the questionnaire.

3.8 Institutional approval

The research proposal was presented to the University of Venda Ethics Committee where the approval was granted (Appendix B). The second approval was from the Department of Education in the Limpopo Province, and the third approval was from the school circuit in the Makhuduthamaga Municipality (Appendix C).Permission to conduct the study was also obtained from the school principals and school governing bodies. Consent form obtained to allow participants to participate in the study (Appendix D).

3.9 Ethical considerations

According to De Vos et al (2012) and Babbie (2007), ethics implies preferences that influence behaviour in human relations, conforming to a code of principles, the rules of conduct, the responsibility of the researcher, and the standards of conduct of a given profession. The following ethical considerations were taken into consideration for this study.

3.9.1. Privacy, anonymity, and confidentiality

The researcher ensured that the educators' privacy was respected and that they remained anonymous, that their names and particulars were not given to any person without their permission. The information provided by the educators was protected and was not made available to anyone other than the researchers.

3.9.2. Informed consent

The researcher explained in detail the aim of the study, the expected duration of the participants' involvement, the procedures which would be followed during the investigation, and made them aware that they would be at liberty to withdraw from the investigations at any time. The consent form was written in English (Appendix D).

3.10 Data analysis

The data was captured on a Microsoft Excel spread sheet by the researcher and exported to the Statistical Package for Social Science (SPSS), version 21 for analysis. A statistician was

consulted for assistance. Descriptive analysis was used to assist in organising, summarising, and interpreting sample data (Salkind, 2000). Categorical data was expressed as frequencies.. The Brown (2010) Linkert scale was used to categorise the nutrition knowledge levels of educators. The following were the categories of nutrition knowledge,: poor (0-39%), adequate (40-59%), more than adequate (60-79%), and excellent (80-100%). Statistical significance was set at $p<0.05$

3.11 Dissemination of the results

Copies of the results will be made available in the following manner: University of Venda library in dissertation format, a technical report will be written for the Limpopo Department of Education, articles will be published, including the possible presentation of results at various conferences.

CHAPTER 4

RESULTS

The data is presented in graphs and tables, in a quantitative format, using statistics.

4.1 Sample characteristics

The study comprised of 200 educators from 30 schools in the Makhuduthamaga Municipality, teaching grade five, six, and seven learners. The majority of the respondents were female (66.5%), while 33.5% were male. The largest group of educators (81.5%) were between 40-59 years of age and others were evenly distributed between 20-39 and 60-79 years. Most educators (70%) were married, followed by those who were single (18%), widowed (8%), divorced (2.5%), and those who did not respond (1.0%) (Table 4.1).

Table 4.1 Demographic information of educators.

Variable	**Number(n)**	**Percentage (%)**
Gender		
Male	67	33.5
Female	133	66.5
Age (years)		
20-39	27	13.5
40-59	163	81.5
60-79	2	1.0
No response	8	4.0
Marital status		
Single	36	18.0
Married	140	70.0
Divorced	5	2.5
Widow	17	8.5
None	2	1.0

4.2 Educational level of educators

Most educators (60.5%) had a diploma as their educational level and 0.5% had a Master's degree. Almost all (94%) of the educators reported that they trained at a college and 6.0% were trained at a University. Some (42%) of the educators had teaching experience of between 21-30 years, while 10.5% of the educators had teaching experience of between 31-40 years (Table 4.2).

Table 4.2: Educational level

Teaching Experience		
Variables	**Number (n)**	**Percentage (%)**
6 months-10 years	24	12.0
11-20 years	69	34.5
21-30 years	84	42.0
31-40 years	21	10.5
No response	2	1.0
Qualifications		
Diploma	121	60.5
Degree	35	17.5
Honours	40	20
Masters	1	0.5
Others	3	1.5
Training Institution		
College	188	94
University	12	6

4.3 Household characteristics

The majority of the educators (82.5%) had up to five children in their household, followed by 15.5% who had between 6-11 children. A small percentage of the educators (2.0%) did not respond.About49.0% of the educators had 6-10 people in their family, while 43.0% had 1-5 people in their family. Most of the educators (74.0%) reported that a male was the head of their families and 24.5% indicated that a female was head of their family (Table 4.3).

Table 4.3: Number of person and head of the family the household.

Variable	**Number (n)**	**Percentage (%)**
Number of persons and head of family in household		
0-5	165	82.5
6-11	31	15.5
No response	4	2.0
Number of persons in household		
1-5	86	43.0
6-10	98	49.0
11-20	15	7.5
No response	1	0.5
Head of the family		
Male	148	74.0
Female	49	24.5
None	3	1.5

The majority of the educators indicated that they had a vegetable garden and that they planted spinach (74.0%), followed by (71.5%) who mentioned beetroot. About 69.5% mentioned carrots and tomatoes (Table 4.4).

Table 4.4: Type of vegetables produced in the educators' garden.

Variable	Number (n)	Percentage (%)
Vegetables		
Spinach	148	74.0
Cabbage	138	69.0
Onion	132	66.0
Tomato	139	69.5
Carrot	139	69.5
Beetroot	143	71.5
Others (specify)	20	10.0

4.4 Nutrition knowledge of educators

About 84.5% of the educators indicated that they obtained their nutrition information from health workers, followed by 75% of educators indicated that they read magazines (Figure 4.1).

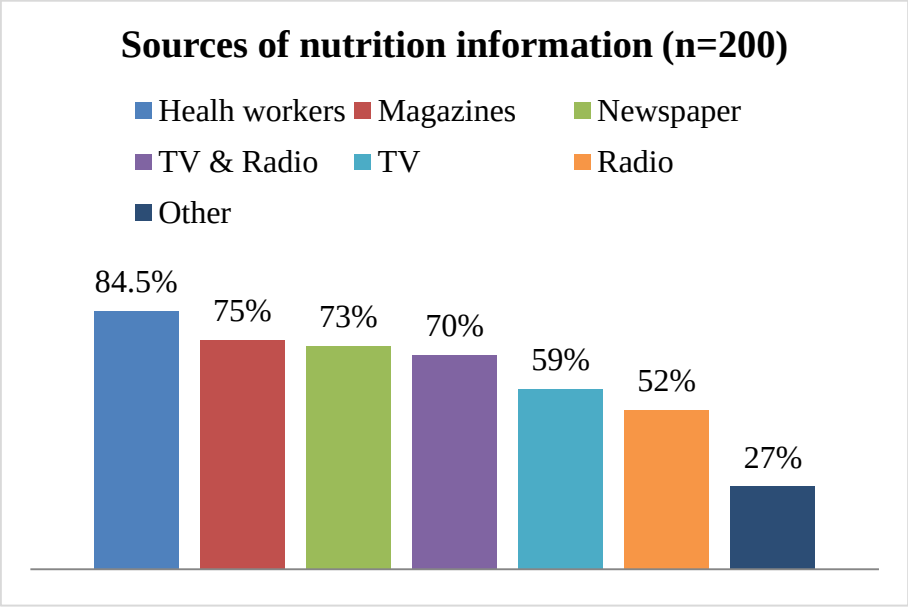

Figure 4.1: Sources of nutrition information

Factors affecting nutrition knowledge were investigated. About (54.5%) educators indicated that nutrition was not part of their curriculum at the training institutions, while 44.0 % of the

educators agreed that nutrition was part of their curriculum at their training institution (Figure 4.2).

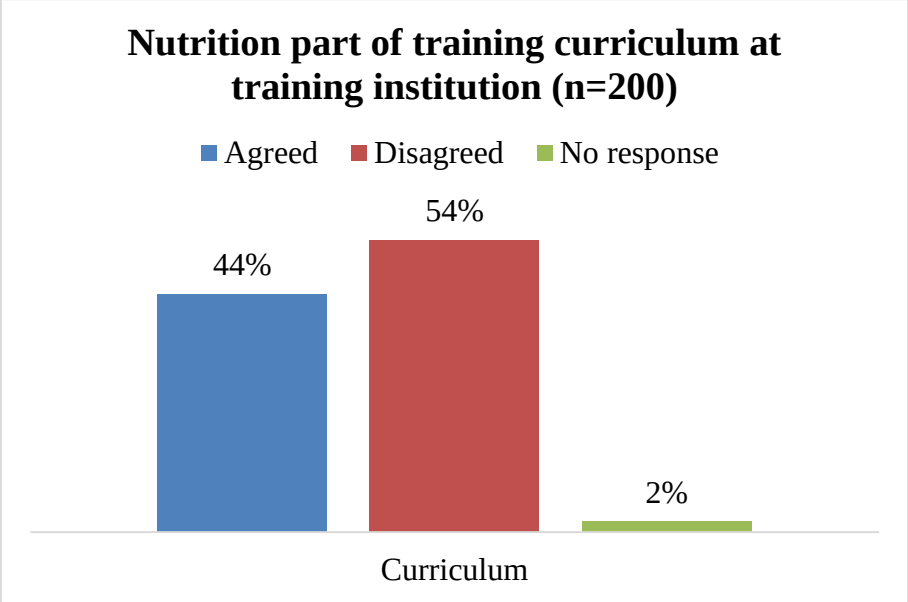

Figure 4.2: Nutrition part of training curriculum at training institution

Most educators (58.5%) indicated that nutrition should form part of the school curriculum at the primary level, while 16.0% of educators indicated that nutrition should form part of the school curriculum at secondary level, and 13.0% indicated nutrition should be part of the curriculum at all levels(Figure 4.3).

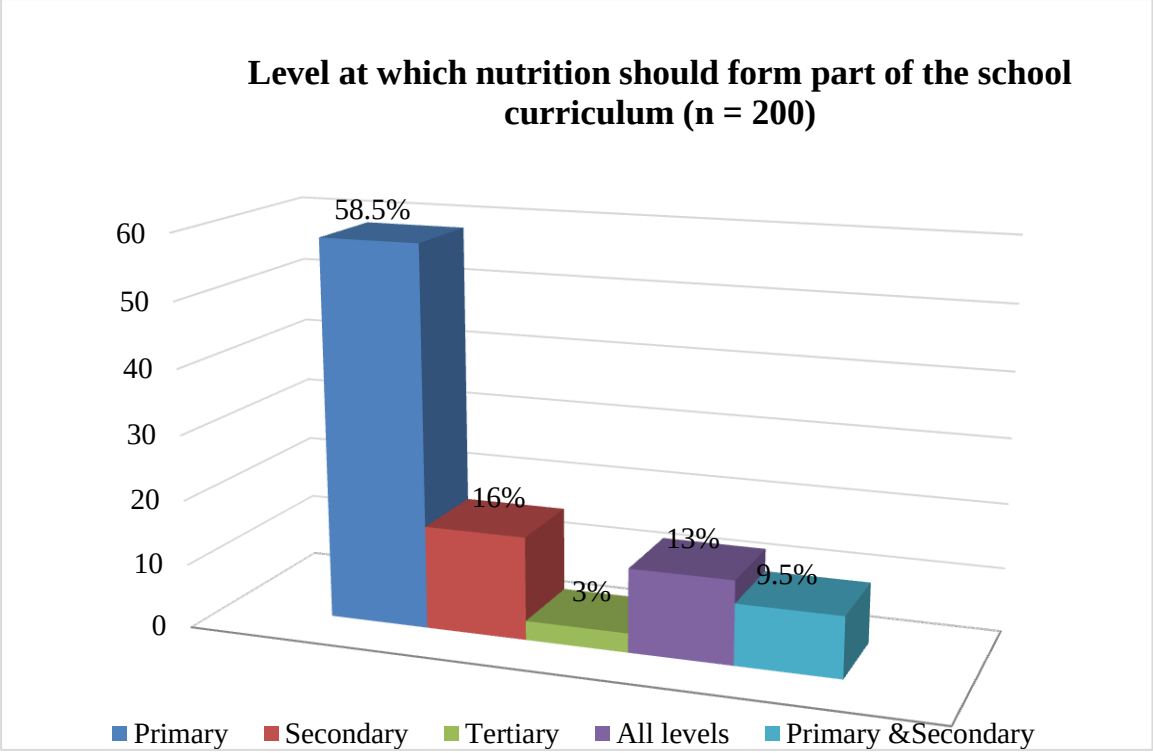

Figure 4.3: Level of nutrition training in the curriculum

Some (48.5%) of the educators indicated that their training affected their nutrition knowledge, while 45.5% indicated that training did not affect their nutrition knowledge, and 6.0% did not answer the question. Many of the educators (52.5%) agreed that their level of education did affect their nutrition knowledge, followed by 45.5% who indicated that the level of education did not affect their nutrition knowledge. The majority (78.5%) of the educators indicated that they did read the food labels before buying food items, while 21.0% did not read the food labels. Further, 72.5% of the educators agreed that the food labels affected their choice of food products while, 24.5% indicated that it did not affect their choice of food products.Furthermore,63.5% of the educators agreed that the nutrition knowledge affected their choice of food, while 32.5% indicated that it did not affect their food choice (Figure 4.4).

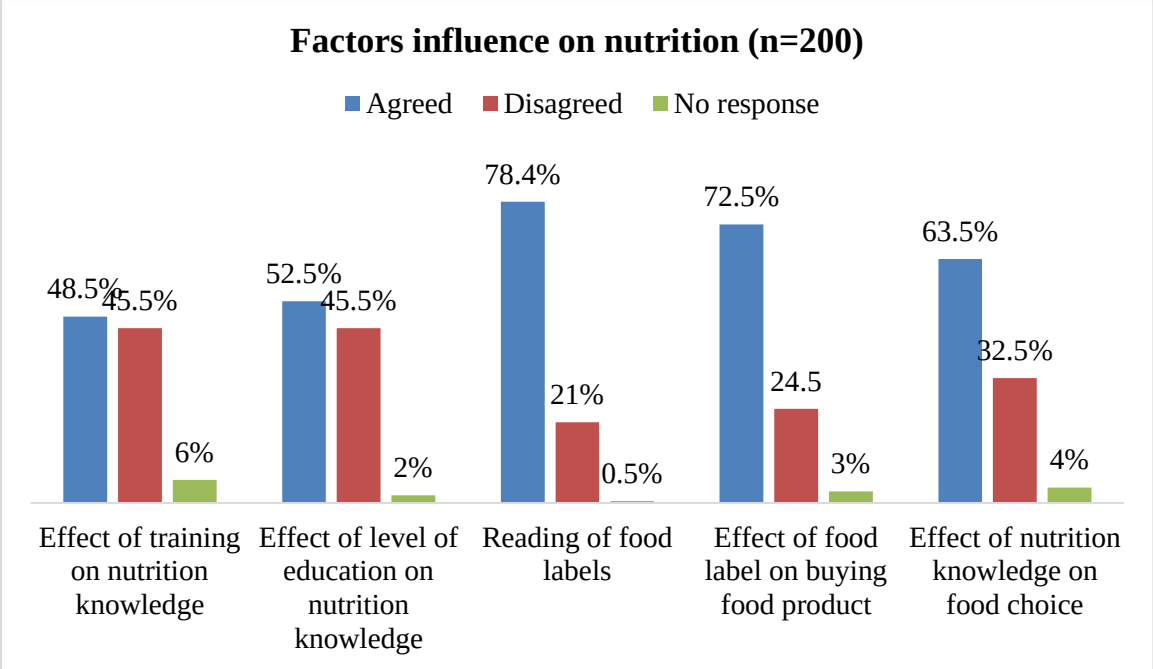

Figure 4.4: Factors affecting nutrition knowledge

Some of the educators (52.0%) indicated that price affected their food choice, followed by 39.0% who said that their families' preferences did, whereas 36.0% indicated "what you want", and 35% indicated taste (Figure 4.5).

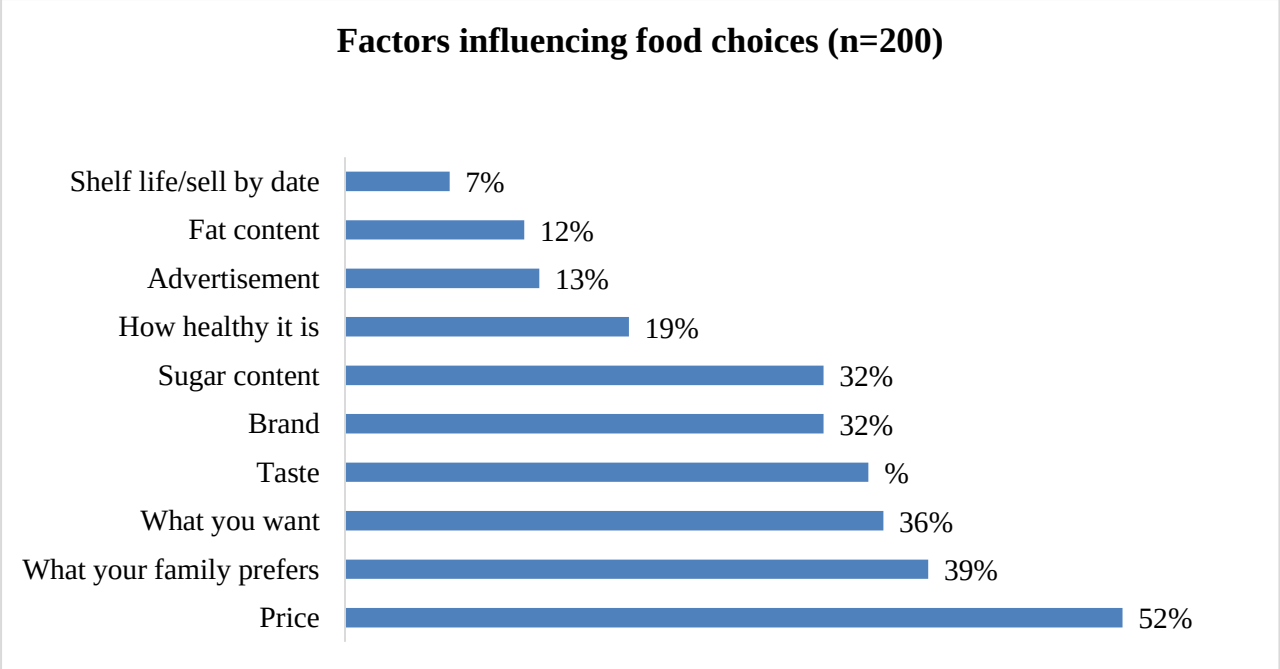

Figure 4.5: Factors affecting food choices

Some (41.5%) of the educators did not identify any nutrition topic they could teach, while 32.0% identified “healthy food and lifestyle”, followed by 7.05%who chose “balanced diet”, and 4.5% who indicated“ food group/pyramid” and good nutrition, respectively. Many identified other specific topics that they were competent in, as shown in Figure 4.6.

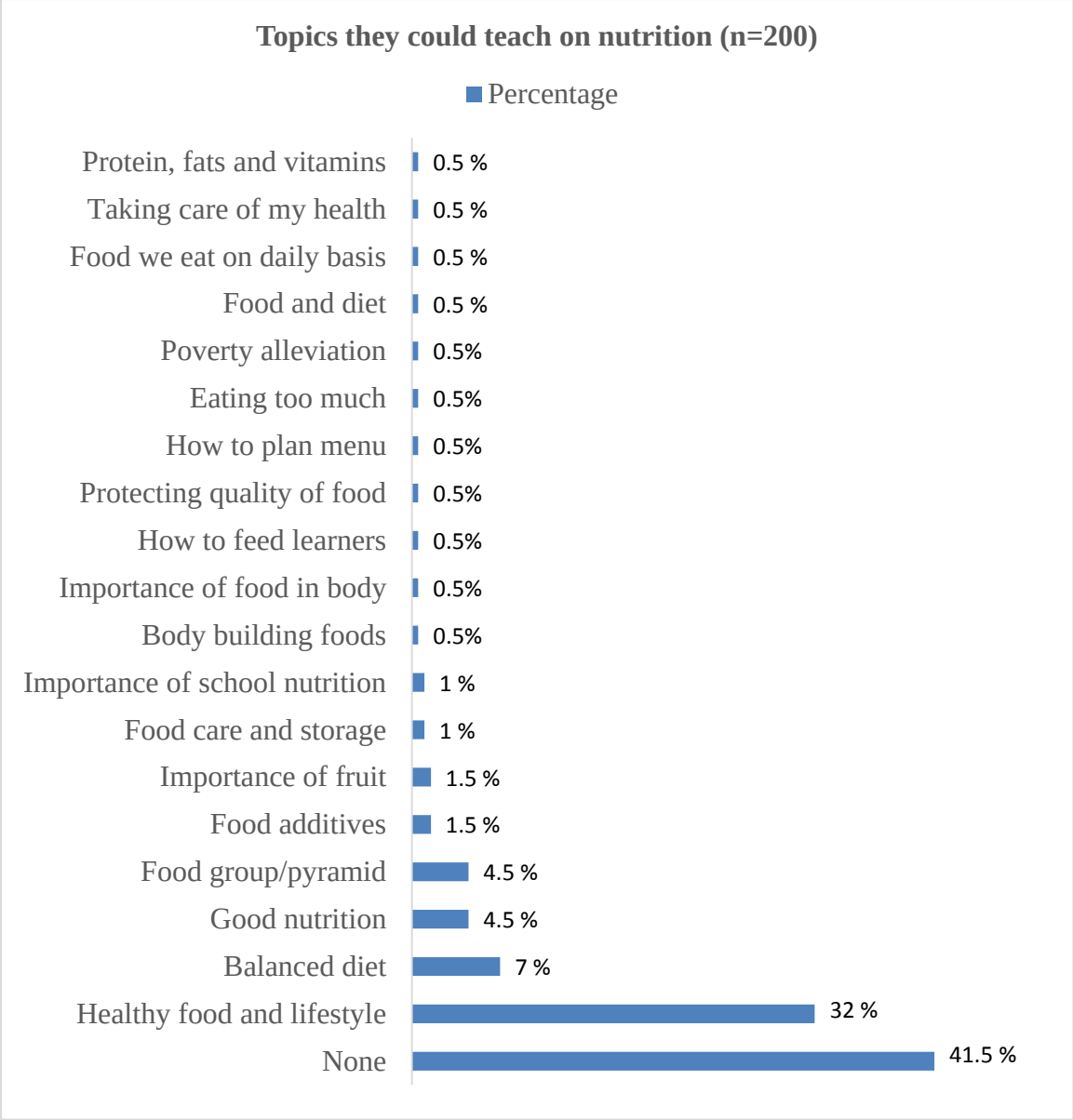

Figure 4.6: Nutrition topics educators felt comfortable teaching

More than half of the educators (55.5%) preferred to talk about issues related to nutrition daily with their families or with anyone, followed by 32.5% who discussed nutrition issues weekly. About 56.0% of the educators indicated that people should discuss nutrition issues daily, while 32.5% indicated that it should be weekly, followed by 9.0% who indicated monthly (Figure 4.7).

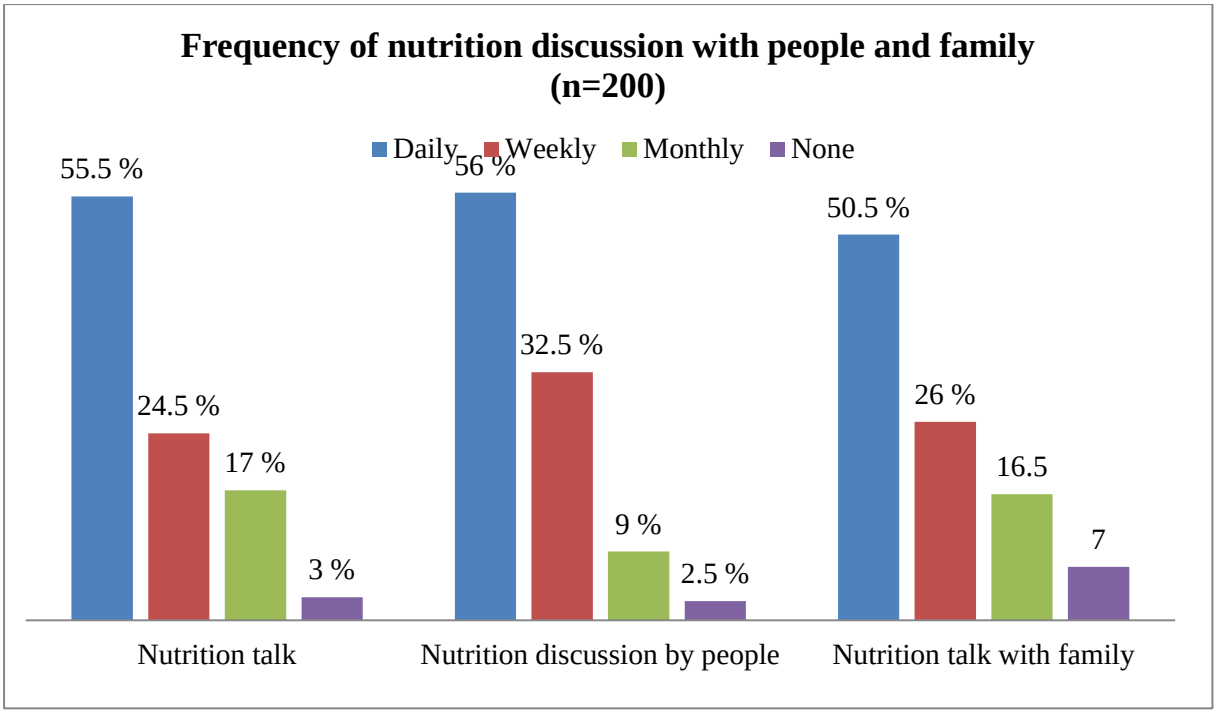

Figure 4.7: Frequency of nutrition discussion among people and family

Some(46%) of the educators disagreed that gender affects their choice of food, and 51.5% of the educators agreed that gender did affect nutrition, while 65% of educators disagreed that gender prevented them from improving nutrition knowledge. About 66% of the educators disagreed that women were not the only ones concerned about nutrition, while 61.3% indicated that they had a vegetable garden (Figure 4.8).

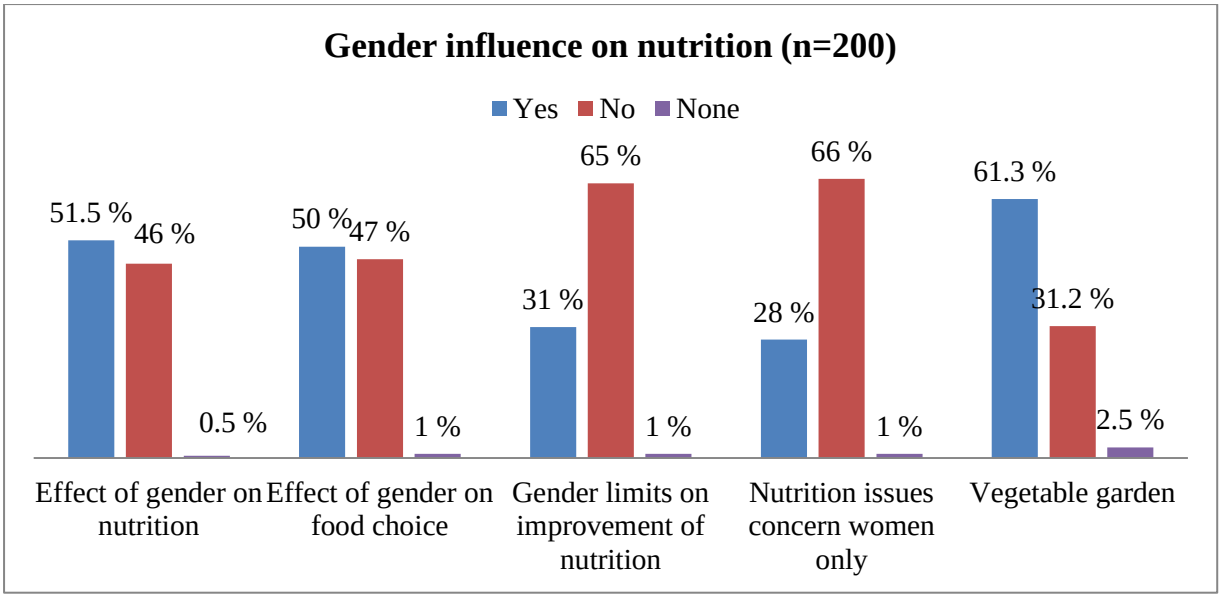

Figure 4.8: Gender influence on nutrition

Most (72.5%) of the educators said that a ten-year-old child should have three meals per day, while only 15.5% indicated that they should have four to six meals per day (Figure 4.9).

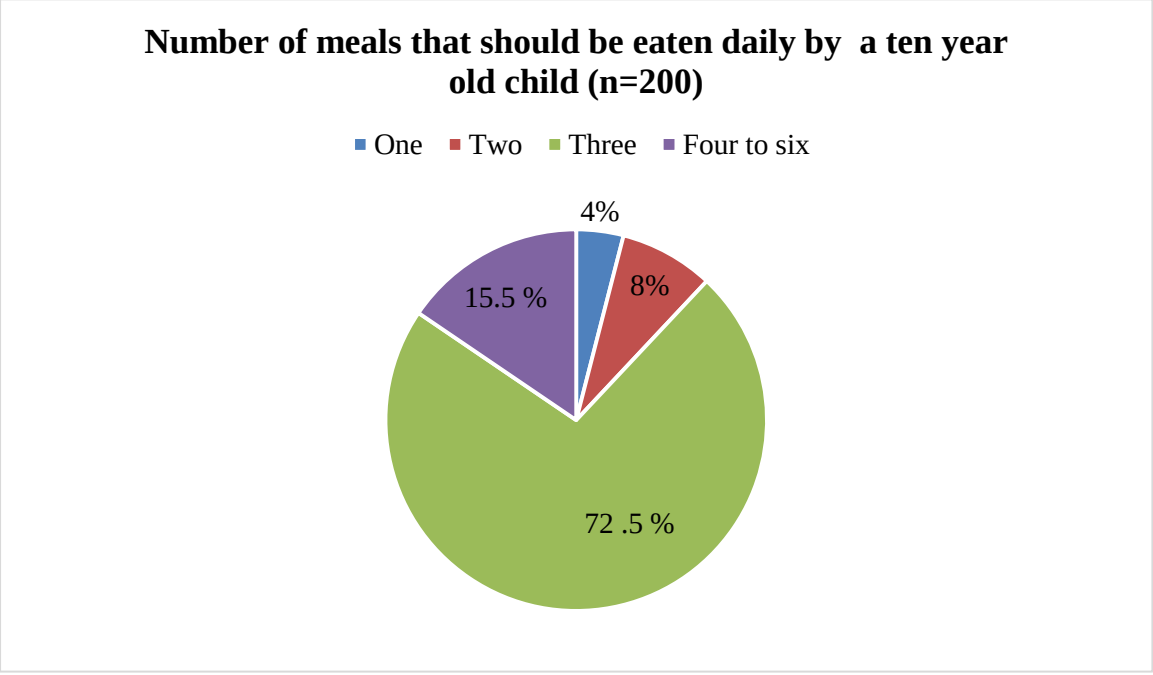

Figure 4.9: Number of meals that should be eaten daily by a ten-year-old child

Only 32.0% reported that breakfast, lunch, and supper were the most important meals for the child, followed by 26.5% who responded that breakfast was an important meal, and 22.5% reported that all meals (breakfast, lunch, supper, and snacks) were important (Figure·4.10).

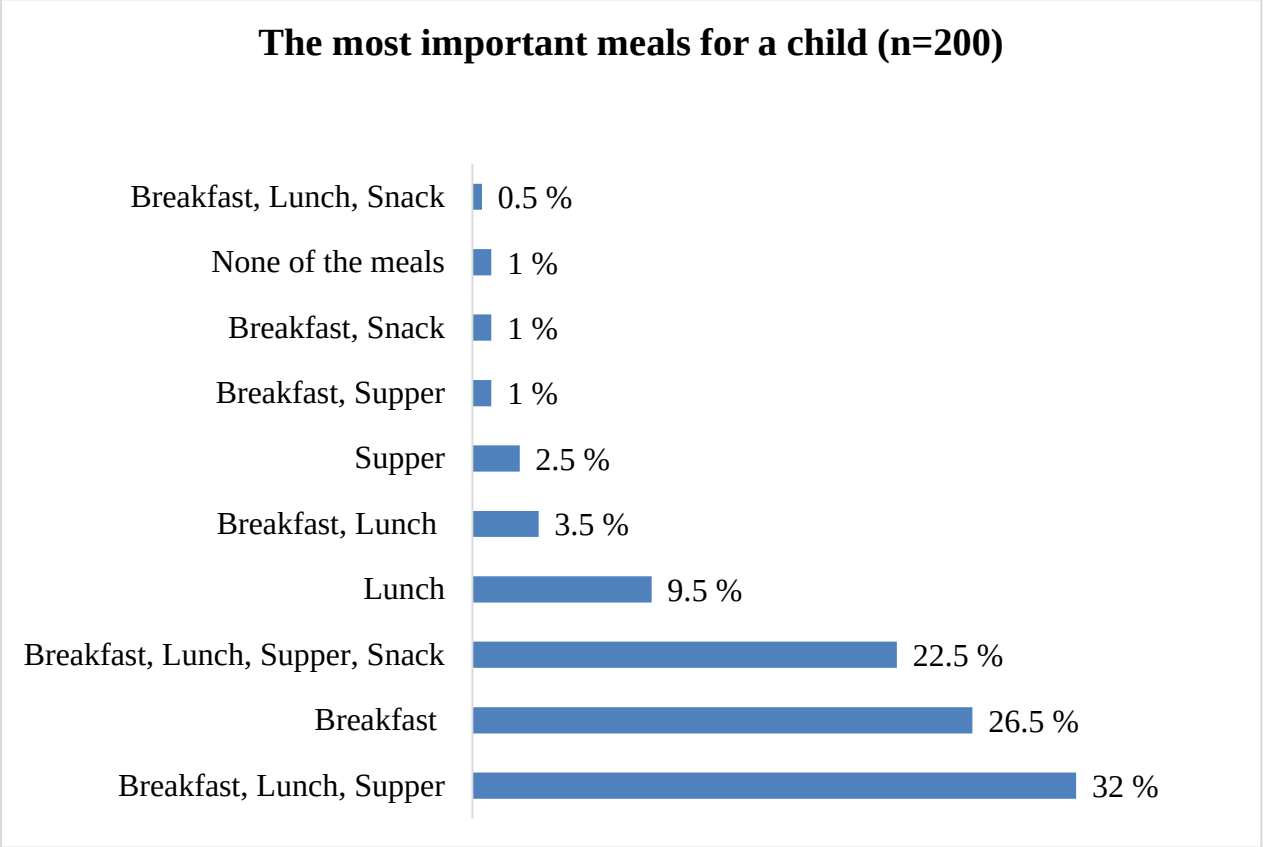

Figure 4.10: The most important meals for a child

Reasons why children should not skip meals were investigated. Only 33.0% responded that children should not skip meals because they would not grow healthily, while a few responded that children would feel hungry (15.5%). Some identified malnutrition or a lack of nutrients as a consequence of skipping meals (Figure 4.11).

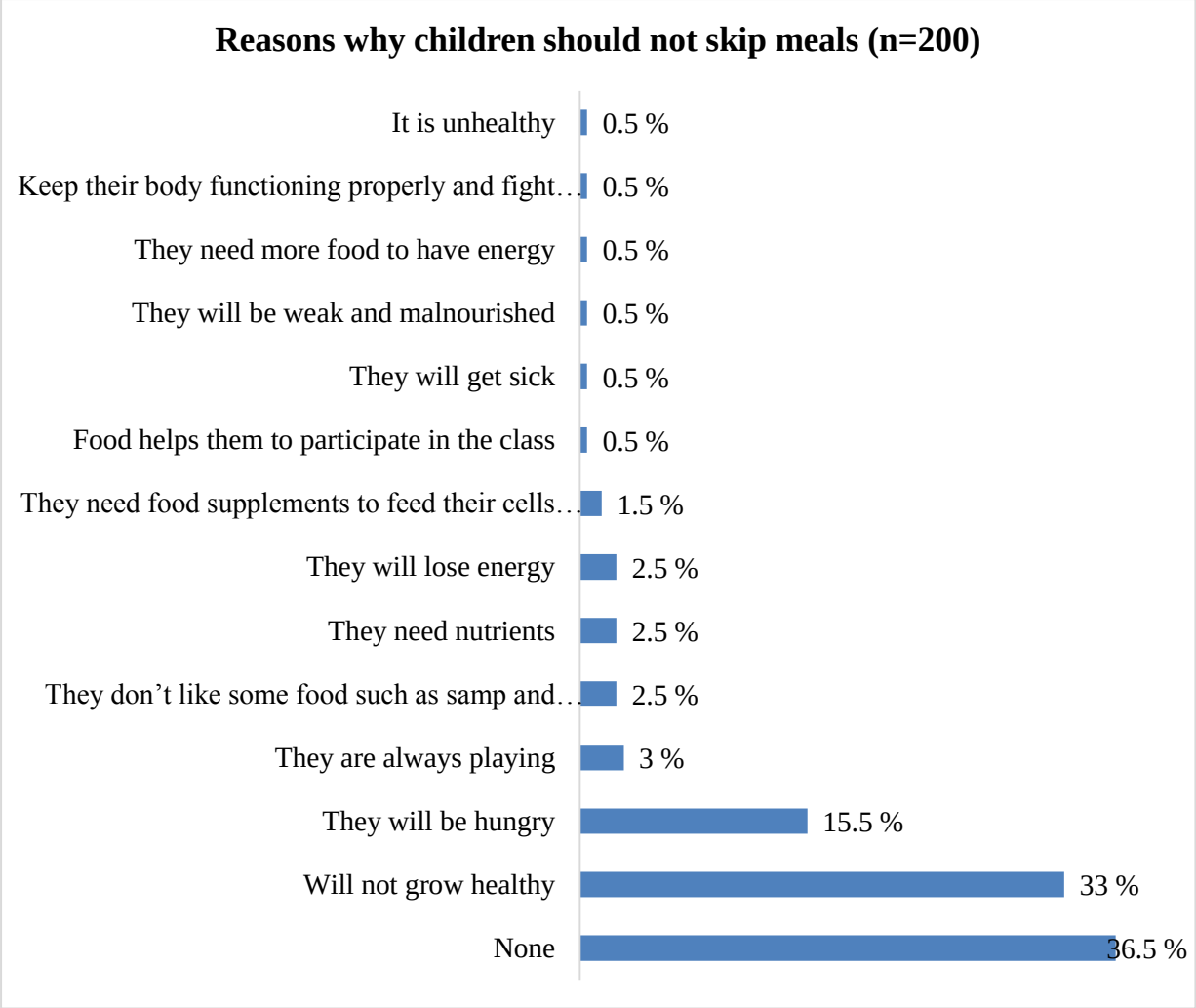

Figure 4.11: Reasons why children should not skip meals

Nutrition knowledge was further assessed by asking about basic foods and nutrition knowledge expected to be known by educators. About three quarters of the educators responded correctly that the importance of carbohydrates was to provide energy, followed by 67.0% who responded correctly that the importance of fat was to provide energy. Furthermore, 26.0% mentioned correctly that the importance of protein was to build the body, and 56.0% of educators responded correctly that the role of vegetables and fruit was to provide the body with vitamins and minerals, followed by 55.5% who correctly mentioned the importance of fruits. Only 5.5% of the educators knew the importance of water, and few of them (3.0%) knew the importance of dried beans (Figure 4.12).

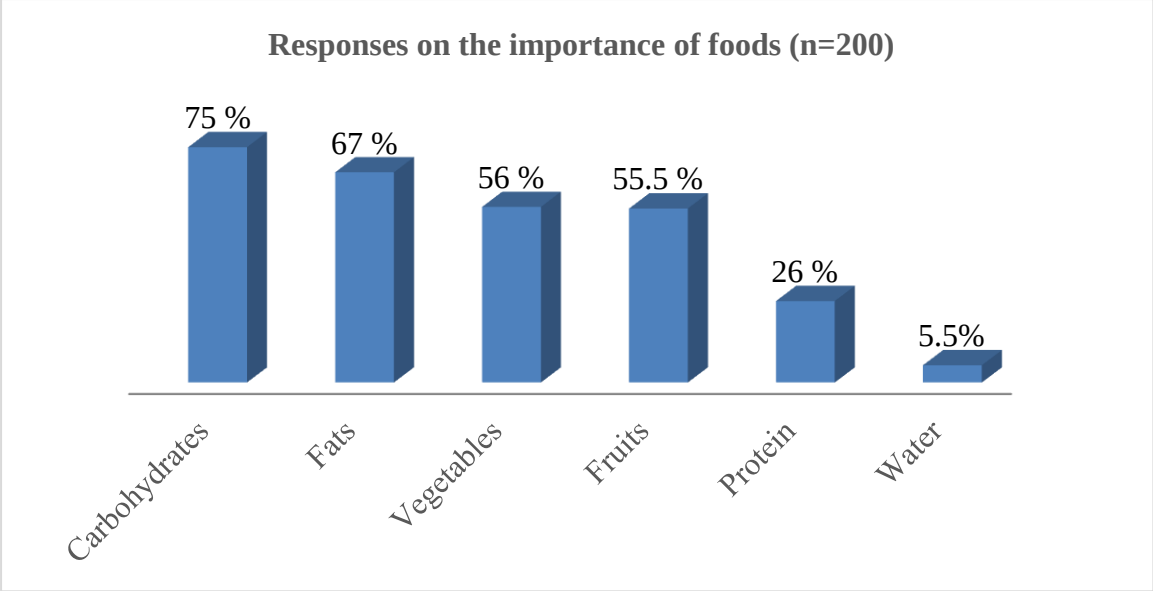

Figure 4.12: Responses on the importance of different foods

Educators were asked a question on what they understood by a balanced diet. Most (79.5%) of the educators indicated that carbohydrates formed part of a balanced diet, followed by 75.5% who indicated that protein, and 73.0% indicated vegetables, formed part of a balanced diet. Some of the educators (4.5%) indicated that alcohol forms part of a balanced diet, while 93.0% did not respond on whether water formed part of a balance diet (Figure 4.13).

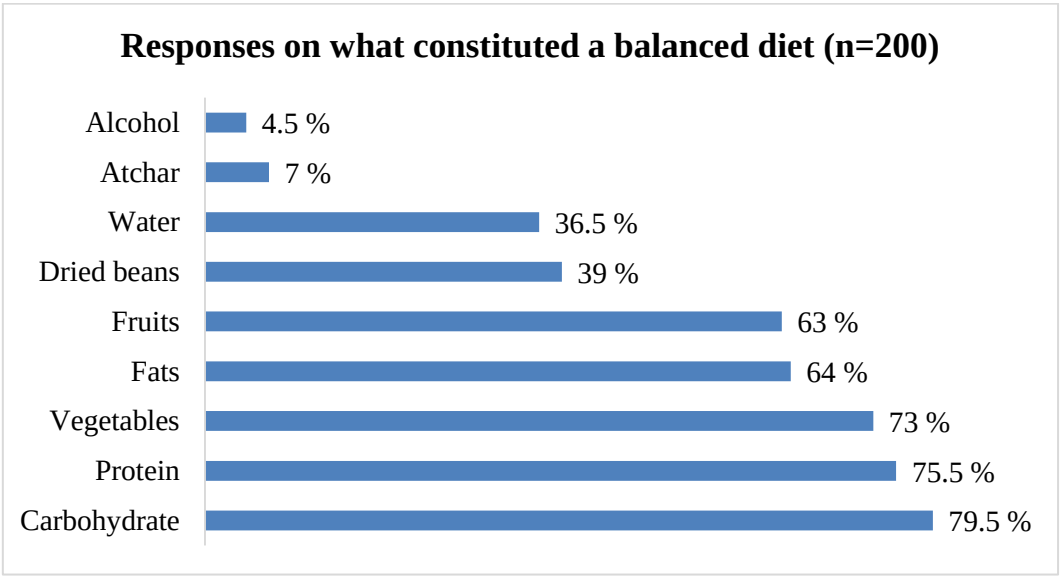

Figure 4.13: Responses on what a balance diet constituted of

Educators were asked to comment on the importance of physical activity in children. Some educators (34.5%) mentioned that children needed to be physically active so that they could be active and concentrate in the class, and 40% indicated that they would grow well and be healthy. Approximately9% responded that it would prevent diseases. Responses are shown in Figure·4.14.

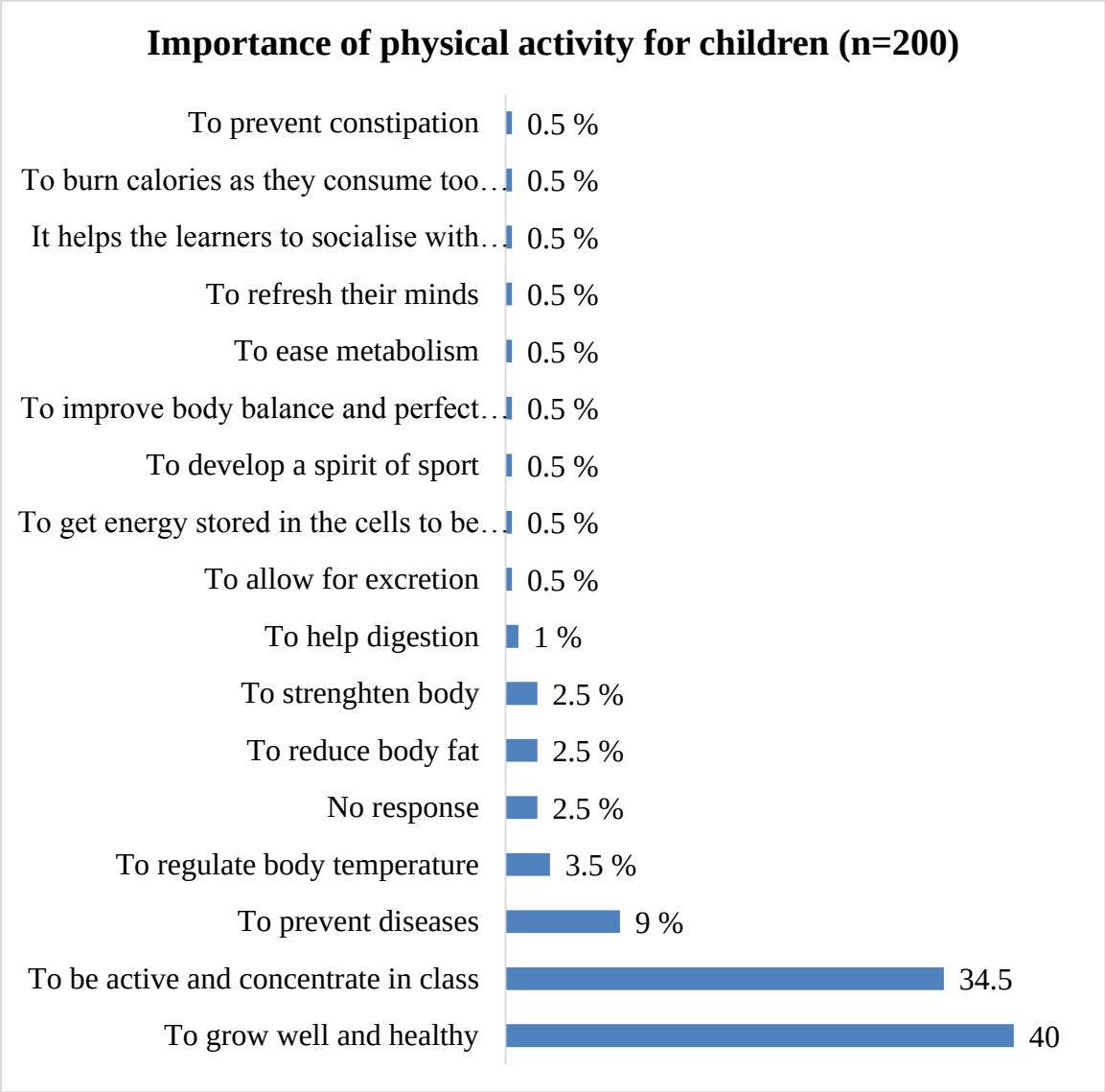

Figure 4.14: Importance of physical activity for children

The majority (84.0%) of the educators knew the importance of fibre; while 52.0% correctly stated the importance of vitamin A, followed by 37.0% who correctly stated the importance of vitamin C. About 26.5% of the educators correctly mentioned the importance of iodine, while 22.5% correctly stated the importance of iron (Figure 4.15).

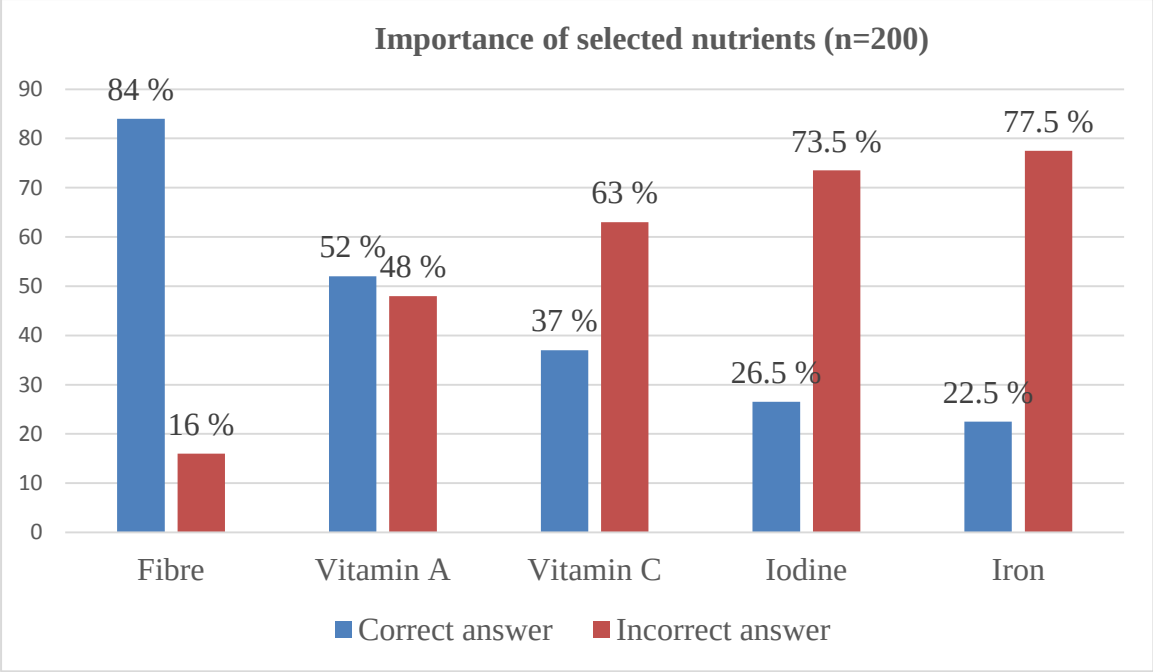

Figure 4.15: Importance of selected nutrients

Educators were asked about the effect of vitamin A and C deficiency on children. Most educators (64.5%) reported that the eyes were affected by a vitamin A deficiency, while 33.0% of the educators said that the skin was affected by a vitamin C deficiency (Figure 4.16).

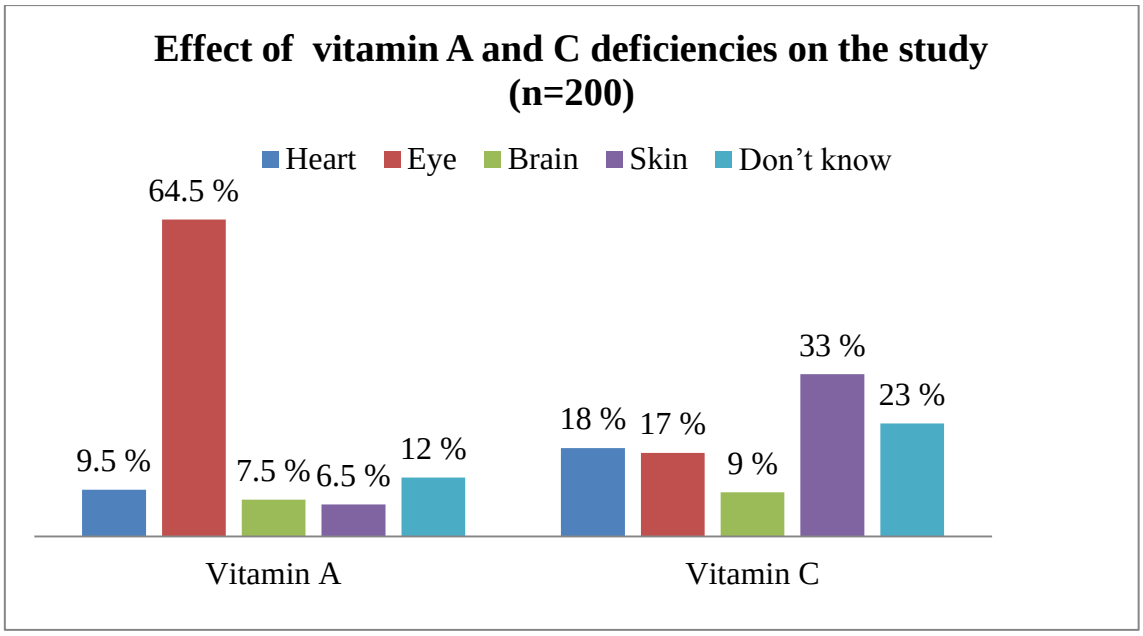

Figure 4.16: Effect of vitamin A and/or C deficiency on the study

Educators were asked to name the foods that were the richest sources of vitamin A and C. They were given food sources such as cabbage, carrots, and tomatos. About half of the educators knew the correct source of vitamin A being carrot, and 37% of educators correctly identified tomatoes as a rich source of vitamin C (Figure 14.17).

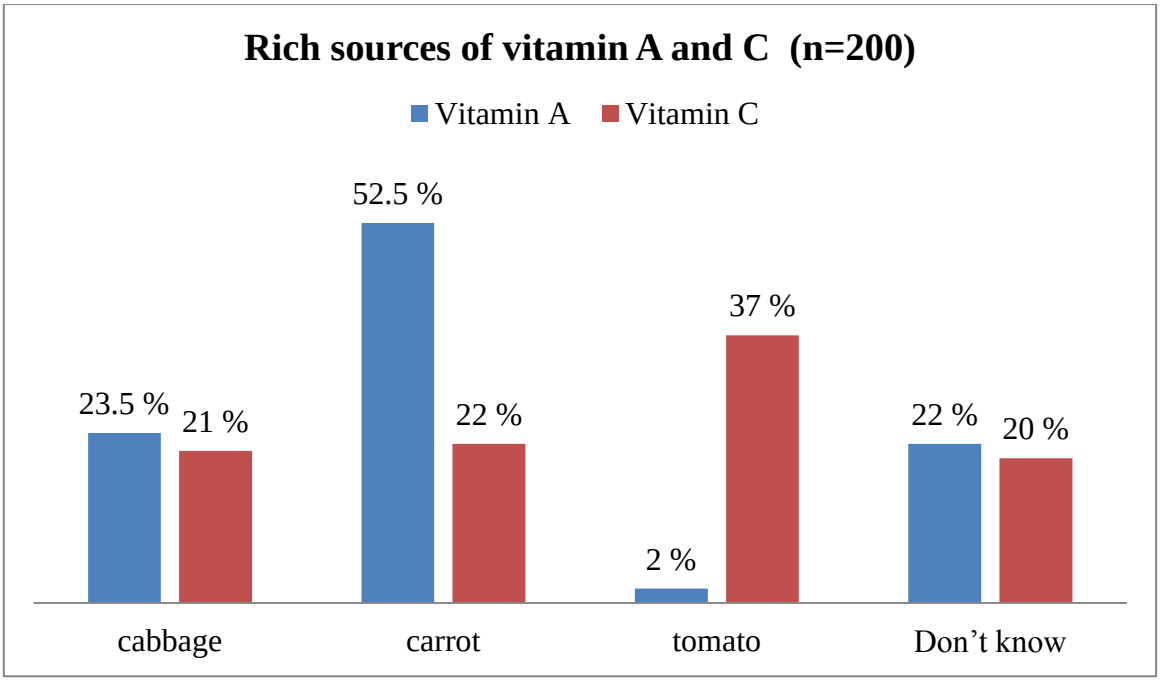

Figure 4.17: Rich sources of vitamin A and C

About half of the educators (54%) did not know the food sources rich in iron, and about 22% of educators were correct to answer that liver was a rich source of iron. Furthermore, 26.5% of educators were also correct to answer that seafood was a rich source of iodine, but about 45% of educators did not know iodine- rich food sources (Figure 4.18).

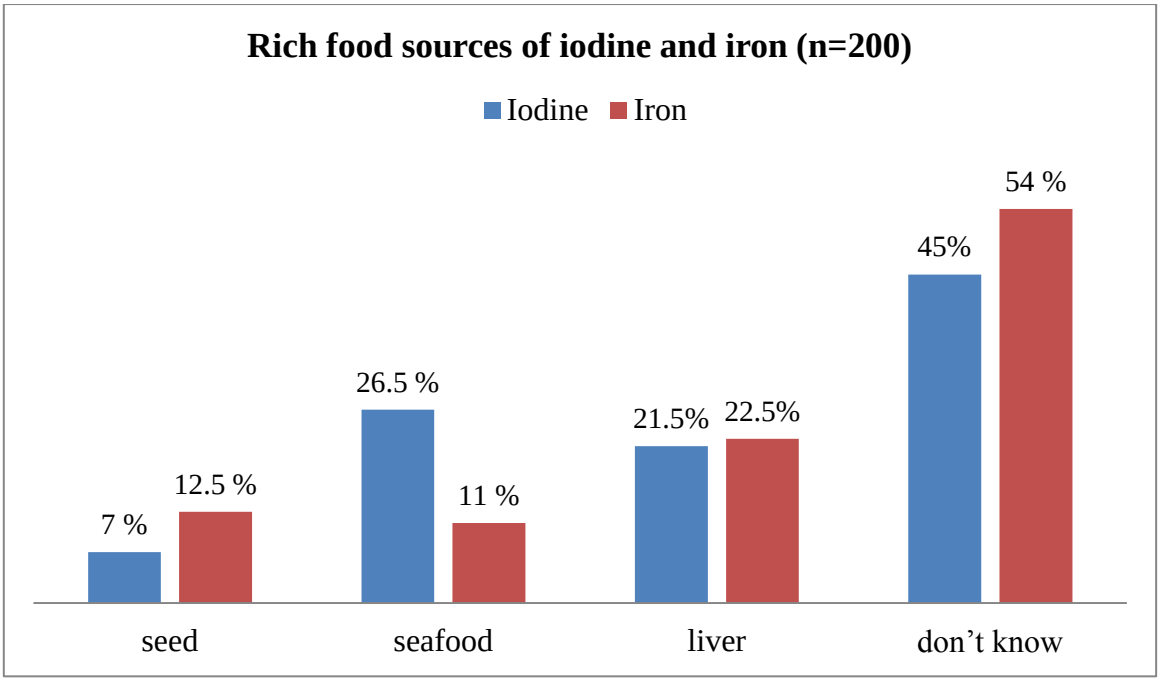

Figure: 4.18: Rich sources of iodine and iron

Almost 84% of the educators were correct that fruit and vegetables are high in fibre (Figure 4.19).

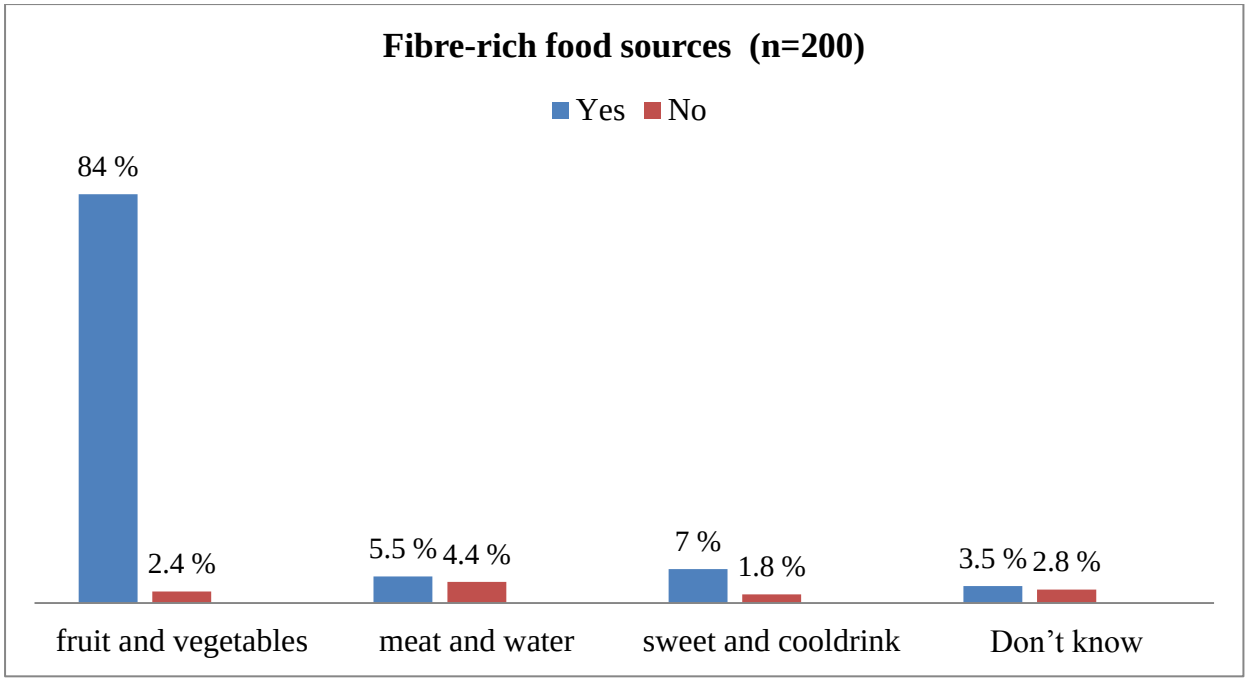

Figure 4.19: Fibre- rich food sources according to the educators

A total knowledge score was computed based on the correct answers for the knowledge question. The majority (92.0%) of the educators had a poor percentage range knowledge score, while 5% had an adequate percentage range knowledge score, and 0.5% had an excellent percentage range knowledge score. About 2.5% of the educators had a more than adequate percentage knowledge score (Figure 4.20).

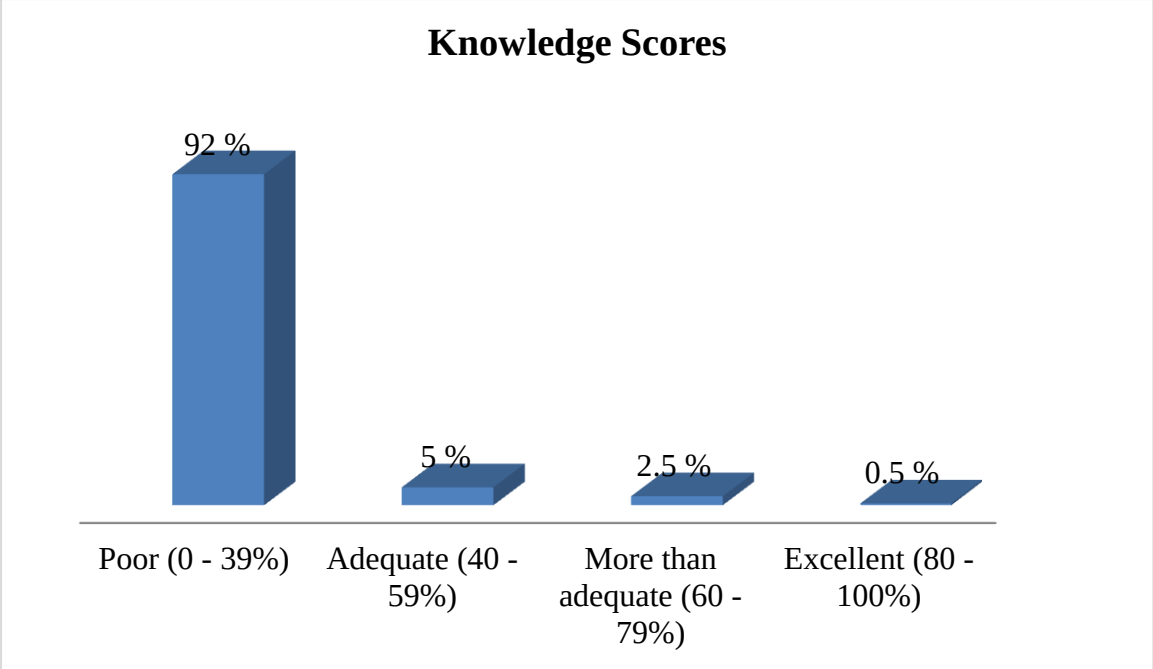

Figure 4.20 Distribution and classification of total knowledge scores

The knowledge score was compared with selected variables, namely: age, gender, education level, and institution of training. There was no significant correlation between the knowledge of educators and their ages (p-value >0.05).Women scored higher than men, with only two men and 16 women scoring adequate, respectively; gender did not influence nutrition knowledge. There was no significant difference in nutrition knowledge scores between different levels of education (p=0129). There was no significant correlation between the institution of training and nutrition knowledge (p=0.534).Neither the age, gender, level of education, qualification level, nor the institution of training of educators influenced the knowledge score. Although the findings were not significant 148 participant between 40-59 years had a poor knowledge score while 119 female participants had a poor knowledge sore and 174 participants who trained at a college had a poor knowledge score (Table 4.5).

Table 4.5 Comparison of knowledge score with selected variables

Variable	**Knowledge score**				**P-value**
	Poor (0-39%)	**Adequate (40-59%)**	**More than adequate (60-79%**	**Excellent (80-100%)**	
Age group					
20-39	26	0	0	1	0.354
40-59	148	10	5	0	
60-79	2	0	0	0	
No Response	8	0	0	0	
Gender					
Male	65	2	0	0	0.249
Female	119	8	5	1	
Education level					
Diploma	114	6	1	0	0.129
Degree	33	1	0	1	
Honours	33	3	4	0	
Masters	1	0	0	0	
Others	3	0	0	0	
Institution of training					
College	174	9	4	1	0.534
University	10	1	1	0	

4.5 Conclusion

In this chapter presented the analysis of the results and focused on the demographic characteristics, factors affecting nutrition knowledge and nutrition knowledge scores. The majority (94%) of educators trained at a college and they also indicated that nutrition was not part of their curriculum, but it did not (45.5%) affect their nutrition knowledge, even though the other half (48.5%) felt it did affect their nutrition knowledge. The educators (58.5%) also

indicated that nutrition education should form part of the curriculum at the primary level. Educators (52.5%) acknowledged that the level of education did affect their nutrition knowledge. About 78.5% of the educators indicated that reading of food labels affected their choice of food products, while 36.0% of the educators indicated that food price affected their choice of food products. Almost 63.5% agreed that nutrition knowledge affected their food choice. In South Africa, the DoBE use FBDG in schools to teach nutrition. About 41.5% of educators could not identify the topic they could teach on nutrition, only 32% identified healthy food and lifestyle. Educators (55.5%) indicated that they preferred to talk about issues related to nutrition daily with their family or anyone else. Some (46%) of the educators disagreed that gender affected their choice of food, and 66% of the educators felt that women were not the only ones concerned about nutrition. About 51.5% agreed that gender did affect nutrition but did not limit them to improve nutrition knowledge. Almost 72.5% of the educators indicated that a ten-year-old child should have three meals per day and indicated that breakfast, lunch, and supper was the important meals for the child. Only 33% indicated that a child should not skip meals because they would not grow well. Almost 67% of educators knew the importance of carbohydrates, fats, and energy. About 56% knew the importance of vegetables and fruits. Most of the educators did not know the importance of water and dried beans. Only 5.5% knew the importance of water, while 3% knew the importance of dried beans.

Educators were asked what they understood about a balanced diet. Nutrients were given in the form of a table and they had to tick nutrients that form a balanced diet. Most ticked three nutrients, which were carbohydrates (79.5%), protein (75.5%), and fruit and vegetables (73%). On the importance of physical activity for children, educators (40%) responded that they would grow well and healthy; while 34.5% of the educators responded that they could be active and concentrate in the class. Educators were given a table from which to choose the importance of vitamin A,C, and fibre, and also the deficiency of vitamin A, C, iron, and iodine. About 84%of the educators knew the importance of fibre, vitamin A (52%), and few (37%) knew the importance of vitamin C. Only 26.5% knew the importance of iodine and 22.5% knew the importance of iron. About 64.5% knew the deficiency of vitamin A, 33% knew the deficiency of vitamin C, and they did not know the deficiency of iodine (73.5%) and iron (77.5%). They did not know rich sources of iron and iodine, but they knew rich sources of vitamin A, C, and fibre. Total knowledge scores showed that educators overall had poor nutrition knowledge which was 92%.

CHAPTER 5

DISCUSSION OF RESULTS

5.1 Introduction

The chapter further discussed the results presented in chapter 4, provides a conclusion to the study, and presents recommendations based on the results.

5.2 Nutrition knowledge of educators

According to Gillespie and Brun (1992), nutrition education needs to be categorised by ethnic group, income, age levels, and literacy level. The study was conducted in the Sekhukhune District, which is in a deep rural part of the Limpopo Province. Litchfield (2009) noted that factors influencing behaviour change include participant and educators' race, and the educator's experience. Most educators (81.5%) were aged between 40-49 years and had 14-21years of experience in teaching. Female educators made up 66.5% of the sample and approximately 60.5% of the educators had a diploma as their highest qualification. The family environment is crucial to the success of nutrition education in schools, as food behaviour change mainly depends, among others, on household food security and parents' nutritional knowledge, attitudes, and practices (Sherman & Muehlhoff, 2007).Available foods are disproportionally distributed among family members with children and women having the less nutritious and the smallest share of the available foods (FAO, 2006). Almost 73.5% of families were headed by males and 21% of the educators indicated that there were approximately 0-6 people in the household. Approximately 70% of educators were married. Information from the school environment, classroom curriculum, media, peers, families, and communities is necessary for the promotion of nutrition, health knowledge and practice among schoolchildren (FAO, 2005a; Traahms & Pipes, 2000). The educators reported the following as a major source of nutrition information: health workers (84.5%), followed by magazines (75.0%), newspapers (73.0%), and radio and television (70.0%). The findings agree with those of a study conducted among nutrition educators by Alexandra (2005) in South Carolina, who identified books, newspapers and television as their major source of nutritional knowledge.

Nutrition education is taught in public schools South Africa with the focus on knowledge for school performance, rather than promoting a motivation towards nurturing nutrition

behaviours that are consistent with health and well-being (Kupolati et al, 2015). Thus, the potential influence of the school environment in shaping desirable nutrition attitudes and practices among learners was not realised (Lakshmanet al, 2010). A lack of training and support for educators is just one of the many obstacles that educators face when implementing school wellness programmes and syllabi. In this study more than half of the educators (54.5%) indicated that nutrition was not part of their curriculum at the training institution. The curriculum should be explicit and teachers should receive training in the use of the curriculum. Nutrition training for teachers that have a behavioural change component can lead to effective nutrition education, and thereby implement behaviour change among (healthy eating) learners (Hildebrand et al, 2012). Therefore, it will not be easy for the educators to teach nutrition while they do not have basic nutrition knowledge themselves. Studies by Kupolati et al (2014), and Oldewage-Theron and Eagl (2012), showed that teachers required training on nutrition education. Poor nutrition knowledge is one of the main factors in the development of malnutrition and needs to be addressed (Briggs et al, 2010).In this study some educators (48.5%) agreed that their training affected their nutrition knowledge, while others disagreed, indicating that their training did not affect their nutrition knowledge.

Food choices and eating patterns are also influenced by the need to negotiate with others in the family about what to buy or eat (Contento et al, 2006; Connors et al, 2001,). People value certain aspects of food over another. In the United States, the major values in choosing foods are taste, convenience, and cost (Glanz et al, 1998). In Europe, the major values are quality/freshness, price, nutritional value, and family preferences, in that order (Lennernas et al, 1997).This study showed that 63.5% of the educators agreed that nutrition knowledge affected their choice of food. According to Roberts et al(2009), educators are the role models for learners in making healthy food choices. In addition, nutrition knowledge is becoming increasingly important in food choice and association between knowledge and eating behaviours shows that with nutrition knowledge, healthier eating behaviours may occur (Zarnowiecki et al, 2011).Therefore, there is an urgent need for the promotion of effective health and nutrition education interventions to implement changes in food choice, diet, and lifestyle (Brug,2004).

The findings of the present study showed that more than three quarters of the educators (78.5%) read food labels before buying food, and 72.5% of them agreed that food labels

affected their choice of food product. This is supported by studies done by Keirle and Thomas (2000) and Chen et al (2009).

Evidence from previous studies confirmed an improvement in the dietary behaviour of learners when classroom teachers implemented nutrition education intervention to learners (Steyn et al, 2009).From the results of this study, 55.5% of the educators preferred to talk about nutrition daily, while56.0% wanted to discuss issues related to nutrition daily, and 50.5% preferred to discuss dietary issues with families. Family meals can provide an opportunity for a pleasant, cooperative time where entertaining conversation and healthy food choices accompany the opportunity to develop strong parent-child relationships and family connectedness (Eisenberg et al, 2004). Educators could encourage future teachers to use family and child development classes to reinforce the importance of families being together and having time to talk on a regular basis, emphasising the important role of family meals to both family dynamics, and family nutrition and wellness. A study done by Kupolati et al (2015) also supports that parents and peers 'influence impacts on nutrition education and on eating behaviour of learners.

Few South African studies have looked into interventions by teachers to influence the dietary behaviour of learners. School children between the ages of 10-12 years present a window of opportunity to influence the dietary behaviours of the next generation of adolescents and adults (Lakshman et al, 2010).In this study 75.5% of the educators felt that a ten-year-old child should have three meals per day, while 26.0% of educators indicated that breakfast was the most important meal for the child. Studies have also shown that, as children get older, they tend to eat breakfast only and less frequently during the rest of the day (Hackett et al, 2002; Kleinman et al, 2002). Children can be irritable and have difficulty concentrating, which can interfere with learning. They also experience low energy, which can limit their physical activities (Appleby, 2009). Many primary school children travel long distances to school with little or no breakfast at all (Appleby, 2009). As a feedback to the Childhood Education Services, teachers reported that there was an improvement in children's attendance, attention, behaviour, and level of concentration when healthy eating was accepted and practiced (Appleby, 2009).

Pollit (1995) claims that skipping breakfast can adversely affect children's performance in problem solving tasks. Only one educator in this study related skipping of meals with performance, but the majority of educators (73%) mentioned that they did not know why

children should not skip meals. It also raises a concern as to whether educators really understand the importance of the National School Nutrition Programme (NSNP), which is now implemented in schools in South Africa.

Attitude, beliefs, and behaviour towards fruit and vegetable intake was found to significantly change teachers' influence on learners' attitudes to fruits and vegetables, as recorded in the hybrid approach of nutrition education. The hybrid model was adjusted to accurately reflect the implementation of school-based nutrition education intervention over the theory driven or the observational techniques (Prelip et al, 2011).The findings in this study showed that most educators understood the importance of carbohydrates, fats, fruit and vegetables, but lacked knowledge in other areas such as the importance of water, protein, and dried beans. Even though they did not know the importance of protein, they did know that it formed part of a balanced diet. Most educators mentioned that carbohydrates, fats, protein, fruit and vegetables formed part of a balanced diet. Only 39.5% of the educators agreed that dried beans form part of balance diet. Few (7.0%) of them indicated that atchar formed part of a balanced diet, which was incorrect. A study done by Dalais et al (2014) reported that only 30.5% of teachers were able to describe a well-balanced diet. Nutrition affects how children perform in school (Hay & Baghurst, 2014). Not only do all children need the opportunity to have a well-balanced diet but according to Farfan-Ramirez et al (2011), a child with adequate nutrition has a higher ability to fully participate in school activities and can actively learn.

In this study, 52.0% of the educators correctly responded that carrot was a rich source of vitamin A. Some(37%) of the educators answered correctly when they indicated that tomatoes were a rich source of vitamin C, while one fourth of the educators (22.5%) were correct when they responded that liver was a rich source of iron, and only 26.5% indicated that seafood was a rich source of iodine. Almost all (84%) of the educators identified fruit and vegetables as foods that are high in fibre. According to the study done by Ayieko and Anyango (2011) in Kenya, the teachers did not show a basic knowledge of foods rich in vitamin A and C. A South Carolina study on nutrition knowledge attitude and practices (KAP) found overall fair nutrition knowledge among nutrition educators, with gaps in the knowledge pertaining to nutrition and the function of minerals and vitamins (Alexandra, 2005).This supports the findings of this study where educators did not have adequate knowledge on the rich sources of vitamin C and the consequences of its deficiency.

The total knowledge score of the educators in this study was (92%)s poor and there was no inferential difference between the educators in terms of their knowledge. About 5% of the educators in this study had adequate knowledge and 0.5% had excellent knowledge. This shows that the educators did not have sufficient nutrition knowledge. According to Uko-Aviomah (2005), students' poor performance at the end of the school year was attributed to factors relating to the skill and effectiveness of the teachers. If educators are not strong in the content knowledge and pedagogical competence vital for effective learning, then the limits of achievements of learners will be equally weak. The need for nutrition training for teachers was confirmed in a South African study, where teachers admitted having insufficient knowledge about nutrition and healthy dietary habits (Nguyen et al, 2013). The findings of this study are supported by studies which found that teachers had poor nutrition knowledge (Dailas et al, 2014; Sharma et al, 2013; Kinsler et al, 2012; Oldewage-Theron & Eagal, 2012; Rafiroiu & Evans, 2005;Martin et al, 1998).In order for teachers to be valuable sources of nutrition information, they must be equipped with adequate knowledge and they must be able to convey accurate nutrition information to students and respond to their questions and concerns about diet and nutrition (Chen et al, 2009).

Despite the importance of nutrition education in schools, the Department of Basic Education has not given necessary emphasised it enough in schools in South Africa. Since nutrition is included as one of many topics forming part of the life orientation syllabus, and without a standardised nutrition curriculum provided to all teachers, the individual teacher's perception of an important topic to teach becomes a determining factor of the content taught. This is also supported by the study done by Murimi et al (2008) in Louisiana, where seventh-grade teachers choose 'healthy food choice' as an important nutrition topic, while the Food Guide Pyramid was the most commonly taught topic. The majority of educators in this study did not identify a nutrition topic that they could teach, while 34% identified healthy food and lifestyle, and others chose food groups, food additives, importance of fruit and vegetables, and good nutrition as nutrition topics. In the Nutrition Guide for Nutrition Education at School (DoBE, Republic of South Africa 2011b), there are eight nutrition topics for teachers to teach in the classroom. However, in this study the educators failed to indicate some of those topics, such as healthy eating, dietary habits in children, nutrients in food, food hygiene, and food processing(DoBE, Republic of South Africa, 2011a; 2011b). It could be that educators did not have confidence in teaching nutrition topics, as nutrition was not part of their curriculum during their training. This was supported by the study done by Lumeng et

al (2008), who reported that educators lacked confidence in teaching topics on which they did not have sufficient knowledge. Evidence shows that 57.7% of the teachers believed that they did not have adequate classroom time to include nutrition competencies (Lambert et al, 2010). It was common to have nutrition treated as a topic in other subjects and not as a distinct subject in many primary schools across Africa (United Nations Standing Committee on Nutrition, 2009). Therefore, there was a need to establish whether the content specific enhanced curriculum approach, was a theory based on the nutrition topics in the existing curriculum of the DoBE (Dudley, Cotton & Peralta, 2015).

Some (58.5%) of the educators felt that nutrition education should form part of the curriculum in the primary level, while 16% of educators indicated that it should start at the secondary level. According to Contento et al (1992), adequate time should be allocated for nutrition education throughout the preschool, primary, and secondary school years as part of a sequential, comprehensive school health education programme. Teachers should be adequately trained to teach nutrition and be provided with on-going in-service training. In addition to sufficient training, teachers need current and relevant nutrition education resources (Renaud et al, 1997). Some authors also raised concerns about the need for training on nutrition for LO teachers (Van Deventer, 2009; Christians, 2006; Rooth, 2005).

In this study, 34.5% of the educators indicated that it was important that children need to be physically active so that they could concentrate in the class, while 40% of the educators mentioned that children need to be physically active so that they could grow and be healthy. Children need to be active so as to promote strong skeletal muscle, and muscular and cardiovascular development (Slawta & DeNeui, 2010). Most children spend most of their time at school, which puts the school in an excellent position to promote healthy eating. Moreover, school-based nutrition education is ideal as children can be engaged in healthy eating and physical activity programmes that reinforce the messages of nutrition education (Briggs et al, 2010; Gross & Cinelli, 2004). Encouragement of healthy attitudes towards physical activity and healthy nutrition behaviour intervention impacts positively on children's health by increasing physical activity and healthy eating (Breslin & Berennam, 2012). Other areas of intervention focus included combining physical activity with dietary behaviours to improve health (De Villers et al, 2015; Eisenmann et al, 2011; Slawta & DeNeui, 2010).

In this study many educators (52.5%) agreed that their education level did affect their nutrition knowledge. However, it is doubtful whether or not educators are equipped to deliver

the appropriate health and nutrition messages (Hay & Baghurst, 2014; Chen et al, 2009). The role of educators in the success of interventions was identified to be of great importance, but capacity development among teachers was a challenge (Draper et al, 2010). The influence of teachers on dietary behaviour of learners can either be helpful or harmful (Senekal et al, 2015). Children need nutrition knowledge to make healthier food choices, and knowledge in relation to eating and nutrition is defined as the understanding of the health benefits of food and nutrients (Zarnowiecki et al, 2011).

A slight majority of the educators agreed that gender affected their nutrition knowledge, while 49.0% disagreed. Most educators disagreed that gender prevented them from improving nutrition knowledge, while the majority disagreed that women were not the only ones concerned about nutrition. This was questionable, since the majority of participants in this study were women. This was consistent with other research studies that reported that women tend to be more knowledgeable about nutrition (Hendric et al, 2008).This belief were not observed in this study. It should be noted that males were under-represented in this study.

School gardens are emerging as health education tools in the academic setting. About 65.5% of educators indicated that they did have vegetable gardens in schools and the majority of them produced spinach (74.0%), tomatoes (69.5%), carrots and cabbage (69.0%). A study of Californian teachers found that school gardens were perceived as an effective tool for promoting healthy eating habits (Graham et al, 2000).This observation agrees with the findings of David et al (2008), where learners followed up on gardening practice by planting new crops at their homes. The development of vegetable gardens was perceived as an important positive factor. It was argued that children become more interested in what they were able to participate in, rather than in what they were taught (Kupolati et al, 2015).

The current study shows that educators' knowledge based on age and gender was poor ($p=0.249$) and there was no significant difference between educators of different ages or genders and the knowledge of these educators. Evidence from other studies showed that the level of nutrition health knowledge was low and depended on gender but not on ethnicity, respondent's academic major, and father's occupation (Yong, 1985; Shariff et al, 2008).

According to Myers and Pope (2009), educators spend more time on subject matters in which they have been trained appropriately, than on others. In the current study most educators were trained at a college and had a diploma as their qualification. There was no significant difference ($p=0.129$) in their knowledge and the training institution. According to Kealey et

al (2000), teacher training should be conceptualised as behaviour change process and should include explicit teacher motivation components that could promote effective implementation of behaviour change in public school classrooms. Therefore, motivating teachers to permanent education and adopting healthy lifestyle could have a positive effect on the success of teaching (Kostanjevec et al, 2011). Adequate pedagogical qualification and good nutrition knowledge on the part of teachers are also important. Therefore, suitable teacher training is necessary. This finding was also supported by Van Deventer (2009), Christians (2006), and Rooth (2005), who raised concern about the need of training teachers for life orientation.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

The purpose of this study was to assess nutrition knowledge of educators in Makhuduthamaga municipality, Limpopo Province. A quantitative, descriptive, and exploratory study was conducted to determine the factors that influence nutrition knowledge of educators and to explore the relationship between factors such as training, level of education, food choices and reading of labels that affect nutrition knowledge. In order to fulfil the aim of the study, the following objectives had to be achieved:

a. To assess the knowledge of educators on early childhood nutrition of children up to ten years of age.

b. To determine the factors that influences the nutrition knowledge of educators.

c. To explore the relationship between these factors and the knowledge of educators.

The developed research questions listed below were successfully answered as per the conclusions that follow this section.

- What is the level of knowledge of educators on early childhood nutrition of children up to ten years of age?
- What are the factors that influence the nutrition knowledge of educators?
- What is the relationship between these factors and the nutrition knowledge of educators?

6.2 Conclusions

The need to train educators on nutrition was one of the main recommendations that emanated from many research projects. Most educators mentioned that training and level of education were of the factors that affected their nutrition knowledge. Nutrition knowledge is becoming increasingly important in food choices and in this study educators acknowledged that training affected their nutrition knowledge. Reading of food labels was the other factor that affected their food choice of products and most of the educators indicated that price and what their

family prefers, affected their behaviour related to food choice. Nutrition forms part of life orientation at schools and most of the educators did not choose the topic they could teach.

Only a few of the educators chose the food pyramid and a balanced diet as a topic they could teach. This emphasised that training is important. As nutrition forms part of the curriculum in schools, they preferred to talk about issues related to nutrition with people and their families on a daily basis. Although women prepare meals in the household, educators felt that nutrition issues did not concern women only and they agreed that gender also affected their choice of food, but it did not limit them to improve their nutrition knowledge. According to the National School Nutrition Programme, breakfast is the most important meal for the day and educators showed that breakfast, lunch, and supper were the most important meals of the child and a hungry child would not concentrate in the class. In this study, few educators indicated that children should not skip meals because they would not concentrate in class. Even though their score on nutrition knowledge was poor, they knew the importance of carbohydrates, fat, fruit and vegetable, rich sources of vitamin A, and fibre. They lacked knowledge on the importance of protein, water, dried beans, and rich sources of iron and iodine. The majority of the educators had poor nutrition knowledge. There was no significant correlation between nutrition knowledge and gender, level of education, institution of training.

6.3 Limitations of the study

The study was conducted in the deep rural area of Sekhukhune, where there was poor infrastructure in some schools, insufficient classrooms, and incapable teachers. Although Sekhukhune has six municipalities, the study only focused on one municipality. This made it difficult to extrapolate the results to the broader population. Therefore, the results of this study need to be interpreted with caution, but may be applicable in similar environments.

6.4 Recommendations

The results from this study may assist the Department of Education to develop nutrition education materials for teachers, to align with the existing school curriculum. This was also recommended by Hill et al (2015), Oldewage-Theron and Napier (2011). Teachers in South

Africa expressed inadequacy in some topics in nutrition and they requested nutrition training. (Nguyen et al, 2013).

In this study educators showed that their nutrition knowledge was affected by their training and level of education. It would benefit the learners and educators if educators were trained on nutrition education, especially those teaching life orientations, since nutrition topics form part of the life orientation subject. Greater support from the DoBE and support from the schools were vital for the success of school-based NE interventions (De Villers et al, 2015). The curriculum should also emphasise the importance of physical activity and school gardening to educators.

REFERRENCES

Abood, D., Black,D., & Coster, D.(2008) Evaluation of a school-based teen obesity prevention minimal intervention, Journal of Nutrition Education and Behavior, 40:168-74.

Aldinger,C.E.& Jones, J.T.(1998) Healthy Nutrition: An Essential Element of a Health-promoting School. WHO, Information Series on School Health. Document four. Geneva:WHO.

Anderson, K.& Strutt, A. (2013) Emerging economies, productivity and trade with resource rich economies by 2030.Australian Agriculture and Resource Economics Society 57th conference, Sydney Australia, 5-8February.

Andrade, P. (2003) Scrambling for Coal. Current event (special Report), 102(23):1-2.

Alexandra, E. (2005) Nutrition knowledge attitudes and practices among nutrition educators in the South,American Journal of Health Studies,20(1):1-14.

Appleby, P.(2009)Food and nutrition for healthy, confident kids: guideline to support healthy eating environment in New Zealand, National Nutrition Resource. Available from:http://healthylifestyles.tki.org.nz [Accessed 25th September 2012].

Aranceta, J.(2001) Nutricio´nComunitaria, 2a edicio´n. 1–284. Barcelona: Masson. Attitude and Practices of Primary School Children. (2008) Pilot study International Electronic, Journal of Health Education,11:119-132.

Auld, G.W., Romaniello, C., Heimendinger, J., Hambidge, C., & Hambidge, M. (1999) Outcomes from a school-based nutrition education program alternating special resource teachers and classroom teachers, Journal of School Health, 69: 403-408.

Ayieko, M.A. & Anyango, J.L. (2011) Evaluation of Nutrition Knowledge and Perception of food among Nursery School Pupils in Kisumu Munucipality-Kenya. Advanced, Journal of Food Sciences and Technology, 3(3):165-172.

Babbie, E.(2007)The Practice of Social Research.11th ed. Belmont, CA: Wadsworth. Engage Learning.

Baskale, H. &Bahar, Z. (2011) Outcomes of nutrition knowledge and healthy food choices in 5 to 6years old children who received a nutrition intervention based on Piaget theory, Journal for Specialists in Paediatric Nursing, 16:283-279

Baranowski, T.&Stable, G. (2000)Process evaluation of the 5-a day projects, Health Education and Behaviour, 27:157-166.

Breslin, G.& Berennam, D.(2012)A healthy lifestyle intervention delivered by aspiring physical education teachers to children of social disadvantage: Study protocol and preliminary finding, Child Care in Practice, 18(3):207-225.

Briggs, M., Fleischhacker, S., &Mueller, C.G. (2010)Position of the American Dietetic Association, School Nutrition Association, and Society for Nutrition Education: comprehensive school nutrition services, Journal of Nutrition Education and Behaviour, 42(6):360–71.Available from: http://dx.doi.org/10.1016/j.jneb.2010.08.007.

Bullen, K.(2004) Changing children's food and health concepts and challenges for nutrition education, Education and Health, 22(4):51–55.

Burke, L.(2002)'Healthy eating in the school environment: a holistic approach', International Journal of Consumer Studies, 26(2):159–163.

Brug,H. (2004) Changing consumer behaviour from a health promotion perspective: barriers and triggers: In Unilever. The healthy choice, an easy choice Vlaardigen, The Netherlands: Unilever Health Institute:43-46.

Brown, S., (2010) ANR Programme Evaluation, Lowa State University Extension, sorrel@ lastate.edu

Cantrell,P., Young, S.,& Moore, A.(2003) Factors affecting sciences teaching efficacy of preserved elementary teachers, Journal of Science Teacher Education, 14:177-192.

Celebuski, C.& Farris, E. (2000)Nutrition education in public elementary school classrooms. U.S. Department of Education, National Center for Education Statistics (NCES). 2000-040. Washington, DC: Author.

Chen, Y.H., Ceh, C.Y., Lai, Y.M., Shyu, M.L., Huang, K.C., & Chiou, H.Y.(2009) 'Significant effects of implementation of health-promoting schools on school educators'

nutrition knowledge and dietary intake in Taiwan', Public Health Nutrition, 13(4):579–588. Available from: http://dx.doi.org/10.1017/S1368980009991017, PMid:19656439

Christians, D.J.(2006) Empowering teachers to implement the Life Orientation learning area in the Senior Phase of the General Education and Training Band. Unpublished MEd dissertation. Stellenbosch: Stellenbosch University.

Collins, M.E.(1999)Promoting healthy body image through the comprehensive school health program, Journal of Health Education,22(5):297-302.

Connors,M.,Bisogni, C.A.,Sobal, J.,& Devine, C.M. (2001) Managing values in personal food systems, Appetite, 36(3):189-200.

Contento, I., Balch,G.I.,Bronner,Y.L.,Paige,D.M., Bisignani, L&. White,S.L. (2007) The effectiveness of nutrition education and implications for nutrition education policy, programs, and research: A review of research, Journal of Nutrition Education, 27: 275-422.

Contento, I.R.,Williams,S.S.,Michela, J.L., &Franklin, A.B.(2006) Understanding the food choice process of adolescents in the context of family and friends, Journal of Adolescent Health, 38(5):575-585.

Contento, I.R.(2011) Nutrition education: Linking research, theory and practice. Jone and Bartlett Publishers, Sudbury MA.

Contento, I.R., Randell, S., & Basch, C.E. (2002) Review and analysis of evaluation measures used in nutrition education intervention research, Journal of Nutrition Education and Behaviour,34: 2–25.

Contento, I.R.(1995) The effectiveness of nutrition education and implications for nutrition education policy, programs and research: A review of research, Journal of Nutrition Education,127(5): 284-286.

Contento, I.R., Manning, A.D.,& Shannon, B. (1992)Research perspective on school-based nutrition education, Journal of Nutrition Education, 24:247-60.

Cosgrove, M.(1991)Cooking in the Classroom: The Doorway to Nutrition Young children, 43-46.

Curtner-Smith, M. (1999) The more things change the more they stay the same: factors influencing teachers' interpretations and delivery of National Curriculum Physical Education. Sport Education Society, 4:75-97.

Dalais, L., Abrahams, Z.,& Steyn, N.P.(2014)The association between nutrition and physical activity knowledge and weight-status of primary school educators, South Africa Journal of Education, 34(3):1–8.Available from: http://dx.doi.org/10.15700/201409161038.

David, D.M., Kimiywe, J.O., Waudo, J.N.,& Orodho, J.A.(2008) Promotion of nutrition education interventions in rural and urban primary schools in Machakos district, Kenya. Journal of Applied Biosciences, 6:130-139. Availableathttp://m.elewa.org/JABS/2008/6/1.pdf [Accessed 25th December 2013].

David, D.M., Kimiywe, J.O.,&Waudo, J.N.(2012) Nutrition Knowledge, Attitude and Practices and Nutrition Status of School-Going in Machakos district, Kenya .International Conference on Nutrition and Food Science. IPCBEE, 39, IACSIT Press, Singapore.

De Villiers, A., Styne, N.P., Draper, C.E., Hill, J., Dalais, L., Fourie, J., Lombard, C., Barkhuizen, G.,& Lambert, E.V.(2012) HealthKick: Formative assessment of the health environment in low-resource primary schools in the Western Cape Province of South Africa. BMC, Public Health.12(1):1. Available from: http://www.biomedcentral.com/1471-2458/12/794 [Accessed 14th July 2016].

De Villiers, A., Styne, N.P., Draper, C.E., Hill, J., Dalais, L., Fourie, J., Lombard, C., Barkhuizen, G., & Lambert, E.V.(2015) Implementation of the HealthKick intervention in Primary schools in low income setting in the Western Cape Province of South Africa: a process evaluation, BMC, Public Health, 15(1):818. Available from: htt://doi:10.1186/s12889-015-2157-8 [Accessed 23rd November 2015].

De Vos, A.S., Strydom, H., Fouche, C.B., & Delport,C.S.L. (2012) Research at grass roots for the Social Science and Human Service Professions. 4th ed: 171-234.

Department of Basic Education (DoBE).(2015) National School Nutrition Programme. Available from: http://www.edu.gov.za/Programme/NationalSchoolNutrition [Accessed 12th July 2015].

Department of Basic Education (DoBE), Republic of South Africa. (2014) National School Nutrition Programme. Available from: http://www.education.gov.za/The

DBEStructure/SocialandSchool/Enrichment/NationalSchool/Nutrition Programme/tabid/131/Default.aspx [Accessed 10th March 2014].

Department of Basic Education (DoBE), Republic of South Africa. (2012)Action Plan to 2014-towards the realisation of schooling 2025. Available from: http://www.education.gov.za/LinkClick.aspx [Accessed 15th January 2016].

Department of Basic Education (DoBE), Republic of South Africa. (2011a) National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Intermediate Phase Grades 4-6: Life Skills. Available from: http://www.edu.gov.za [Accessed 15th November 2012].

Department of Basic Education, Republic of South Africa. (2011b)National Curriculum Statement (NCS).Curriculum and Assessment Policy Statement (CAPS) Intermediate Phase Grades 4-6: Natural Sciences and Technology. Available from: http://www.edu.gov.za [Accessed 15th November 2012].

Department of Education. (2011) Curriculum and Assessment Policy Statement (CAPS): Natural Sciences and Technology, Intermediate Phase Grade 4-6. DoE, editor. Pretoria.

Department of Education. (2010) Curriculum and Assessment policy statement (CAPS). DoE, editor. Pretoria

Department of Education (DoE) in South Africa. (2009) National School Nutrition Programme: a guide for secondary schools. Education Department, South Africa. Available from: http://www.education.gov.za [Accessed 2nd December 2015].

Department of Health (DoH) [in South Africa]. (2003) Guideline for nutrition intervention of health facilities to manage and prevent child malnutrition. Department of Health Pretoria:11-20.

Department of Health (DoH) in South Africa. (2008a) Integrated Nutrition Programme. A foundation for life. Issued 5. Available from: http://www.westerncape.gov.za/sites/inp_foundation_for life_1to12pdf [Accessed 3rd December 2015].

Dittrich, M., Giljum, S., Polzin, C., Lutter, S.,& Bringezu, S.(2011) Resources use and resources efficiency in emerging economies. Sustainable Europe Research Institute. Working

paper 12.Australia:SERI. Available from: htt://seri at/wp-content/uploads/2011/03/SERI/working Paper 12pdf.

Dixey, R., Heindl, I., Loureiro, I., Pérez-Rodrigo, C., Snel,J., & Warnking, P.(1999)Healthy Eating for Young People in Europe. A School-based Nutrition Education Guide. Copen Hague: European Network of Health Promoting Schools.

Dollahite, J., Hosig, K.W., White, K.A., Rodibaugh, R., &Holmes, T.M. (1998) Impact of a school-based community intervention program on nutrition knowledge and food choices in elementary school children in the rural Arkansas delta, Journal of Nutrition Education, 30: 289-301.

Downs, S. M., Farmer, A., Quantanilha, M., Berry, T.R., Mager, D. R., Willows, N.D.,& McCarger, L.J. (2012) From paper to practice: barriers to adopting nutrition guidelines in schools, Journal of Nutrition and Education Behaviour, 44:114-122.

Draper, C.E., De Villers, A., Lambert, E.V., Fourie, J., Hill, J., Dalais, L., Abrahams, Z.,& Steyn,N.P.(2010) HealthKick: nutrition and physical activity intervention for primary school in low-income setting, BMC Public Health.10:389, [Accessed 13th July 2013].

Dudley, D.A., Cotton, W.G., &Peralta, L.R. (2015) Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis, International Journal of Behavioural Nutrition and Physical activity,8:127. Available from: http://www.ijbnpa.org/content/8/1/127.

Eboh, L.O., & Boye, T.E. (2006) Nutrition Knowledge and Food Choices in Primary School Pupils in Niger – Delta Region Nigeria, Pakistan Journal of Nutrition, 5:308-311.

Education Statistics in South Africa.(2016)Published by Department of Basic education. Available from: http://nces.ed.gov/surveys/frss/publication/96852/3.asp.

Eisenmann, J.C., Alaimo, K., Pfeiffer,K., Pack, H., Carlson, J.J., Hayes, H., Thompson, T., Kelleher, D., Oh, H. J., Randall, J., Sue, Mayfield, K., &Holmes, D.(2011) Project FIT: Rationale, design and baseline characteristics of a school and community based intervention to address physical activity and healthy eating among low income elementary school children, BMC Public Health, 11:607-617. Available from: http://doi.10.1186/1471-2458-11-607 [Accessed 20th July 2014].

Eisenberg, M.E., Olson, R.E., Neumark-Sztainer, D., Story, M., & Bearinger, L.H.(2004)American Medical Association of Paediatric Adolescent, 158:792-796.

Fahlman, M., McCaughtry, N., Martin, J., & Shen, B. (2011) Efficacy, intent to teach and implementation of nutrition education increases after training for health educators, American Journal of Health Education, 42:181-190.

FAO/WHO.(1992)Promoting appropriate diets and healthy lifestyles .Theme Paper No.5.In Major Issues for Nutrition Strategies. Rome, FAO\WHO.

FAO, (2005a) Nutrition Education in Primary Schools: A Planning Guide for Curriculum Development. 1: Rome, Italy. 7-8, 17, 67-69, 92.

FAO (2005b) Setting Up and Running a School Garden: A Manual for Teachers, Parents and Communities. Rome, Italy. 182-190.

FAO (2005c) Nutrition Education in Primary Schools(Vol. 1: The Reader). Rome: FAO. Available at http://www.fao.org/3/a-a0333e.pdf [Accessed 10 December 2014].

FAO (2006) Nutrition Education in primary schools: A planning guide for curriculum development. Available from http://ftp.fao.org/docrep/fao/009/ [Accessed 21st June 2012].

FAO (1993) Guidelinesforlanduse.Rome:FAO.Available from http://www.fao.org/docrep/t0715e00.htm [Accessed4 December 2012].

FAO (2001) A compendium of FAO Experience in Basic Education. Available from: http://www.fao.org/SD/2001/KN1003_en.him.

Farfan-Ramirez, L., Diemoz, L., Gong, E., &Lagura, M. (2011) Curriculum intervention in preschool children: Nutrition matter, Journal of Nutrition Education and Behaviour, 43: 162-165.

Finnish National Board of Education. (2004) National core curriculum for basic education. Available from: http://www.oph.fi/english/publications/2009/nation_core_curricula_forbasic_eduation[Accessed 18th July 2012].

Fraenkel, J.R. (2006) How to design and evaluate research in education 11th ed. New York. McGraw-Hill.

Gil, A. (2010) Tratado de Nutricion:Tomo iii-Nutricion.Humana en el Estado de Salud (2nded, 3rd volume. MadridEditorial MedicaParamericana, S.A.

Gill, T., King, L., & Webb, K. (2005) Best options for promoting healthy weight and preventing weight gain in NSW. Sydney: NSW Centre for Public Health Nutrition.

Gillespie, A. & Brun, J. (1992) Trends and challenges for Nutrition Education Research,Journal of Nutrition Education, 24(5):222-226.

Gilson, R.J.(2000) Globalizing Corporate Governance: Convergence of form or function. Working paper available at SSRN.

Glanz, K., Basil, M.,Maibach, E., Goldberg, J.,&Snyder, D. (1998)Why Americans eat what they do: Taste, nutrition, convenience, and weight control concerns as influences on food consumption, Journal of the American Dietetic Association, 98(10):1118-1126.

Glasauer, P., Aldinger, C., & Sen-Hai, Y. (2003) Nutrition as an entry point to health promoting schools lessons from China Fnaana, 33:27-33.

Global Child Nutrition Forum (GCNF), School feeding in Uganda, (2006) Report for Global Child Nutrition Forum. http://www.gcnf.org/country-reports/uganda/2006-Uganda-School:Feeding pdf [cited 25 August 2011].

Graham, V., Gibbons, K., Marraffa, C.,& Sultana, J. (2000) Filling the Gap – children aged between six and eight years: sources of nutrition information used by families, school nurses and teachers, Australian Journal of Nutrition and Dietetic, 57: 90–94.

Graham, H., Feensta, G., Evans, A,. Zidenberg-Cherr, S. Davis school program supports life-long healthy eating habits in children, California Agriculture, 2004,58:200-205.

Gross, S.M., Pollock, E.D.,& Braun, B.(2010) Family influence key to fruit and vegetable consumption among fourth and fifth grade students, Journal of Nutrition Education and Behaviour, 42(4):235-241.

Gross, S.M. & Cinelli, B. (2004) Coordinated school health program and dietetics professionals: partners with promoting healthful eating, Journal of the American Dietetic Association, 104(5):793-798. Available from: http://dx.doi.org/10.1017/S1368980009991017.PMid:19656439.

Hackett, A.F., Gibbon, M., Sratton, G.,& Hamill, L.(2002)Dietary intake of 9-10-year-old and 11-12-year-old children in Liverpool, Public Health Nutrition, 5(3):449-455.

Hay, S.& Baghurst, T. (2014) Apractice method for teaching and assessing nutrition knowledge in elementary schools children. Oklahoma AHPERD, 51:27-31.

Hammerschmidt, P., Tackett, W.,& Golzynski, M. (2011) Barriers to end facilitators of healthy eating and physical activity in low income schools, Journal of Nutrition Education and Behaviour, 43(1):63-68.

Harris, K., Paine-Andrews, A.,& Richter, K. (1999)Reducing elementary school children's risk for chronic disease through school lunch modification, nutrition education and physical activity, Public Health Nutrition, 2: 445-8.

Hedwig, A., Kikafunda, J.K., Malde, K.M., Oldewage-Theron, W.H., & Egal, A.A.(2012) Breakfast, midday meals and academic achievement in rural primary school in Uganda: implications for education and school health policy, 56:11217.

Hendric, G.A., Convey, J.,& Cox, D.(2008)Exploring nutrition knowledge and the demographic variation in knowledge levels in an Australian community sample, Public Health Nutrition, 11(12):1365-1371.

Hildebrand, D.A., Jacob, T.,& Garraid-Foster, D.(2012) Food and fun for everyone: a community nutrition education for 3rd and 4th Grade students suitable for school wellness programme, Journal of Nutrition Education and Behaviour, 44(1): 93-95.

Hill, J., Draper, C.E., De Villers, A., Fourie, J.M., Mohamed, S., Parker, W.,& Steyn, N.(2015)Promoting healthy eating lifestyle behaviour through the Life Orientation curriculum: Teachers perception of the Health Kick intervention, South African Journal of Education, 35(1):981-989.

Hoelscher, D.M., Evans, A., Parcel, G., & Kelder, S.H. (2002) Designing effective nutrition interventions for adolescents, Journal of the American Dietetic Association, 102: S52-S63.

Hoover, J.R., Martin, P.A.,& Litchfield, R.E.(2009)Evaluation of a new education curriculum and factors influencing its implementation. Journal of Extension, 47(1):1-16. Available from: htt://www.joe.org/joe/2009february/a4.php.

Johnson, R.W. (2009) Local School Wellness Policies: How Are School Implementing the Congressional Mandates? Available from: http://www.rwif.org/pr/product.jsp?id=44708.

Jones, A. M & Zidenberg-Cherr, S. (2015) Exploring nutrition education resources and barriers, and nutrition knowledge in teachers in California, Journal of Nutrition Education and Behaviour,47(2):162-167. http://dx.doi.org/10.1016/j.jneb.2014.06.011.

Kabahenda, M., Mullis, R.M., Erhard, J.G., Nurlhurp-Clewes, C.,& Nichols, S.Y.(2011) Nutrition education to improve dietary intake and micronutrients nutrients among children in less-resourced area in Kabarole district, Western Uganda, South African Journal of Clinical Nutrition, 24(2):83-88.

Katz, D.L., Katz, C.S., Treu, J.A., Reynolds, J., Njike, V., Walker, J., Smith, E.,& Michael, Kann, L., Telljohann S.,& Wooley, S.(2009)Health education: results from the school health policies and programs study 2006,Journal of School Health, 77:408-34.

Kann, L., Brener, N.,& Wechsler, H.(2007)Overview and summary: school health policies and programs study 2006,Journal of School Health, 77:385-97.

Kelly, A. V., (2009) Leading curriculum Theory and practical, pp1-55, Newburg Park, CA, sage.

Khan,A.Z., Rafique, G., Qureshi, H & Badruddin,S.H. (2013) A nutrition education intervention to combat under nutrition experience from a developing country. ISRN Nutrition, l210287 (7). Available from: htt://doi:10.10.5402/2013/210287 [Accessed 23rd December 2015].

Katz, J.(2011)Teaching healthful food choice to elementary school students and their parents, Journal of School Health, 81(1):21-28.

Keirle, K.&Thomas, M. (2000) The influence of school health education program on the knowledge and behaviour of school children towards nutrition and health, Research in Science and Technology Education, 18: 173-190.

KIE.(2002)Republic of Kenya, Ministry of Education, Science and Technology Primary Education syllabus. Vol. 1 and 2 KIE Nairobi, Kenya.

Kelder, S.H., Perry, C.,& Landklepp, K.(1994)Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviours, American Journal of Public Health, 84:1121–1126.

Kealey, K.A., Peterson Jr, A.V., Gaul, M.A.,& Dinh, K.T.(2000) Teacher training as a behavior change process: principles and results from a longitudinal study, Health Education and Behaviour, 27:64–81.

Kimm, S.Y., Barton, B.A., Obarzanek, E., McMahon, R.P.,Sabry, Z.I.,& Waclawiw, M.A.(2001) Racial divergence in adiposity during adolescence: The NHLBI growth and health study. Paediatrics, 107(3), e34. Available from: http://pediatrics.aappublications.org/cgi/content/full/107/3/e34 [Accessed 31st March 2008].

Kinsler, J., Slusser, W., Erausquin, J. T., Thai, C. L.,& Prelip, M. (2012) Nutrition knowledge and self-effeminacy among classroom food based dietary guideline and to enhance healthier lifestyles, Journal of Public Health Nutrition,10(1):117-124.

Kleinman, R.E., Hall, S., Green, H., Korzec-Ramirez, D., Patton, K., Pagano M.E.,& Murphy, J.M. (2002) Diet, breakfast, and academic performance in children, Annual Nutrition Metabolic, 6(S1): 24-30.

Kloka, D.(2003) Integrated Nutrition Programme: School feeding. Pretoria: Department of Health. [Background document for Cabinet briefing]

Koch, V.&Kostanjevec, S. (2005)Nutrition education in Slovenia,AktuelleErnährungsmedizin, 30(3): 130-130.

Koch, V.&Kostanjevec, S. (2005)Nutrition as an element in the curriculum of the nine-year elementary school system in Slovenia. In: Technology – food –nutrition – health /1st Central European Congress on Food and Nutrition/2nd Slovenian Congress on Food and Nutrition, September 22 – 25, (p 206). Ljubljana, University of Ljubljana, Biotechnical faculty.

Kollajtis-Dolowy, A. (1996) State of knowledge of food and nutrition in selected groups of youth in Poland and changes caused by education. Warsaw, Poland. (Doctoral dissertation).

Koplan, J.P., Liverman, C.T., &Kraak, V.I. (Eds).(2005)Preventing childhood obesity: health in the balance: executive summary, Journal of the American Dietetic Association, 105:131-138.

Kostanjevec, S., Jerman, J.,& Koch, V. (2011) The effect of nutrition education on 6th grades knowledge of nutrition in nine-year primary schools in Slovenia, Eurasia Journal of Mathematics Science and Technology, 7(4):243-252.

Kristjansdottir, A.G., Thorsdottir, I.,& De Bourdeaudhuij, I. (2006) Determinants of fruit and vegetable intake among11-year-old schoolchildren in a country of traditionally low. The impact of a school garden among primary-school students 1939 fruit and vegetable consumption, International Journal of Behaviour, Nutrition and Physical activity. Act 3: 4

Kubik, M.Y., Lytle, L.A., Hannan, P.J, Story, M.,&Perry, C.L. (2002) Food related beliefs, eating behaviour, and classroom food practises of middle school teachers, Journal of School Health, 72: 339-34.

Kumar, R. (2011) Research methodology a step-by-step guide for beginners 3rd ed. Thous and Oaks,CA:Sage Publication. London.

Kupolati, M.D., Gericke, G.J., & MacIntyre, U.E. (2015) A Teachers perceptions of school nutrition education's influence on eating behaviour of learners in the Bronkhorstspruit District, South African Journal of Education, 35(2):1-10.

Kupolati, M.D., MacIntyre, U.E., & Gericke, G.J. (2014) School-based nutrition education, Nutrition and Food Science, 44(6):520-535.

Labadorios, D., Styen, N.P., & Nel, J. (2011) How diverse is the diet of adult South Africa. Nutrition Journal,10:33. Available from: http://www.nutrition.com/content/10/1/33 [Accessed 2016].

Lakshman, R.R., Sharp, S.J., Ong, K.K., & Forouhi, N.G.(2010)A novel school-based intervention to improve knowledge in children, BMC Public Health, 10:123-132.

Lambert, L.G., Monroe, A.,& Wolff, L.(2010)Mississippi Elementary School Teacher's Perspectives on Providing Nutrition Competencies under the Framework of Their School Wellness Policy, Journal of Nutrition Education and Behaviour, 42(4):271-276.

Lambert, L.G., and Carr, D. H.(2006) Perceptions of elementary school nutrition education practices by school foodservice directors, teachers and principal. Journal of Child Nutrition and Management.http://www.fao.org/ag/humannutrition/nutritioeducation/en(accessed March 12, 2015).

Lennernas, M., Fjellstrom,C., & Becker, W.(1997) Influences on food choice perceived to be important by nationally-representative are sample of adults in the European Union, European Journal of Clinical Nutrition, 51(2):S2-S15.

Litchfield, R. (2009) Brain storming rule as assigned goal. Does brainstorming really improve idea quantity? Motivation and Emotion, 33(1): 25-31. Available from: doi.10/007/s/1031-008-9109-x.

Lytle, L.(1995) Nutrition education for school-aged children: a review of research, Journal of Nutrition Education, 27: 298-311.

Lytle, L.A., Gerlach, S., &Weinstein, A.B. (2001)Conducting nutrition education in junior high schools: Approaches and challenges, Journal of Nutrition Education, 33:49-54.

Lumeng, J.C., Kaplan-Sanoff, M.,& Shuman, S. (2008) Head Start teachers' perception of children's eating behaviour and weight status in the content of food scarcity, Journal of Nutrition Education Behaviour, 40(4):237-243.

Martin, R.E., Hoover, L.C., Fox, E.A., Lan, W.Y., &Ahmad, M. (1998) Assessment of nutrition education of secondary Texas teachers, Journal of Family and Consumer Sciences Education, 16(2):60-75.

Masembe-Kasirye, F.N. (2005) Efforts to introduce milk in school feeding programmes in Uganda first eastern and southern Africa school. Available from: http://www.fao.org/es/ESC/common/ecg/187/en/Uganda/pdf

MaučecZakotnik, J., HlastanRibič, C., Poličnik, R., Pavčič, M., Štern, B., & Pokorn, D. (2007) Food and nutrition action plan for Slovenia 2005-2010. Ljubljana, Ministry of health.

Myers, L.A., & Pope, J.F. (2009) Nutrition, food and wellness rationale and resources for implementation in family and consumer science teacher preparation programs, Journal of Family Constitution. Science Education, 27:13-29.

Mbithe, D. (2008) Promoting nutrition education intervention in rural and urban Primary Schools in Machakos District, Kenya: Focus on school gardens. Unpublished Doctoral Dissertation, Kenyatta University, Nairobi, Kenya.

McCoy, K. (1998) Advised to Parents: Talking to Your Teen Will Listen, National parenting Center.

McCaughtry, N.,Martin, J.J., Fahlman, M.,& Shen, B.(2011) Urban health educators perspectives and practices regarding school nutrition policies, Journal of Medicine and Health,27(1):9-8.

McNultry, J.(2013) Challenges and issues in nutrition education, Rome: Nutrition Education and Consumer Awareness Group. Food and Agriculture of the United Nation. Available from: http://www.fao.org/ag/humannutrition/nutritioneducation/en [Accessed 12th March 2015].

Myers, M.K., Conklin, M.T., Lewis, J.R., Marshak, J., Cousin, S., Turnage, C., &Wood, D.(2001)Barriers to healthy nutrition environments in public middle grades, Journal of Child Nutrition & Management, 25: 66-71.

Ministry of Education (2007) Improving School Leadership: Finland Country Background Report, Helsinki. Available from: http://www.oecd.org/finland/38529249.pdf.

Ministry of Education (2009) Strategy for the Internationalisation of Higher Education Institutions in Finland 2009–2015, 2009:23, Helsinki. Available from: http://www.minedu.fi/export/sites/default/OPM/Julkaisut/2009/liitteet/opm23.pdf?lang=en

Morris, J. & Zidenberg-Cherr, S. (2002) Garden enhanced nutrition curriculum improves 4th grade school children's knowledge of nutrition preferences for some vegetables, Journal of the American Dietetic Association, 102(1):91-93.

Morris, J.L., Briggs, M., Zidenberg-Cherr, S(2002) Development and Evaluation of a Garden-Enhanced Nutrition Education Curriculum for Elementary Schoolchildren, Journal of Child Nutrition & Management, 2:1-10.

Mullen, M.C. & Shield, J. (2004) Childhood and adolescent overweight: the health professional's guide to identification, treatment, and prevention. Chigago, IL: American Dietetic Association.

Murimi, M.W., Sample, A & Hunt, A.(2008) Nutrition instruction in seventh grade: a comparison of teachers with and without FCS background, Journal of Family and Consumer Sciences Education, 100:22-7.

Naylor, P.J., Macdonald, H.M., Reed, K.E., &McKay, H.A.(2006) Action Schools! BC:A socio-ecological approach to modifying chronic disease risk factors in elementary school children, Preventing Chronic Disease, 3(2):A60.

Neumark-Sztainer, D., Wall, M., Larson, N.I., Eisenberg, M.E.,& Loth, K. (2011) Dieting and disordered eating behaviours from adolescence to young adulthood :findings from a 10-year longitudinal study, Journal of American Dietetic Association, 111(7):1004–11.

Neumark-Sztainer, D., Story, M.,& Harris, T. (1999) Beliefs and attitudes about obesity among teachers and school health care providers working with adolescents, Journal of Nutrition and Education, 31, 3-9.

Nguyen, K.A., De Villiers, A., Fourie, J.M., Bourne,L.T., & Hendricks, M.K.(2013) The feasibility of implementing food-based dietary guidelines in the South African primary-school curriculum, Public Health Nutrition, 18(2):1-14.

Nguyen, K.A., De Villier, A., Forrie, J.M.,& Hendricks, M. (2017) Challenges to implementing the food based dietary guideline in the South African primary school curriculum; qualitative study exploring the perception of principals and curriculum advisors, South African Journal of Clinical Nutrition, 30(1):15-20.Available from: http://dx.doi.org/10.1080/160706582016.123097

Nuhlicel, P.A., Simpson, G.A., Lillich, T., & Borman, M.(2002) Status of nutrition education in Ohio elementary schools, Journal of Nutrition and Education, 29: 92-97.

Olenja, J.M.(2004) Malnutrition and infant mortality among the Samia of Busia District, Western Kenya: Methodological and conceptual issues, Paper presented at workshop on Research and Intervention Issues Concerning Infant and Child Mortality and Health, International Research Development Centre, Ottowa.

Oldewage-Theron, W.&Egal, A. (2012) Impact of nutrition education on nutrition knowledge of public school educators in South Africa, Health SA Gesondheid, 17(1). Available from :http://dx.doi.org/10.4102/hsag.v17i1.602.

Oldewage-Theron, W.H. &Napier, C.E. (2011) Nutrition education tools for primary school children in the Vaal region, Development of Southern Africa, 28(2):283-292.

Olivares, S.,Zacarias, I., Andrade, M.,Kain,J., Lera,L., Vio, F.,& Moron, C. (2005)Nutrition education in Chilean primary schools,Food and Nutrition Bulletin, 26(2):S179-184.

Olivares, S.,Zacarias, I., Kain,J., Lera,L., Pizarro, F., Vio, F.,& Moron, C. (2004)Nutrition status, food consumption and physical activity among Chilean schools children: a descriptive study, European Journal of Clinical Nutrition, 58:1278-1285.

Olivares, S., Snel, J., McGrann, M.,& Glasauer, P.(1998) Nutrition education in primary schools, Food Nutrition and Agriculture,22:57-62.

Oosthuizen, D., Oldewage-Theron, W.H.,& Napier, C.E. (2011) The impact of nutrition education programme on dietary intake patterns of primary school children, South African Journal of Clinical Nutrition, 24(920):75-81.

Osborne, C. & Forestell, C.(2012) Increasing children's consumption of fruit and vegetable. Does the type of exposure matter? Physiology and Behaviour, 106:362-368.

Onyango, A.W. (2003) Dietary Diversity, Child Nutrition and Health in Contemporary African Communities. Comparative Biochemistry and Physiology - A Molecular and Integrative Physiology,136(1):61-69.Available from: http://www.sciencedirect.com/science/article/pii/S1095643303000710.

Parker, S.M., Salisburg-Glennon, J.,& Struemler, B.(2013) School gardens: strategies among limited income older adults enrolled in community nutrition education programmes. Journal of Extension, 49(1). Available from:www.joe.org [Accessed 9th February].

Peralta, L., & Cotton, W.G. (2016) Teaching healthy eating to elementary school students: Scoping Review of Nutrition Education Resources, Journal of School Health,86(5):334-3345. Available from: doi:10.1111/josh.12352.

Peltzer, K. (2004) Nutrition knowledge among a sample of rural and white South Africans, South African Journal of Clinical Nutrition,17(1):24-31.

Perez-Escamilla, R., Haldeman, L., & Gray, S. (2002) Assessment of nutrition education needs in an urban school district in Connecticut: establishing priorities through research, Journal of the American Dietetic Association, 102: 559-562.

Pe´rez-Rodrigo, C., Luna, F., Tejedor F.,&Armentia, A. (2001b) Programa: Alimentacio´n, nutricio´n y dietaequilibrada. Comisio´nmixtasanidad-educacio´n. Gobierno Vasco.

Pe´rez-Rodrigo, C., Klepp, K.I, Yngve, A., Sjo¨strom, M., Stockley, L.,&Aranceta, J. (2001a) The school setting: an opportunity for the implementation of dietary guidelines, Public Health Nutrition, 4:717–724.

Perez-Rodrigo, C., & Aranceta, J. (2003) Nutrition education in schools: Experiences and challenges. European Journal of Clinical Nutrition, 57: S82-S62.Available from: dio:10.1038/sj.ejcn.1601824.

Perez-Rodrigo, C.,& Aranceta, J.(2001) 'School-based nutrition education: lessons learned and new perspectives', Public Health Nutrition,4(1A): 131–139.

Pollitt, E.(1995) Does breakfast make a difference in school? Journal of the American Dietetic Association, 95(10):1134-9.

Prelip, M., Slusser, W., Thai, C.L, Kinsler, J.,& Erausquin, J.T.(2011) Effect of school based-nutrition program diffused throughout a large urban community on attitude, beliefs and behaviours related to fruit and vegetables consumption, Journal of School Health,81(9):520-529.

Prelip, M., Kinsler, J., Chan, L.T.,Erausquin, J.T.,& Slusser, W. (2012) Evaluation of a school based-multicomponent nutrition program to improve young children's fruit and vegetables consumption, Journal of Nutrition Education and Behaviour,44(4):310-318.

Prelip, M., Erausquin, J.T., Slusser, W.,Vecchiarelli, S., Weightman, H., Lange, L.,& Neumann, C. (2006) The role of classroom teachers in nutrition and physical education, California Journal of Health Promotion,4(3):116-127. http://www.csuchico.edu/cjhp/4/3/116-127-prelip.pdf.

Preventative Institute (PI). (2012) Nutritional education in schools. Prevention Institute's nutrition policy profile series. Available from :http://www.preventioninstitute.org.

Public Service Commission (PSC). (2008) Report on the evaluation of national school nutrition programme (PSNP), Commission House. South Africa.

Rafiroiu, A.C. & Evans, A. (2005). Nutrition knowledge, attitude and practices among nutrition educators, South American Journal of Health Studies, 20:29-38.

Renaud, L., Chevalier, S., Dufour, R., O'Loughlin, J., Beaudet, N.,&Bourgeois, A. (1997) Evaluation of the implementation of an educational curriculum: optimal intervention for the

adoption of an educational program of health in elementary schools, Canadian Journal of Public Health, 88: 351-353.

Republic of Chile Ministeroi de Educacion. (2003) Santigo, Chile. Available from: http://www.mineduc.cl [Accessed 12th January 2004].

Ritchie, L., Raman, A., Sharman, S., Fitch, M., & Fleming, S. (2011) Dietary intakes of urban high body mass index, African American children, and family and child dietary attributes predict child intakes, Journal of Nutrition Education and Behaviour, 43:236-243.

Roberts, S.M., Pobocik, R.S., Deek, R., Besgrove, A., & Prostine, B. A. (2009)A qualitative study of junior high school principals and school food service directors experiences with the Texas school nutrition policy, Journal of Nutrition Education and Behaviour, 41(4):293-299.

Rosario, R., Araujo, A., Oliveria, R. Padrao, P., Lpoes, O., Teixeira, V., Moreira, A., Barros, R., Pereira, B.,& Moreira, P.(2012) The impact of an intervention taught by trained teachers on childhood fruit and vegetables intake ,Journal of Obesity, Article ID 342138. Available from: htt://dx.dio.org/10.1155/2012/342138 [Accessed 28th August 2013].

Rooth, E.(2005) An investigation of the status and practice of Life Orientation in South African schools in two provinces. PhD thesis. Cape Town: University of the Western Cape.

Rossiter, M., Glanulle,T., Taylor, T.,& Blum, I. (2007) School food practices of prospective teachers, Journal of School Health, 77:694-700.

Salkind, N.J. (2000) Exploring research. Upper Saddle River NJ. Prentice Hall.

Sallis, J.F., McKenzie, T.L., Conway, T.L., Elder, J.P., Prochaska, J.J., Brown, M., Zive, M.M, Marshall, S.J.,& Alcarez, J.E. (2003) Environmental interventions for eating and physical activity: a randomized controlled trial in middle schools, American Journal of Prevention and Medicine, 24:209–217.

Schneiderm, D. (2000) International trends in adolescent nutrition, Social Science & Medicine, 51(6): 955-967.

Senekal, M., Seme, Z., De Villers, A.,& Steyn, N.P. (2015) Health status of primary school educators in low socio-economic areas in South Africa, *BMC* Public Health, 15(1):1 Available from: http://doi.10.1186/s12889-015-1531-x.

Shalem, Y., & Hoadley, U.(2009) The dual economy of schooling and teachers morale, South Africa International Studies in Sociology of Education,19(2):115-130.

Sharma, M. (2006) School-based interventions for childhood and adolescent obesity, Obesity Review, 7:261-269.

Shariff, Z.M., Bukhari, S.S., Othman, N., Hashim. N., Ismail, M., & Jamil, Z.(2008) Nutrition Education Intervention Improves Nutrition Knowledge, Attitude and Practices of Primary School Children: A Pilot Study, International Electronic Journal of Health Education, 11:119-32.

Sharma, S., Dortch, K.S., Byrd-Williams., C Truxillio, J.B., Rahman, G.A., Bonsu, P., & Hoelscher, D, (2013) Nutrition related knowledge, attitude and dietary behaviours among head start teachers in Texas: cross sectional study, Journal of the American of Nutrition and Dietetic, 113(4):558-562

Sherman, J.& Muehlhoff, E. (2007) Developing a Nutrition and Health Education Program for Primary Schools in Zambia, Journal of Nutrition Education and Behaviour, 39:335-34.

Sherma, J. (2003) From nutrition needs to classroom lessons, Food, Nutrition and Agriculture, 33:1-11.

Shilts, M., Lamp, C.,& Horowitz, M. (2009) Pilot study: eat-fit impact sixth graders academic performance on achievement of mathematics and English education standards, Journal of Nutrition Education Behaviour, 41:127-31.

Shisana, O., Labadorias, D., Rehle, T., Simbayi, L., Zuma, K.,Dhansay, A., Reddy, P.,&Parker,W. (2013) South Africa National Health and Nutrition Examination Survey (SANHANES-1). HSRC Press, Cape Town.

Stang, J., Story, M., & Kalina, B. (1998) Nutrition education in Minnesota public schools: Perceptions and practices of teachers, Journal of Nutrition Education, 30: 396-404.

Steyn,N.P., Lambert, E.V., Parker, W., Mchiza, Z.,& De Villiers, A. (2009) A review of school nutrition interventions globally as an evidence base for the development of the HealthKick programme in the Western Cape, South Africa, South African Journal of Clinical Nutrition, 22(3):145-152.

Statistics South Africa. (2010). Millennium development goal 2-Achieve universal primary eduction .http://statssa.gov.za/MDG_GOAL_2(accessed September 7,2015).

Sindall, C. (1993) Food and Nutrition Program. In-house paper. Victorian Food and Nutrition Programs, Australia.

Slawta,J.N.,& DeNeui, D. (2010) Be a fit kid: nutrition and physical activity for the fourth Grade,Health Promotion, 11(4):522-529.

Smitasiri, S. (1994) Nutri-Action Analysis: Going beyond good people and adequate *resources*. Bangkok, Institute of Nutrition, Mahidol University.

Soliah, L.A., Newell, G.K., Vaden, A.G., & Dayton, A.D. (1983) Establishing the needs for nutrition education: II. Elementary teachers' nutrition knowledge, attitudes, and practices, Journal of the American Dietetic Association, 83(4):447-453.

St. Leger, L.(1998) Australian teachers' understanding of the Health Promoting School concept and the implications for the development of school health, Health Promotion International, 13(3):223-235.

Sturm, R.& Datar, A.(2005) Body mass index in elementary school children, metropolitan area food prices and food outlet density, Public Health, 119(12):1059-68. PMID: 16140349. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16140349.

Suzuki, Y.& Rowedder, M. (2002) Relationship between the curriculum system and understanding of nutritional terms in elementary schools children, International Journal of Consumer Studies,26:249-255.

Tachannen-Moran, M., Woolfolk-Hoy, A.E., &Hoy, W.K. (1998) Teachers' efficacy: its meaning and measure, Review of Educational Research, 68: 202-248.

Terre Blanche, M., Durrheim, K.,& Painter, D.(2010)Research in practice applied method for social sciences 2nd ed. 131-345.

Traahms, C.M., & Pipes, P. (2000) Nutrition in childhood. In: Worthington-Roberts, B.S., Williams, S.R., eds. Nutrition throughout the Life Cycle. 4th ed. Boston, Mass: McGraw Hill. 26-40: 226-261.

Troccoli, K.B. (1993) Eat to learn, learn to eat: the link between nutrition and learning in children. Washington, DC: National Health/Education Consortium. (National Health/Education Consortium occasional paper no. 7).

Uganda Education Act: pre-primary, primary and post primary education-Act.2008 (act 13 supplement).Kampala: UPPC. Available from: http://www.education.go.ug/EducationAct.pdf [Accessed October 2011].

Uganda Demographic Health Survey (UDHS). (2006) Uganda Bureau of Statistics Kampala, Uganda, Calverton, MD; Macro International Uganda National Exam.

Uko-Aviomah, E.E. (2005) Evolving and dynamic curriculum for Home Economics in Nigerian schools In: SO Oraifo, GcEdozie DN Ezeh (Eds) Curriculum Issues in Contemporary Education, Book in Honour of Professor Ebele Maduewesi. Benin-City: DaSylva influence.

UNICEF. (2008) Evaluation of the school nutrition programme: national report, Department of Education, South Africa.

UNICEF. (2012) The state of the world's children: Children in urban world. Available from: http://unicef.org/SOWC/files/SOWC/2012-MainReport_EN 21dEC2011pdf [Accessed 5th January 2015].

United Nation. (2015) World economic situation and prospects. New York: United Nation. Available from: http://www.org/esa/policy/wess/wesp/html [Accessed 28th May 2014].

United Nations Standing Committee on Nutrition. (2009)Why nutrition is important. Available from: http://www.unscn.org/en/home/why-nutrition-isimportant.php.

United States Department of Agriculture. (2005) My Pyramid. Available from: http://www.mypyramid.gov [Accessed 5th April 2007].

UNESCO. (2007) International Bureau of Education, Finnish National Board of Education, Preschool Basic Education Development Planning.

Van Cauwenberghe, E.M., Maes, L., Spittaels, H., Van Lenthe, F.J., Oppert, J.,& De Bourdeaudhuij, I. (2013) Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents, British Journal of Nutrition,103(6):781-797.

Van Deventer, K. (2009) Perspective of educators on the implementation of the Life Orientation in Grade R-11 from selected Western Cape schools, South African Journal of Education, 29:127-145.

Vander Schee, C.,& Gard, M.(2014)Healthy, happy and ready to teach, or why kids can't learn from fat teachers: the discursive politics of school reform and teacher health, Critical Public Health, 24(2):210-225. Available from: doi: 10.1080/09581596.2013.828152.

Van Zyl, L.E. (2014) Research methodology for the economic and management science. Based on Salkind 8th ed.

Vermeerch, C.,& Kremer, M. (2004) School meals, educational achievement, and school competition: evidence from a randomized evaluation. World Bank Policy Research working papers no 3523. Washington, DC: World Bank.

Vorster, H.H., Love, P., & Browne, C.(2001) Development of food-based dietary guidelines for South Africa-the process, South African Journal of Clinical Nutrition, 14(3):S1-S80.

World Health Organization (WHO). (2008)School Policy Framework: Implementation of the WHO Global Strategy on Diet, Physical Activity and Health. Geneva: WHO Press.

WHO (1999) Healthy nutrition: an essential element of a health promoting school. Geneva. Document 4. Geneva. Available from: http://www.who.int/hpr.

World Food Programme. (2010) Impact Evaluation of WFP School Feeding Programmes in Kenya (1999-2008): A Mixed-Methods Approach 1. Full Evaluation Report. Available from: http://www.wfp.org.

WHO. (1998) Healthy nutrition as essential element of a health promoting school. WHO information series on School health, Geneva: WHO.

Worsly, A. (2002) Nutrition knowledge and food consumption nutrition knowledge change food behaviour?, Asia Pacific Journal of Clinical Nutrition, 11:S519-S585.

Yong, B.M.(1985)Factors influencing nutrition knowledge of teachers, Journal of the Royal Society of the Promotion of Health, 105(6):204-205. Available from: http://rsh.sagepub.com/content/105/6/204.abstactdoi:10.1177/146642408510500606

Zarnowiecki, D., Sinn, N., Petkov, J.,& Dollman, J. (2011) Parental nutrition knowledge and attitudes as predictors of 5-6-year-old children's healthy food knowledge, Public Health Nutrition, 15(7), 1284-1290.Available from: http://www.education.go.ug/EducationAct.pdf.

APPENDIX A

ASSESSMENT OF NUTRITION KNOWLEDGE OF EDUCATORS IN PRIMARY SCHOOLS IN MAKHUDUTHAMAGA MUNICIPALITY, LIMPOPO PROVINCE

NAME OF RESEARCHER: MATLOU MAGOAI
NAME OF SUPERVISOR: MABAPA NS
NAME OF INSTITUTION: UNIVERSITY OF VENDA

QUESTIONNIARE FOR EDUCATORS
SECTION A:

Socio-Demographic data

Code: _____

1. Date of Interview

2. Age_____years

3. Level which you teach?

Primary	1
Secondary	2

4. How many years are you in the field?

5. How many children do you have in the household?

6. How many are you in the household?

7. Who is the head of the household?

8. Marital Status

Single	1
Married	2
Divorced	3
Widowed	4
Living together	5

9. Gender

Male	1
Female	2

10. What is your tertiary education level?

Diploma	1
Degree	2
Honors	3
Masters	4
Others (specify)	5

11. Where were you trained as an educator?

College	1
University	2

12. What is your source of nutrition information (tick all apply)

Television	1
Radio	2
TV and Radio	3
News paper	4
Magazines	5
Health workers	6
Other; specify	7

FACTORS AFFECTING NUTRITION KNOWLEDGE

EDUCATION

13. Was nutrition education included in the curriculum at university/college when you were trained?

Yes	1
No	2

14. In your opinion do you think nutrition should form part of the curriculum?

Primary	1
Secondary	2
Tertiary	3

15. Did your train affect the level of nutrition knowledge you have?

Yes	1
No	2

16. Does your level of education affect your knowledge of nutrition?

Yes	1
No	2

17. Do you read food labels before buying food?

Yes	1
No	2

18. If yes do the labels affect your ultimate choice of food product?

Yes	1
No	2

19. Does nutrition knowledge you have affect food choice?

Yes	1
No	2

20. If no what affect your choice of buying food?

Price	1
Taste	2
Brand	3
How healthy it is	4
Advertisement	5
How much fat it is	6
How much sugar it is	7
What you want	8
How long it will last or stay fresh	9
What your family will eat	10

21. If you are supposed to teach nutrition knowledge what topic will you teach?

_____

_____

_____

SOCIAL

22. How often do you and your colleagues talk about nutrition?

Daily	1
Weekly	2
Monthly	3

23. In your opinion do you think your gender affect nutrition knowledge?

Yes	1
No	2

24. Does your gender affect choice of food?

Yes	1
No	2

25. How often must people discuss nutrition related issues?

Daily	1
Weekly	2
Monthly	3

26. Does your gender limit you to improve nutrition knowledge?

Yes	1
No	2

27. How often do you talk about nutrition with your family?

Daily	1
Weekly	2
Monthly	3

28. Do you think nutrition/food issues are issues that only women must concern with?

Yes	1
No	2

29. Do you have vegetable garden at school?

Yes	1
No	2

30. Which vegetables do you plough?

Spinach	1
Cabbage	2
Onion	3
Tomatoes	4

Carrot	5
Beetroot	6
Others(specify)	7

SECTION B

Nutrition Knowledge Test

31. How many meals should a ten year old have per day?

One	1
Two	2
Three	3
Four-Six	4

32. Which meals are important for children?

Breakfast	1
Lunch	2
Super	3
Snacks	4
All of the above	5

33. Why shouldn't children skip meals?

_____

_____

_____

_____

34. Which one is the importance of carbohydrates?

Body building	1
Provide energy	2
Provide vitamins and minerals	3
Aids in the regulation of normal temperature	4
Hold moistures in stools, soften them	5

Don't know	6

35. Which one is the importance of Protein?

Body building	1
Provide energy	2
Provide vitamins and minerals	3
Aids in the regulation of normal temperature	4
Hold moisture in stools, soften them	5
Don't know	6

36. Which one is the importance of Fat?

Body building	1
Provide energy	2
Provide vitamins and minerals	3
Aids in the regulation of normal temperature	4
Hold moisture in stools, soften them	5
Don't know	6

37. Which one is the importance of Vegetables?

Body building	1
Provide energy	2
Provide vitamins and minerals	3
Aids in the regulation of normal temperature	4
Holding moisture in stools, soften them	5
Don't know	6

38. Which one is the importance of Fruits?

Body building	1
Provide energy	2
Provide vitamins and minerals	3
Aids in the regulation of normal temperature	4
Holding moisture in stools, soften them	5
Don't know	6

39. Which one is the importance of Water?

Body building	1
Provide energy	2
Provide vitamins and minerals	3
Aids in the regulation of normal temperature	4

Holding moisture in stools, soften them	5
Don't know	6

40. Which one is the importance of dried beans?

Body building	1
Provide energy	2
Provide vitamins and minerals	3
Aids in the regulation of normal temperature	4
Holding moisture in stools, soften them	5
Don't know	6

41. Which foods/nutrients form part of balanced diet? (Tick all apply)

Food/nutrients	1
Carbohydrates	2
Protein	3
Fats	4
Vegetables	5
Fruit	6
Water	7
Dried beans	8
Alcohol	9
Achar	10

42. What is the importance of involving children in physical activity?

_____

_____

_____

_____

43. Which one of the vegetables is rich in vitamin A? (tick one)

Cabbage	1
Carrot	2
Tomatoes	3
Don't know	4

44. Lack of vitamin A affect which part of the body? (Tick one)

Heart	1
Eyes	2

Brain	3
Skin	4
Don't know	5

45. Which one of the vegetables is rich in vitamin C? (Tick one)

Cabbage	1
Carrot	2
Tomatoes	3
Don't know	4

46. Lack of vitamin C affect which part of the body? (Tick one)

Hart	1
Eyes	2
Brain	3
Skin	4
Don't know	5

47. Which food are rich source of iodine?

Seeds	1
Seafood	2
Liver	3
Don't know	4

48. Which food are rich sources of iron?

Seeds	1
Seafood	2
Liver	3
Don't know	4

49. Which foods are high in fiber? (Tick one)

Fruits and vegetable	1
Meat and water	2
Sweet and cool drink	4
Don't know	5

APPENDIX B

RESEARCH AND INNOVATION

OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:

M.M. MAGOAI

PROJECT TITLE: *"The Assessment of Nutrition Knowledge of Educators in Primary Schools of Makhuduthamaga Municipality, Limpopo Province, South Africa ."*

PROJECT NO : SHS/08/NUT/002

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Ms. M.M. Magoai	University of Venda, Department Nutrition	Principal Investigator

ISSUED BY:

UNIVERSITY OF VENDA, HEALTH, SAFETY AND RESEARCH ETHICS COMMITTEE

Date Considered: 27 August 2009

Decision by Ethical Clearance Committee Granted

Signature of Chairperson of the Committee : .....

Name of the Chairperson of the Committee : Prof. P.E. Lukhele-Olorunju

UNIVERSITY OF VENDA
PRIVATE BAG X5050, THOHOYANDOU, 0950 . LIMPOPO PROVINCE. SOUTH AFRICA
TELEPHONE 015 962 8504 / 8313 / 8484 . FAX 015 962 8439 / 4749

APPENDIX C

University of Venda
Creating Future Leaders

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

Enquiries: Dr. Makola MC, Tel No: 015 290 9448. E-mail: MakolaMC@edu.limpopo.gov.za.

UNIVERSITY OF VENDA

DEPARTMENT OF NUTRITION

PRIVATE BAG X5050

THOHOYANDOU

0950

MS. Magoai

LIMPOPO PROVINCE
DEPARTMENT OF EDUCATION
2013 -05- 15
H.O.D'S OFFICE
PRIVATE BAG X9489 POLOKWANE 0700

RE: Request for permission to Conduct Research

1. The above bears reference.
2. The Department wishes to inform you that your request to conduct a research has been approved- **TITLE: ASSEMENT OF NUTRITION KNOWLEDGE OF PRIMARY SCHOOL EDUCATORS IN MAKHUDU THAMAGA MUNICIPALITY OF LIMPOPO PROVINCE.**
3. The following conditions should be considered

   3.1 The research should not have any financial implications for Limpopo Department of Education.

   3.2 Arrangements should be made with both the Circuit Offices and the schools concerned.

   3.3 The conduct of research should not anyhow disrupt the academic programs at the schools.

   3.4 The research should not be conducted during the time of Examinations especially the forth term.

   3.5 During the study, the research ethics should be practiced, in particular the principle of voluntary participation (the people involved should be respected).

Cnr. 113 Biccard & 24 Excelsior Street, POLOKWANE, 0700, Private Bag X9489, POLOKWANE, 0700
Tel: 015 290 7600, Fax: 015 297 6920/4220/4494

3.6 Upon completion of research study, the researcher shall share the final product of the research with the Department.

4. Furthermore, you are expected to produce this letter at Schools/ Offices where you intend conducting your research as an evidence that you are permitted to conduct the research.
5. The department appreciates the contribution that you wish to make and wishes you success in your investigation.

Best wishes.

Thamaga MJ

15/05/2013

Date

Head of Department

APPENDIX D

PARTICIPANT INFORMATION AND CONSENT FORM

Researcher Project: Development of a questionnaire to assess nutrition knowledge of educators in municipality in Makhuduthamaga

Researchers
Ms Magoai Matlou masters student at the University of Venda
Ms Mabapa Solomon PhD student Division of Human Nutrition , Faculty of Health Sciences, University of Cape Town

Dear Sir/Madam

We would like to invite you to take part in a study. With this study we aim to assess nutrition knowledge of educators in primary schools.

If you are interested to take part in the study, one of our fieldworkers will make appointment to visit your school.

What do you need to do if you take part in the study?

- You must be teaching grade 5-7.
- We will give you a questionnaire to fill it and you are not allowed to discuss the questionnaire with other educators.
- The questionnaire should be filled immediately and given back to the fieldworker before she leave.
- You will not benefit directly, but the information we get from you will help us to improve the nutrition education in schools.

If you are interested in taking part, the fieldworker will be visiting the primary school and, please fill the questionnaire.

There are a few other important things that we would like you to know

- This study was approved by the ethics committee of the University of Venda. This committee makes sure that it is safe for you to take part in the study.
- We give each educator who took part in the study a code number so that nobody knows the answers you provide
- You are free to withdraw from the study at any time, it does not matter what the reason is. This will not count against you.
- If you have any questions about the study you can phone Ms Magoai Matlou on 015 287 5705. You may also phone the chairperson of the Univen ethics committee Prof

GE Ekosse on 015 406 6338 if you are uncomfortable the way the study conducted or the way you are treated

If you agree that you will take part in the study, please fill the following

I---------- The information in this document has been explained to me and I understand it. I agree to participate in the study. This decision was made of my own free will; nobody forced me to take this decision.

.....	.....	.....
Signature	Date	Place

I declare that I did not force the subject to participate in the study. I have fully informed the above person of the aim, procedures of the study.

.....	.....
Signature of Researcher	Date
Place	