South African Journal of Childhood Education
ISSN: (Online) 2223-7682, (Print) 2223-7674

Nutrition knowledge competencies of intermediate and senior phase educators in Limpopo Province

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Dates:
Received: 21 Sept. 2021
Accepted: 13 Apr. 2022
Published: 25 Oct. 2022

How to cite this article:
Mbhenyane, X.G., Magoai, M.M., Mabapa, N.S. & Tambe, A.B., 2022, 'Nutrition knowledge competencies of intermediate and senior phase educators in Limpopo Province', *South African Journal of Childhood Education* 12(1), a1114. https://doi.org/10.4102/sajce.v12i1.1114

Background: Children's food preferences and willingness to try new foods are influenced by the people around them, including families and teachers. The eating behaviours children practise early in life may continue to shape their food attitudes and eating patterns through adulthood.

Aim: The purpose of this study was to explore the nutrition knowledge competencies of educators in primary schools.

Setting: This study was conducted in Makhuduthamaga local municipality, Limpopo Province, South Africa.

Methods: This study adopted a quantitative, descriptive and exploratory research design. A simple random sampling technique was used to select 30 primary schools and purposively select 200 educators responsible for Grades 5–7. The data were analysed using the Statistical Package for Social Science (SPSS), version 21.

Results: Of the 200 educators, 66.5% were women and 34% were trained at a college and had teaching experience of between 21 and 30 years. Most of the educators knew the importance of carbohydrates, fat, vegetables and fruits. Only a quarter (26%) of educators knew the importance of protein, although 75.5% knew that protein forms part of a balanced diet. The overall knowledge score revealed that 92% of the educators had a poor knowledge score. There was no significant difference among selected socio-demographic characteristics, such as level of education ($p = 0.129$), training institution ($p = 0.534$) and nutrition knowledge ($p > 0.05$).

Conclusion: The overall nutrition knowledge of educators was poor, with about half of the educators reporting that their training was the main determinant of their nutrition knowledge. Therefore, there is a need for the incorporation of nutrition content into the training curriculum of educators.

Keywords: Nutrition knowledge competencies; educators; primary schools; South Africa, primary school children, child growth and development; nutrition education, learner dietary behaviours; food choices, nutrient content.

Introduction

Nutrition knowledge refers to the knowledge of concepts and processes related to nutrition and health, including knowledge of diet and health, diet and disease, foods representing major sources of nutrients, and dietary guidelines and recommendations (Axelson & Brinberg 1992; McKinnon, Giskes & Turrell 2014). 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 (Contento 2011).

Nutrition education aims to impart knowledge about 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 thus needs to be addressed (Briggs, Fleischhacker & Mueller 2010). Furthermore, McNulty (2013) adds that nutrition education is effective in addressing malnutrition of varying degrees in children. Some of the factors that have been observed to influence nutritional status are the lack of education and nutrition knowledge of carers, inappropriate nutrition education, misconceptions, and passing harmful dietary traditions and poor nutritional practices from parents to children (Shisana et al. 2013).

In South Africa, few studies on nutrition have looked into targeting an intervention at teachers 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. 2010).

Impressing upon children the importance of nutrition in their early years is paramount because they are still determining lifelong food preferences and eating habits (Zarnowiecki et al. 2012). If children can learn what kind of diet they should eat, they have a higher likelihood of making healthier decisions by eating more fruits, vegetables, dairy and bread, and less fat (Başkale & Bahar 2011).

Besides the school food environment, classroom teachers perceive a disconnect between what is taught in nutrition and the home food environment according to a study in the United States of America (Howie et al. 2016). According to Lytle (1995), family involvement is important for enforcing learning outcomes in classroom nutrition education. In addition, in a similar study conducted by Hammerschmidt et al. (2011) at a low-income Michigan school, teachers emphasised nutrition messages in the classroom 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. Parents may, however, feel resentment towards teachers who try to influence what they eat (Downs et al. 2012).

Nutrition education should include a variety of changes targeting a modification in the knowledge, attitude and behaviour of individuals or populations aimed 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 (Kupolati, Gericke & MacIntyre 2015). This situation led to learners from such homes refusing to eat certain vegetables when they were 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, Jacob & Garrard-Foster 2012).

The influence of teachers on the 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 foods that are healthy choices in front of learners or avoiding unhealthy classroom food practices (Rossiter et al. 2007). Evidence from previous studies has confirmed an improvement in the dietary behaviour of learners when classroom teachers implemented nutrition education intervention to learners (Rossiter et al. 2007; Steyn et al. 2009).

Nutrition education is an important element of the Primary School Nutrition Programme (PSNP) in South Africa. However, only the feeding scheme division has been successfully implemented in most primary schools, albeit with logistical problems. The nutrition education section is supposed to be done by teachers with the children. 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 aims to provide baseline data on nutrition knowledge of teachers and to identify the content taught during formal training.

The need for nutrition training of teachers was confirmed in a South African study where teachers admitted to have limited knowledge about nutrition and healthy habits (Nguyen et al. 2017). 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, attitude and practices assessments as they may transmit unhealthy nutrition behaviours to learners (Dalais et al. 2014; Senekal et al. 2015).

Food and nutrition are taught as an integral part of life skill, natural science and technology subjects in South African primary schools. According to Oldewage-Theron and Napier (2011), no nutrition education resources or tools were available for primary school children in the Vaal region, and most teachers recommended an appropriate educational tool for primary school children in all grades where English is the medium of instruction.

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

Nutrition content has not been incorporated into the teaching programme as a subject in primary schools. Topics on food are taught in other subjects (Department of Basic Education 2011) which may be inadequate to impart nutrition education (Nguyen et al. 2017). Lack of nutrition education materials for teachers and learners has been reported by Oldewage-Theron and Napier (2011). The aim of this study was to assess the nutrition knowledge competencies of educators in primary schools in the Makhuduthamaga local municipality.

Methods

Study design

The study design was quantitative, descriptive and exploratory. An exploratory study is the extension of descriptive research that focuses more directly on the discovery of relationships, while the exploratory researcher focuses on a phenomenon of interest (Terre Blanche, Durrheim & Painter 2010). The researchers attempted to understand the entirety of a phenomenon, in this case, nutritional knowledge competencies.

Study area and population

This study was conducted in Sekhukhune District in a deep rural area of the Limpopo Province, in which 95% is rural and 5% is urban. The population is 1 076 840, and the district is divided into four local municipalities. This study was conducted in one of the local 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 24.7350° S, 29.8352° E – 189 km from Polokwane city. About 38.1% of its population are children aged 0–14 years and there are 151 primary schools. *Sepedi* is the dominant language (Statistics South Africa 2011).

The target population comprised primary school educators teaching Grades 5–7 learners in public schools in Makhuduthamaga local municipality.

Sampling procedure and size

Of the 151 schools in the municipality, 20% (30 schools) were selected for the study using a simple random sampling method. Thus, all educators of the population of Makhuduthamaga local municipality had an equal chance of being selected (De Vos et al. 2012). From the 30 schools used as a sampling frame, purposive sampling was used to select the educators with an estimated 1132 teacher population in the local municipality. All educators from the 30 schools teaching Grades 5–7 were requested to participate in the study, of which 200 educators agreed to participate.

Measurement of the variables

A researcher-administered questionnaire consisted of three main sections, namely (1) socio-demographic information, (2) determinants or factors influencing nutrition knowledge and (3) nutrition knowledge. Socio-demographic information was measured to understand the characteristics of participants; knowledge regarding nutrition was measured to determine the level of knowledge of educators. The questionnaire was developed based on the objectives and reviewed literature related to the study. The questionnaire was developed and implemented in English. Reliability was tested by using a pre-validated questionnaire which was adapted to suit the study and modified based on the comments from the pilot study. The questionnaire was refined for content validity by the inputs from other authors who are experts in nutrition.

The validity of the questionnaire was further verified by conducting a pilot study among 20 educators from three schools in the Makhuduthamaga local municipality. This exercise enabled us to establish validity and to revise the questionnaire. Questions that were confusing were modified. Educators who participated in the pilot study did not form part of the final sample.

Data collection procedure

The researcher visited each school twice. The first visit was to engage with the school circuit authorities, to introduce the study and ask for permission to conduct the research. During the second visit, the researcher held a meeting with educators to explain the aim, objective and significance of the study, and recruit participants and obtain their consent. The questionnaire was administered to the educators either during the lunch break or after school hours to avoid interruption of lessons. An appropriate time was agreed upon between the researcher and the participants in advance.

Data analysis

The data were captured on a Microsoft Excel spreadsheet by the researcher and exported to the SPSS version 21 for analysis. Descriptive statistics was used to interpret the data according to variables, such as age, marital status, gender, educational level and experience. The presentation of results was in the form of percentages, counts or frequencies, and visually in the form of graphs, tables and charts.

The overall educators' knowledge of nutrition was classified as poor (0% – 39%), adequate (40% – 59%), more than adequate (60% – 79%) and excellent (80% – 100%). A linear regression analysis was used to determine if there were relationships between independent variables (age, gender, marital status, educational level qualifications). A p-value less than 0.05 was considered significant.

Results

Demographic characteristics

The study comprised 200 educators from 30 schools in the Makhuduthamaga local municipality. Most of the educators were women (66.5%), in the age group of 40–59 years (81.5%) and married (70%). Regarding educational level, 60.5% of the educators had a diploma, while just 0.5% had a master's degree. Less than half (42%) of the educators had teaching experience of between 21 and 30 years, while 10.5% of the educators had teaching experience of between 31 and 40 years (Table 1).

The majority of the educators (82.5%) had up to five children in their household, while 15.5% had between 6 and 11 children. About half (49.0%) of the educators reported that they had a household family size of 6–10 persons, while 43.0% stated that there were 1–5 persons in their households. Most of the educators (74.0%) stated that a man was the head of their family as compared to 24.5%

who stated that a woman was the head of their family. In addition, all the educators revealed that they had a vegetable garden and that they grew the following vegetables: spinach (74.0%), beetroot (71.5%), carrots (69.5%), tomatoes (69.5%), cabbage (69.0%) and onions (66.0%) (Table 2).

Nutrition knowledge of educators

Sources of nutrition knowledge of educators

Regarding the source of information, 84.5% of the educators reported that they obtain their nutrition information through the health workers. Moreover, 75% and 73% of educators stated that they read magazines and newspapers, respectively. In addition, 70% got their nutrition information from both the television and radio, 59% got their information from the television, 52% got their information from radio and 27% got their information from other information sources such as social media (Figure 1).

Food choices

The majority (78.5%) of the educators indicated that they do read food labels before buying food items, while 21.0% stated that they did not read food labels. Furthermore, 72.5% of the educators agreed that the food labels affected their choice of food products, while 24.5% said that it did not affect their choice of food products. Additionally, 63.5% of the educators agreed that their nutrition knowledge affected their choice of food, while 32.5% reported that it did not affect their food choice (Figure 2).

The factors that influenced food choices of the educators when buying included the following: food prices (52.0%), what their families' preference is (39.0%), 'what they want' (36.0%) and taste (35%). The educators also reported that the brand (32%), the healthy nature of the food (19.0%), advertisement (13.0%), fat content (12%) and shelf life or sell by the date affected their food choices (Figure 3).

The effect of gender on the choice of food was also evaluated and 51.5% of the educators agreed that gender affected the nutrition choice. Forty-six per cent of the educators disagreed that gender affects their choice of food. In addition, 65% of educators disagreed that gender limited them to improve their nutrition knowledge and 66% of the educators disagreed that women were the only ones concerned about nutrition.

Food and nutrient knowledge

Nutrition knowledge was further assessed by asking about basic foods and nutrition expected to be known by educators. About three quarters (75%) of the educators responded correctly that the importance of carbohydrates was to provide energy, 67.0% reported that fat was used to provide energy and 26.0% mentioned that the importance of protein was to build the body. More than half (56.0%) of the educators knew that vegetables and fruits were used to provide the body with vitamins and minerals. Only 5.5% of the educators knew the importance of water, and very few of them (3.0%) knew the importance of dried beans (Figure 4).

The educators' knowledge of 'balanced diet' was also assessed. Most (79.5%) of the educators stated that carbohydrates formed part of a balanced diet, followed by 75.5% who said protein, and 73.0% stated vegetables as

TABLE 1: The socio-demographic characteristics of the educators.

Variable	Number (*n*)	%
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
No response	2	1.0
Teaching experience (years)		
0.5–10	24	12.0
11–20	69	34.5
21–30	84	42.0
31–40	21	10.5
No response	2	1.0
Qualifications		
Diploma	121	60.5
Degree	35	17.5
Honours	40	20.0
Master's degree	1	0.5
Others	3	1.5
Training institution		
College	188	94.0
University	12	6.0

TABLE 2: Educators' household characteristics (*n* = 200).

Variable	Number (*n*)	%
Number of children in household		
0–5	165	82.5
6–11	31	15.5
No response	4	2.0
Number of persons in household or household size		
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
Vegetable cultivated in the gardens		
Spinach	148	74.0
Cabbage	138	69.0
Onions	132	66.0
Tomatoes	139	69.5
Carrots	139	69.5
Beetroot	143	71.5
Others (specify)	20	10.0

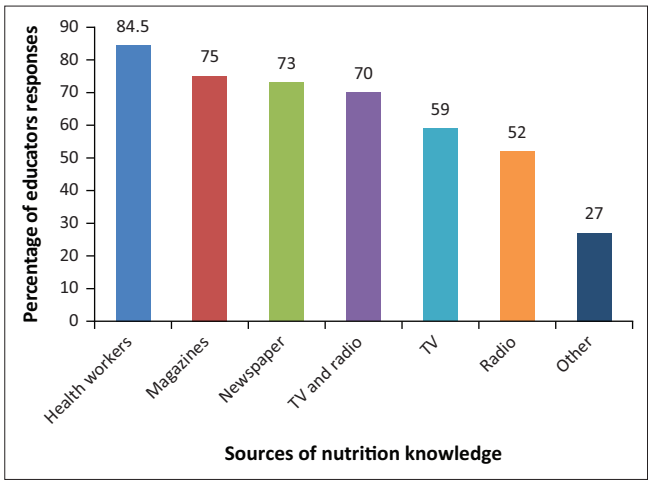

FIGURE 1: Sources of nutrition information.

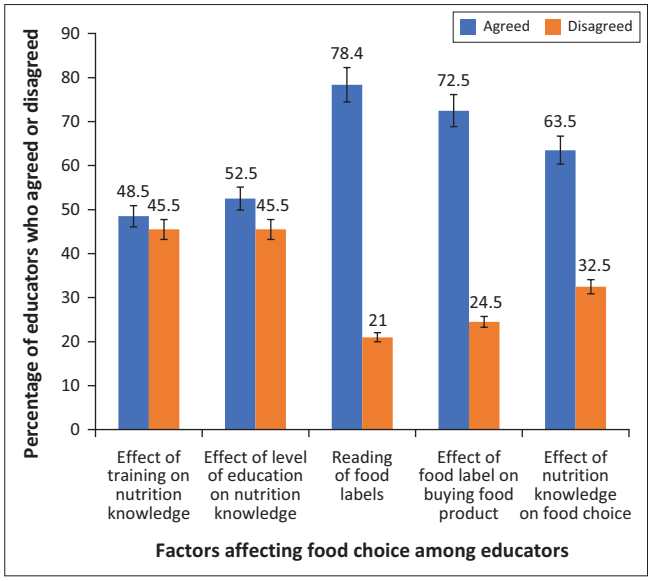

FIGURE 2: Factors affecting food choice among educators (n = 200).

part of the balanced diet. In addition, few of the educators (7.0%) knew that water formed part of a balanced diet, while 4.5% said that alcohol forms part of a balanced diet.

The majority (84.0%) of the educators knew the importance of fibre, 52.0% correctly stated the importance of vitamin A, while 37.0% knew 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.

Detailed findings revealed that about half (52.5%) of the educators knew the correct source of vitamin A is carrot, and 37% of educators identified tomatoes as a rich source of vitamin C. Furthermore, 46% of the educators knew the food sources rich in iron, 22% of educators knew liver was a rich source of iron, while only 26.5% of educators recognised that seafood was a rich source of iodine.

Almost 84% of the educators understood that fruits and vegetables are high in fibre. The results also revealed the

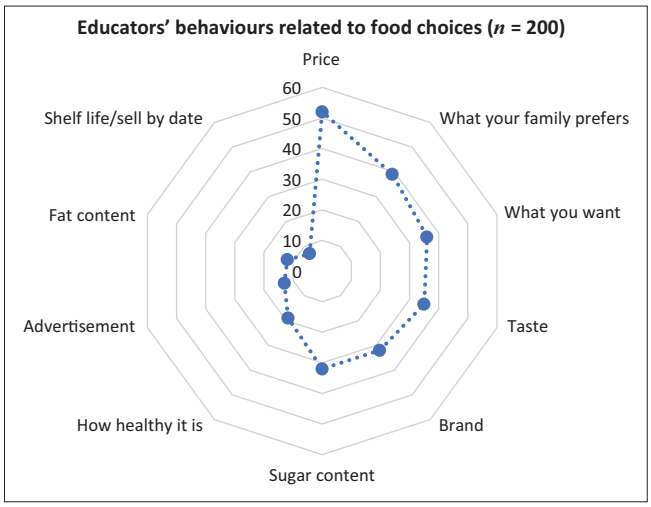

FIGURE 3: A radar chart showing the percentage of educators' behaviours related to food choices.

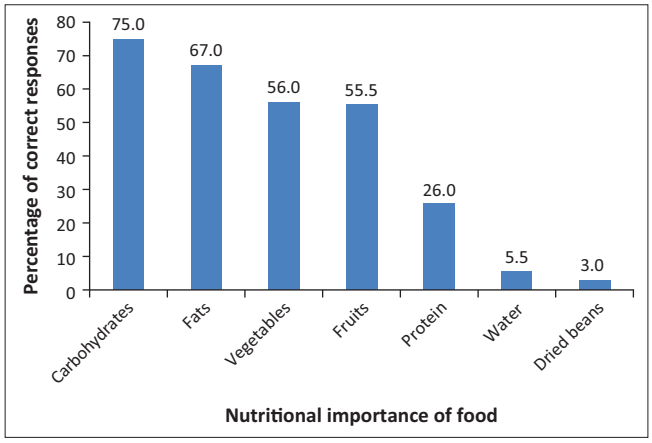

FIGURE 4: Percentage of correct responses on importance of food.

educators' knowledge of vitamins A and C deficiency in 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 is affected by a vitamin C deficiency (Figure 5).

Children's dietary needs

Findings regarding educators' knowledge of the number of meals a 10-year-old child should eat showed that 72.5% of the educators reported that a 10-year-old child should eat three meals per day, 15.5% stated that they should have four to six meals per day, 8% reported two meals per day, and 4% reported one meal per day. Furthermore, 32.0% of educators reported that breakfast, lunch and supper were the most important meals for the child, 26.5% responded that breakfast was an important meal and 22.5% reported that all meals (breakfast, lunch, supper and snacks) were important.

Thirty-three per cent of educators reported that children should not skip meals because they would not grow healthy, while a few (15.5%) responded that children would feel hungry. Also, 5.5% of the educators identified malnutrition or lack of nutrients because of children skipping meals.

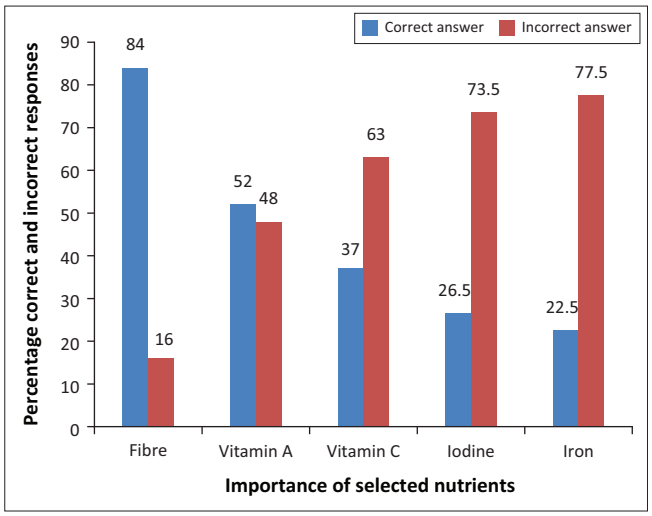

FIGURE 5: Importance of selected nutrients.

Educators were asked to comment on the importance of physical activity in children. About one-third of the educators (34.5%) mentioned that children needed to be physically active in order to concentrate in the class, and 40% stated that children would grow well and be healthy if they were physically active. Approximately 9% of educators responded that physical activity would prevent diseases.

Nutrition content in the curriculum

With respect to the nutrition topics the educators were competent to teach, 58.5% of the educators revealed topics they could teach, whereas 41.5% of the educators did not identify any nutrition topic they could teach. The five most cited topics by the educators were as follows: healthy food and lifestyle (32.0%), balanced diet (7.0%), food group or pyramid (4.5%), good nutrition (4.5%), food additives (1.5%) and importance of fruit (1.5%). The other nutrition topics educators identified that they were competent to teach included body building foods (0.5%), importance of food in the body (0.5%), how to feed learners (0.5%) and protecting the quality of food (0.5%). The least cited topics were how to arrange a menu (0.5%), poverty alleviation (0.5%), food diet (0.5%), taking care of my health (0.5%) and protein, fat and vitamins (0.5%) (Figure 6). The topics are based on the content of the life skills curriculum.

More than half of the educators (56.0%) preferred to talk about issues related to nutrition daily with their families or with anyone, 32.5% preferred weekly discussions, 9.0% talked monthly and 2.5% did not discuss nutrition with anyone.

Factors affecting nutrition knowledge competencies of educators

Factors affecting nutrition knowledge were investigated. More than half (54.0%) of the educators stated that nutrition was not part of the curriculum at their training institutions, while 46.0% reported that nutrition was part of their curriculum at their training institution. Furthermore, 48.5% of the educators stated that their training affected their

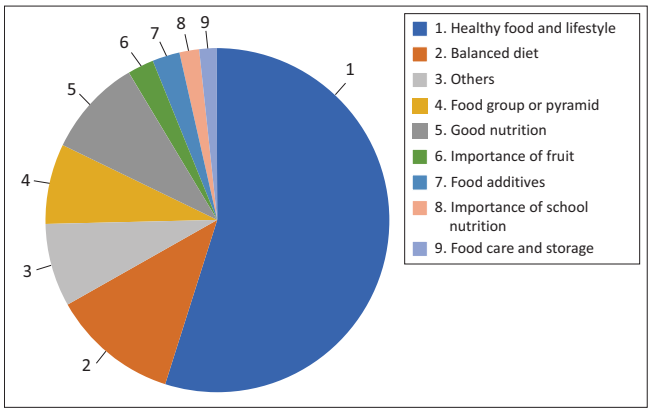

FIGURE 6: Nutrition topics that the educators felt comfortable in teaching the learners.

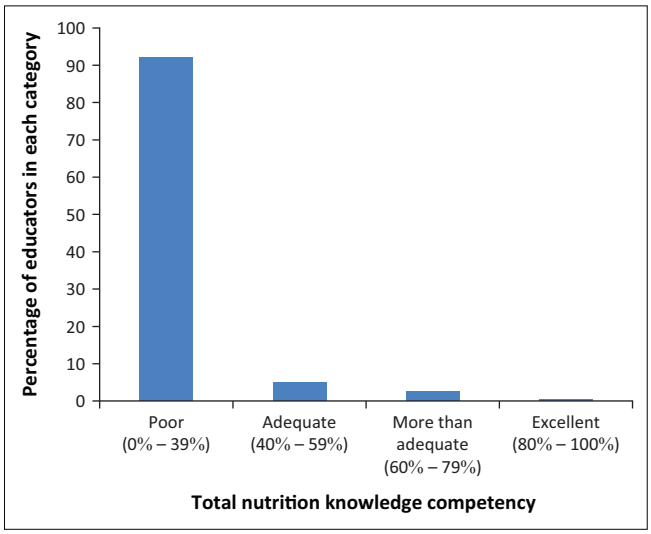

FIGURE 7: Total nutrition knowledge competency scores.

nutrition knowledge, while 45.5% said that training did not affect their nutrition knowledge. Six per cent were neutral. Also, about half of the educators (52.5%) agreed that their level of education affected their nutrition knowledge, while 45.5% reported that their level of education did not affect their nutrition knowledge. In addition, 58.5% of the surveyed educators proposed that nutrition should form part of the curriculum at the primary level, 16.0% of educators mentioned that nutrition should form part of the curriculum at secondary level and 13.0% stated that nutrition should be part of the curriculum at all levels. Few educators (12.5%) did not know whether nutrition should form part of the primary or secondary level curriculum (Figure 7).

Overall ranking of educators' knowledge of selected nutrition aspects

A total knowledge score was computed based on the correct answers for the knowledge question. Scores ranging between 0% and 39% were ranked as poor nutrition knowledge, 40% – 59% as adequate, 60% – 79% as fair and 80% – 100% as excellent. The majority (92.0%) of the educators had a poor knowledge score, 5% had an adequate knowledge

score, 2.5% had more than adequate knowledge score and 0.5% had an excellent knowledge score.

The knowledge score was compared with selected variables, namely, age, gender, education level and institution of training, and it was found that none of the variables influenced the knowledge score. There was no significant correlation between the knowledge of educators and their ages ($p > 0.05$). Women scored higher than men, with only two men and 16 women scoring adequate, respectively; gender did not influence the knowledge score. There was no significant difference in knowledge between different levels of education ($p = 0.129$). There was no significant correlation between the place of training and nutrition knowledge ($p = 0.534$).

Discussion

Educator competency

This study reports that most educators were aged between 40 and 49 years and had between 14 and 21 years of teaching experience. Female educators made up two-thirds 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 any nutrition education in schools because the change in food behaviour mainly depends on household food security and parents' nutritional knowledge, attitudes and practices (Sherman & Muehlhoff 2007), among other factors. The majority of educator families were headed by men and one-fourth of the educators reported that there were approximately 1–6 persons in the household. The majority of the educators were married. Eating patterns are also influenced by the need to negotiate with others in the family about what to eat (Contento et al. 2006).

Slightly more than half of the educators agreed that gender affected their nutrition knowledge. This was questionable because the majority of participants in this study were women. This breakdown was consistent with another research study that reported that women tend to be more knowledgeable about nutrition (Hendrie, Coveney & Cox 2008). This belief was not observed in this study. It should be noted that men were under-represented in this study.

Information from the school environment, classroom curriculum, media, peers, families and communities are necessary for the promotion of nutrition, health knowledge and practice among school children (Food and Agriculture Organization of the United Nations 2006). The educators reported the following as major sources of nutrition information: health workers, magazines, newspapers, and radio and television. The findings agree with those of a study conducted among nutrition educators by Anca Codruta and Alexandra (2005) in South Carolina, who identified books, newspapers and television as their major sources of nutritional knowledge.

In this study, fewer than half of the educators agreed that their training affected their nutrition knowledge, while others disagreed, indicating that their training did not affect their nutrition knowledge. Studies by Kupolati et al. (2015) and Oldewage-Theron and Napier (2011) showed that teachers required training on nutrition education. Poor nutrition knowledge and training is one of the main factors in the development of malnutrition and needs to be addressed (Briggs et al. 2010).

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). Food choices vary from one place to another. In the United States of America, the major values in choosing foods are taste, convenience and cost (Glanz et al. 1998). In Europe, the major values are quality or freshness, price, nutritional value and family preferences, in that order (Lennernäs 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 the association between knowledge and eating behaviours shows that with nutrition knowledge, healthier eating behaviours may occur (Zarnowiecki et al. 2012). 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 (Van Cauwenberghe et al. 2010).

The findings of the present study showed that more than three quarters of the educators read food labels before buying food, and the majority of them agreed that food labels affected their choice of food product. This finding is supported by a study conducted by Chen et al. (2010).

School environment

Nutrition education is taught in public schools in South Africa with a 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 (Lakshman et 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 reported that nutrition was not part of their curriculum at their training institution. The curriculum should be explicit, and teachers should receive training in the use of the curriculum. Nutrition training for teachers that has a behavioural change component can lead to effective nutrition education, and thereby help foster healthy eating behaviours in learners (Hildebrand et al. 2012). It is not easy for the educators to teach nutrition while they do not have basic nutrition knowledge themselves.

Evidence from previous studies confirmed an improvement in the dietary behaviour of learners when classroom teachers implemented nutrition education interventions for learners (Steyn et al. 2009). From the results of this study, just over half of the educators preferred to talk about nutrition daily, while over half wanted to discuss issues related to nutrition daily. Almost half of the educators 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). A study conducted by Kupolati et al. (2015) also supports how parents' and peers' influence has an impact on nutrition education and eating behaviour of learners.

This study revealed that the majority of the educators felt that a 10-year-old child should have three meals per day, while less than one-third of educators reported that breakfast was the most important meal for the child. Children can be irritable and have difficulty concentrating if they are hungry, which can interfere with learning. They also experience low energy, which can limit their physical activities. Many primary school children travel long distances to school with little or no breakfast at all. As 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 practised (Appleby 2009).

Only one educator in this study related skipping of meals with performance; this implies that the majority of educators did not know the consequences of children skipping meals. It also raises a concern as to whether educators really understand the importance of the PSNP, which is now implemented in schools in South Africa. In this study, just over one-third of the educators stated that it was important for children to be physically active so that they could concentrate in the class. Forty per cent of the educators mentioned that children need to be physically active so that they could grow and be healthy.

Children need to be active to promote strong skeletal muscle and muscular and cardiovascular development. Children spend most of their time at school, which place the school in an excellent position to promote healthy eating. Encouragement of healthy attitudes towards physical activity and healthy nutrition behaviour interventions impacts positively children's health by increasing physical activity and healthy eating (Breslin & Brennan 2012; Eisenmann et al. 2011; Senekal et al. 2015).

Nutrition knowledge

The findings of this study show that most educators understand the importance of carbohydrates, fats, fruits 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 knew that it formed part of a balanced diet. Most educators mentioned that carbohydrates, fats, protein, and fruits and vegetables formed part of a balanced diet.

Only 39.5% of educators agreed that dried beans form part of a balanced diet. Few (7.0%) of them stated that *atchaar* formed part of a balanced diet, which was incorrect. A study conducted by Dalais and colleagues (2014) reported that only 30.5% of teachers were able to describe a well-balanced diet. Nutrition affects how children perform in school (Hays & 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.

The present study shows that about half of the educators correctly responded that carrots are a rich source of vitamin A. Some of the educators answered correctly when they said that tomatoes are a rich source of vitamin C, while fewer than a quarter of the educators were correct when they responded that liver is a rich source of iron. Only less than one-third of educators stated that seafood is a rich source of iodine. Almost all of the educators identified fruits and vegetables as foods that are high in fibre.

According to the study conducted by Ayieko and Anyango (2011) in Kenya, the teachers did not show a basic knowledge of foods rich in vitamins A and C. A South Carolina study on nutrition knowledge, attitude and practices found overall fair nutrition knowledge among nutrition educators, with gaps in their knowledge pertaining to nutrition and the function of minerals and vitamins (Anca Codruta & Alexandra 2005). This finding supports this study's observations where educators did not have adequate knowledge about rich sources of vitamin C and the consequences of its deficiency.

The present study revealed that the total knowledge score of the educators is poor – showing that the educators did not have sufficient nutrition knowledge. Students' poor performance at the end of the school year is attributed to factors relating to the skill and effectiveness of the teachers (Uko-Aviomah 2005). If educators are not strong in the content knowledge and pedagogical competence so 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 to have insufficient knowledge about nutrition and healthy dietary habits (Nguyen et al. 2017). The findings of this study are supported by studies which found that teachers had poor nutrition knowledge in Zambia (Sherman & Muehlhoff 2007), South Africa (Dalais et al. 2014; Oldewage-Theron & Napier 2011) and the United States of America (Kinsler et al. 2012). 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. 2010).

Nutrition curriculum for intermediary and senior phase

The majority of educators in this study did not identify a nutrition topic that they could teach. Just over one-third of educators identified healthy food and lifestyle as nutrition topics. 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 (Department of Basic Education 2011), there are eight nutrition topics for teachers to teach. In this study, however, 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 (Department of Basic Education 2011). It could be that educators did not have confidence in teaching nutrition topics because nutrition was not part of their curriculum during their training.

This was supported by a study conducted by Lumeng et al. (2008) who reported that educators lacked confidence in teaching topics in which they did not have sufficient knowledge, while Lambert, Monroe and Wolff (2010) showed evidence that just over half of the teachers believed that they did not have adequate classroom time to include nutrition competencies.

More than half of the educators felt that nutrition education should form part of the curriculum at the primary level, while less than one-fifth of educators stated that it should start at the secondary level. According to Kyere et al. (2020), 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 ongoing in-service training. In addition to sufficient training, teachers need current and relevant nutrition education resources.

School gardens are emerging as health education tools in the academic setting. About 65.5% of the educators in this study reported that they had vegetable gardens in their schools and the majority of them produced spinach (74.0%), tomatoes (69.5%), carrots (69.5%), and cabbage (69.0%). This observation agrees with the findings of a study where learners followed up on gardening practice by planting new crops at their homes (Hendrie et al. 2008). The development of vegetable gardens was perceived as an important positive factor. It is argued that children became more interested in what they were able to participate in, rather than in what they were taught (Kupolati et al. 2015). Anecdotal evidence, a growing body of research-based literature supports the use of youth gardens as a beneficial teaching tool. The benefits of school gardens can be divided into four categories: academic achievement, a healthy lifestyle, environmental stewardship, and community and social development. Only education level and the institution where qualification was obtained from were determined. The content on specific nutrition in the education curriculum of the different institutions was not established.

Limitations

This study was conducted in the deep rural area of Sekhukhune, where there is poor infrastructure in some schools, insufficient classrooms and incapable teachers. Although Sekhukhune has six municipalities, the study focused on only one municipality – this makes 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 to similar environments.

Policy implications

The school environment is ideal for targeting interventions by educators aimed at influencing the dietary and health behaviours of learners. University curricula for educators should integrate credit bearing relevant child nutrition content, similarly to what happens with medical and nursing curricula.

Conclusion

Training educators on nutrition is one of the main recommendations emerging from this study. Among the factors that affected the educators' nutrition knowledge was training and level of education of the educators. The educators had insufficient knowledge regarding the importance of protein, water, dried beans and sources rich in iron and iodine. Reading of food labels and food prices also affected educators' choice of products. Nutrition forms part of Life orientation at schools; most of the educators did not choose the topic from the curriculum that they could teach, with only a few choosing the food pyramid and a balanced diet as a topics they could teach. It will benefit the learners and educators if educators could provide education in nutrition, especially those teaching Life orientation, because nutrition topics form part of life orientation subjects. The curriculum should also emphasise the importance of physical activity and school gardening to educators.

Acknowledgements

The authors thank the educators for their participation in this research.

Competing interests

The authors have declared that no competing interests exist.

Authors' contributions

M.M.M. worked on the literature review and was the interviewer of all participants. All the authors (X.G.M., M.M.M., N.S.M. and A.B.T.) contributed to the research process and final writing up of this article.

Ethical considerations

The research proposal was submitted to the University of Venda Ethics Committee that granted the approval. 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 local municipality. Permission to conduct the study was also obtained from the school principals and school governing bodies. The researcher explained in detail the aim of the study, the expected duration of the participants' involvement and the procedures which would be followed during the investigation, and made the educators aware that they would be at liberty to withdraw from the investigations at any time. All the participants signed a consent form which was written in English. The researcher ensured that the educators' privacy was respected and that they remained anonymous. The information provided by the educators was protected and was not made available to anyone other than the researchers.

Ethical clearance to conduct this study was obtained from the University of Venda, Health, Safety and Research Ethics Committee (Clearance No. SHS/08/NUT/002).

Funding information

This research was funded by the South African National Research Foundation.

Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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