

# Adolescents Nutrition Knowledge: A mixed methods Research.

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## Research

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# Abstract

**Background** Poor nutrition has been associated with lack of nutrition education, which leads to chronic diseases like diabetes, hypertension, obesity and coronary artery diseases. The objectives of the study were to evaluate learners' knowledge of nutrition education principles and to determine how the knowledge of nutrition principles could be improved among learners.

**Methods** Mixed methods cross-sectional research with application of semi-structured face-to-face interviews and a structured questionnaire were used to collect data. Eight stake-holders participated in the qualitative component of the study while 108 learners from 8 different schools responded to the questionnaire. The qualitative data was analyzed by coding and categorizing the data into themes and sub-themes while the quantitative data was analyzed using SPSS yielding frequencies, percentages, means and standard deviations.

**Results** A significant proportion of learners lacked the nutrition knowledge due to the absence of health promotion campaigns in the schools and teaching of the nutrition principles was only limited to Life Science in the high school curriculum. Majority (56%) of the learners were taught nutrition education at primary school mainly in the Life Orientation curriculum while less than 2% were taught in grade 11 and 12. About 92% of the learners were not aware of the nutritional value of fruits, vegetables, milk and fats.

**Conclusions** Incorporation of nutrition education in a compulsory subject in high school and in-school nutrition education sessions in school gatherings that involve various stakeholders is critical in improving the nutrition knowledge of stakeholders. Such interventions will assist in curbing diet related chronic diseases.

## Introduction

Nutrition education involves various educational strategies and environmental support aimed at acquiring the knowledge, skills, attitudes and behaviour that facilitate the adoption of healthful food choices and active physical activity [1, 2]. It involves nutrient functions, food groups, how the diet should be constituted, and what happens if inappropriate quantities are consumed [3]. Nutrition education can be provided through school curriculum in groups in class or verbal individual instructions, media campaigns and distribution of resource materials like charts, pamphlets and posters to deliver messages on good nutrition which should bring about appropriate behaviour change [1, 4]. The changed behaviour must be sustained throughout post school life to maintain a healthy population.

Furthermore, nutrition education also involves the provision of gardening knowledge and skills as learners are imparted knowledge on the dietary significance of vegetables and fruits which they grow.<sup>4</sup> Nutrition education includes planning meals, making food budget, reading food labels, eating a balanced diet, hand washing, food safety, healthy snacks, healthy beverages, food preparation and kitchen safety [5, 6].

Lack of nutritional education results in various problems such as overweight, obesity and underweight. Overweight and obesity result from availability of cheap, high energy non-nutrient dense foods, and increased consumption of sugary carbonated drinks in both high- and low-income countries [7]. Weight gain may also be a result of genetic diseases such as Prader-Willi Syndrome which is caused by a malfunction in the part of the brain that controls feelings of fullness and hunger [5]. Lack of knowledge in healthy eating and physical activity among children in Mississippi Delta resulted in a number of them being obese [8]. In addition, what and how parents cook can either facilitate or be a barrier to healthy eating [8]. This concurs with Haidar et al. [9] study observations where an increase in parental support was positively associated with healthier dietary behaviours.

One study in secondary schools in Nigeria observed that nutrition education songs had significant effect in improving adolescents' knowledge, attitude and practice of healthy eating [10]. Nutrition education in the Ghana School Feeding Programme was done using posters, songs promoting healthy diets and the meal planner tool enabled participants to learn about the nutrition value of locally available foods, and to determine the quantities of food stuffs to procure [11]. The Meal Planner Tool also enabled the planners to correctly estimate the quantity of food the caterer needs to prepare per child and maintains the quality of food. In earlier studies carried out in Tamale in Ghana, the nutritional knowledge of respondents was observed to be very poor indicating that health promotion campaigns were not available and accessible to some of the schools during that period [12].

There is a prevalence of malnutrition (undernutrition and over-nutrition) and micronutrient deficiencies in developing countries including South Africa [3, 13–15]. In South Africa, nutrition education is one of the objectives of the national school nutrition programme aimed at addressing issues of malnutrition [6]. However, the effectiveness of the programme in promoting nutrition education is yet inconclusive.

Nutrition education intervention programmes in South Africa should be based on South African food-based dietary guidelines and should address issues of variety of foods in each food group, hygiene and sanitation, starchy foods as the bases of meals, and eating plenty of vegetables and fruits every day [13].

In one study, moderate knowledge of nutrition among teachers of both primary and secondary schools in Greece increased significantly after participation in the e-learning programme in health promotion [16]. In one study, 45 Life Orientation teachers in South Africa were lacking health and nutrition related knowledge and one would wonder how they transmitted the relevant knowledge to the learners [17]. However, the knowledge of teachers who participated in the programme improved significantly after a nutrition education programme intervention. It is likely that several teachers who were not part of the study lacked the knowledge. Teachers are expected to provide nutrition education knowledge to learners, and it is a big challenge if the teachers lack the desired knowledge. This gap needs to be closed if learners are to get adequate nutrition knowledge and skills before they exit the school system.

## **Objectives of the Study**

To evaluate learners' level of awareness of nutrition principles.

To determine how the knowledge of nutrition principles can be improved among learners.

## **Significance of the Study**

The study sought to explore the adolescent learners' nutrition knowledge and determine the best practices that can be employed to enhance the acquisition of basic nutrition principles by all learners at high school. This knowledge is critical as it helps the society to develop good eating habits which are critical in preventing numerous nutritional related disorders, some of which are prevalent in the South African society. The study may also assist policy makers and curriculum designers to include nutrition education in the high school curriculum.

## **Research Methodology**

The research adopted the pragmatic research paradigm. Pragmatic researchers focus on what and how to research based on the expected outcomes [18]. Pragmatism allowed the researcher to be free of mental and practical constraints imposed by post-positivism and interpretivism [19]. Hence, there was no restriction to a method or technique. The research was underpinned by a mixed methods research approach and a concurrent triangulation research design. The rationale for this design was that one data collection form would supply strengths to offset the weaknesses of the other form resulting in a holistic understanding of learners' knowledge of nutrition education.

## **Population and Sample**

The qualitative population consisted of eight school nutrition programme (SNP) teacher co-ordinators, eight principals, eight service providers, and thirty food handlers in the eight secondary schools in one circuit in Pinetown District.

The qualitative sample consisted of three school nutrition programme (SNP) teacher coordinators, three principals, one service provider, one food handler in the four purposively selected secondary schools in the Circuit. Stratified purposive sampling was used, and it is a process of dividing the sampling frame into strata to obtain relatively homogenous sub-groups and a purposeful sample is selected from each stratum.

The experience of participants was between two weeks and six years. Five of the participants were degreed while one had a certificate, one diploma and the least qualification was Grade 10. Their ages were between 29 years and 52 years.

The diversity of experience among stakeholders assisted the investigator to have a better perception about the implementation of the nutrition programme. The researcher was able to collect qualitative data from participants who had different levels of exposure to the programme and hence different views.

The quantitative population consisted of 685 learners in grade 12 who were above 17 years of age from eight schools in a circuit in Pinetown District. The quantitative sample had 108 (more than 10% to maintain a representative sample size) learners who were drawn using stratified random sampling.

## Data Collection Instruments

An instrument is a mechanism for measuring a phenomenon, which is used to gather and record information for assessment, decision making and understanding [20]. This section will focus on in-depth interviews, and questionnaires.

### Semi-Structured Interviews

Face-to-face in-depth interviews were conducted using a semi-structured interview guide. Participants were introduced to the study and permission to audio record was sought with each interviewee. Interviews were conducted in closed offices within the schools to maintain confidentiality of participants' responses. The time for the interview was variable for different participants due to their different time schedules. An interview guide with standardised questions was used to ensure that all questions based on each objective were completely answered and time was not wasted on irrelevant questions. The data was collected between June and September 2017. Face to face interviews were conducted with teacher co-ordinators, principals, food handlers and food suppliers.

### Investigator-Administered Structured Questionnaire

The investigator administered a semi-structured questionnaire to collect data from learners. The semi-structured questionnaire was completed in the presence of the researcher. An introduction was done, and all the background information was given before learners could complete the questionnaire. Consent forms were given to the learners who had to read and voluntarily sign to participate in the study. The questionnaires were completed by learners from the humanities, science and commerce classes during the different times allocated to the researcher by principals in different schools. The researcher clarified each question to the learners before giving them time to write their responses. The respondents had the opportunity to seek further clarification on questions that they did not understand well. Learners were encouraged to write responses without influence from friends.

### Trustworthiness

**Trustworthiness:** Trustworthiness was made possible through developing credibility, dependability and confirmability.

**Credibility:** The researcher ensured credibility through asking an expert in research to review the sampling, data collection and analysis procedures. Credibility was also achieved by member checking where the data and findings of the data analysis were brought back to the original participants to seek their input concerning the accuracy, completeness and interpretation of data [21]. Credibility was also ensured through data and method triangulation.

**Dependability:** refers to consistency and accuracy of interpretations made from qualitative data and analysis [22,23]. It is obtained through stepwise replication and inquiry audit [24]. An audit trail was outlined in order to check procedural dependability which impacted on the accuracy of data. Data

triangulation where data was collected from several participants and method triangulation also ensured dependability.

**Confirmability:** Confirmability shows the degree to which the researcher is free of bias in the procedure of data collection, data analysis and interpretation of research findings [23]. It was achieved through triangulation, respondent validation, Efficient data collection methods and member checking [25].

**Validity:** Validity was ensured by an expert and experienced researcher who reviewed the questions on the questionnaire, and by pilot testing done with ten learners who were not part of the study. This ensured that questions were comprehensive and clear for the group of respondents. The questionnaire had enough set of relevant questions to adequately address each research objective.

Validity was also ensured through triangulation. A variety of data sources and multiple methods were used to study the research problem. External validity was achieved by random sampling of respondents across several strata (males and females in quintiles 2 and 3 in the commerce, science and humanities classes) that reflected the population to which the results were generalised [26]. External validity was ensured by having a representative sample size which was more than 10% of the population size.

**Reliability:** was mainly achieved through pilot testing.

## **Data analysis**

Qualitative data analysis involves categorizing data, identifying patterns and interpreting the data. For qualitative data from interviews, thematic content analysis by coding and categorizing data was used. Results were then presented in narrative texts and tables. The quantitative was analysed using SPSS which yielded percentages and frequencies which were presented in texts and tables. The quantitative and qualitative data were synchronised during analysis. Some of the data collected from the interviews and questionnaires enabled cross checking of the data accuracy. Some differences in data demanded the researcher go back to the field to seek further clarification from participants.

## **Ethical Considerations**

This study was carried out in accordance with the recommendations and with the permission of the KwaZulu-Natal Department of Education. Ethical approval was provided by the Research Ethics Committee of the University of Fort Hare. All teachers and learners provided written informed consent and assent in accordance with the Declaration of Helsinki.

# **Results**

## **Results from the Questionnaire on learners' exposure and familiarity to nutrition education Issues**

A relatively large proportion of learners 52 (48.1%) indicated that they had learnt about nutrition while a smaller proportion 21 (19.4%) indicated that they had not learnt about nutrition (Table 4.1).

Table 4.1: Learners' school exposure on nutritional education issues (percentages are in brackets)

Nutrition education principle	Learners' responses							
	Yes	No	not sure	No response				
Learnt about nutrition	52 (48.1)	21 (19.4)	21 (19.4)	14 (13.0)				
No. & % of learners	52 (48.1)	21 (19.4)	21 (19.4)	14 (13.0)				
Grade in which learners were taught Nutrition education issues	8	9	10	11	12	Primary school		
No. & % of learners taught	22 (20.4)	22 (20.4)	19 (17.6)	2 (1.9)	1 (0.9)	56 (51.7)		
Subjects that taught nutrition education	Life Orientation		Nutrition programme		Life Sciences			
No. & % of learners taught in that subject	69 (63.9)		1 (0.9)		35 (32.4)			
Food groups that learners were aware of.	Protein	bread/cereal& pasta	Fruits	vegetables	milk	Fats	No response	
No. & % of learners aware of that food group	21 (19.4)	19 (17.6)	5 (4.6)	8 (7.4)	1 (0.9)	10 (9.3)	44 (40.7)	

Most respondents 56 (51.7%) were taught nutrition education at primary school, a small proportions in grades eight and nine 22 (22.4%) and 19 (17.6%) in grade ten. Insignificant numbers of respondents, 2 (1.9%) and 1 (0.9%), indicated that they were taught nutrition education in grade eleven and twelve respectively. Respondents, 69 (63.9%) and 35 (32.4%) indicated that they were taught nutrition education in Life Orientation and Life Sciences respectively. It was amazing to note that one (0.9%) respondent indicated that he/she was taught nutrition education during the school nutrition programme. It was also quite surprising that most respondents in grade twelve were not able to mention the food groups of the food guide pyramid. Only a small proportion 21 (19.4%) was able to mention protein as one of the food groups and 19 (17.6%) were able to mention the bread, cereal and pasta groups. A very small proportion of the respondents were able to mention fruit 5 (4.6%), vegetables 8 (7.4%), milk 1 (0.9%) and fat 10 (9.3%) as the other food groups that are important to provide important nutrients to the body. Generally, there was lack of nutrition education knowledge among learners.

Table 4.2: Learners' familiarity with issues of nutrition

Key: EF = Extremely familiar; MF = Moderately familiar; SWF = Somewhat familiar; SLF = Slightly familiar; NF = Not familiar at all; SDEV = Standard deviation.

Nutrition issue	Learners' Familiarity to the nutrition issue						Total	Mean	SDEV
	EF 5	MF 4	SWF 3	SLF 2	NF 1	No response			
Nutritious food to be eaten daily	36 (33.3)	22 (20.4)	15 (13.9)	12 (11.1)	21 (19.4)	2 (1.9)	108 (100%)	3.4	1.5
A balanced diet.	43 (39.8)	22 (20.4)	13 (12.0)	12 (11.1)	12 (11.1)	6 (5.6)	108 (100%)	3.7	1.4
How to grow vegetables	24 (22.2)	16 (14.8)	12 (11.1)	13 (12.0)	42 (38.9)	1 (0.9)	108 (100%)	2.7	1.6
Washing your hands with soap before eating	42 (38.9)	14 (13.0)	10 (9.3)	12 (11.1)	30 (27.8)	0 (0.0)	108 (100%)	3.2	1.8
Overall mean								3.3	

(Learners responded by ticking on a likert scale: 1 Not familiar, 2 slightly familiar, 3 somewhat familiar, 4 moderately familiar and 5 extremely familiar. The data was entered on SPSS which computed the mean scores and standard deviations for all variables in Table 4.2.)

Table 4.2 indicates that growing of vegetables (Mean = 2.7, SD = 1.6) was not considered to be important in the NSNP. The results however, single out balanced diet (Mean = 3.7, SD = 1.4) and nutritious foods to include in the school lunch box (Mean = 3.4, SD = 1.5) as principles which most learners were familiar to relative to other principles. The overall mean of 3.3 depicts that most of the learners were somewhat familiar with the nutrition principles. Despite the fact that most learners were familiar with the nutrition education principles, 21(19.4%) were not aware of nutritious foods to eat daily, 12(11.1%) did not know about balanced diet, 42(38.9%) had no knowledge on how to grow vegetables and 30(27.8%) did not know the importance of washing their hands with soap before eating.

### **Results from stakeholder interviews on learners' exposure and familiarity with various issues of nutrition**

Data from interviews reflected different views on nutrition education among participants. Most participants indicated that nutrition education was not being taught to learners while a few reflected that nutrition education was being taught. All participants concurred that nutrition education was important and most of them recommended that it be taught to all learners in schools. The researcher engaged participants in drawing up implications of the school nutrition programme on learners' nutrition education.

Teachers were too busy to teach nutrition education which was not part of the curriculum in most grades. One of the teacher co-ordinators expressed that:

*There is a challenge of time in terms of promoting nutrition education amongst the learners because educators wouldn't get much time to train learners on nutrition education because they have other work to do (PC).*

It is crucial for the stakeholders to have the knowledge of nutrition education. In instances where the stakeholders lack such information, it will be difficult to convince learners to eat food items like soya mince which are not common in their homes. One of the participants highlighted the lack of nutrition knowledge among key role players in the programme. He bemoaned that:

*The co-ordinators themselves were not trained and do not know about nutrition education, so nutrition education is not being taught to learners (SG).*

Teaching of nutrition education must be accompanied by supporting materials such as charts and relevant books or videos to assist teachers in imparting nutrition knowledge to learners. Such supporting materials were not available in most of the schools. One of the participants noted that:

*There are no materials or documents available to support nutrition education among learners. There is no school based support to promote good eating habits (TD).*

The unavailability of materials on nutrition education was also echoed by another participant who indicated that learners' food choice was sometimes determined by the weather conditions. The participant also confirmed that nutrition education was taught in Life Sciences as well as Natural Sciences. The participant had this to share:

*The challenges of unavailability of posters on healthy eating habits for learners to see that the food provided in the programme is healthy. Learners are not taught besides those who are learning Natural Science and Life Sciences (TB).*

For learners to eat a particular type of food, they need to be familiar with that food. Alternatively, knowing the value of a food item may be important if one has to take a type of food that is not common in one's diet. Due to absence of nutrition education to most learners, they were unlikely to be familiar with the importance of different food types. One of the participants had this to share:

*In GET and FET, there are theories of other issues not nutrition education principles (TC).*

Learners' lack of knowledge in nutrition education was reiterated by another participant who added that learners in all grades need to be equipped with the nutrition education knowledge. The participant had this to say:

*I would give learners 3 out of 10 on their knowledge in terms of the nutrition education. The priority group to teach nutrition education will be grade 8. However, all the learners deserve some form of support in*

*nutrition education. Diet and food guide pyramid are the most important principles. It is important for the stakeholders to participate in promoting nutrition education (PE).*

In line with the lack of nutritional knowledge among the learners, one of the participants accentuated the need to teach nutrition education. The participant felt that the nutritional education information would promote a healthy lifestyle. The participant indicated that:

*Yes, I think learners need to be taught about nutrition education. Teachers must teach learners about healthy eating habits. This will help them to avoid fatty foods which can make them sick (FD).*

In one of the schools, the acquisition of nutrition education information was facilitated by a learner support agent who was from the department. This was a great advantage to the school since the learner support agent could address the nutrition education issue to all learners in the school whenever he was afforded the opportunity to do so. One of the participants expressed that:

*The Department provides a learner support agent. They guide learners on good eating habits. He plans the specific issue to address to all learners on a specific day including the issue on nutrition. Stakeholders, especially parents and the teacher coordinator have to play a very important role in promoting nutrition education (PD).*

### **Respondents' recommendations on nutrition education**

Generally, learners acknowledged that all the suggested principles were of paramount importance in assisting them to gain knowledge on nutrition education as reflected by mean values between 4.1 and 4.4 (Table 4.3).

Table 4.3: Level of learners' agreement on the suggested principle to promote nutrition education.

(SA = strongly agree, A = agree; N = neutral; D = disagree; SD = strongly disagree)

Nutrition principle	Learners' responses							
	SA 5	A 4	N 3	D 2	SD 1	Total	Mean	SDEV
There should be compulsory subject in the school curriculum which teaches and assess nutrition education.	55 (50.9)	26 (24.1)	17 (15.7)	2 (1.9)	8 (7.4)	108 (100)	4.4	0.9
School nutrition programme stakeholders need to recognise and acknowledge their role in promoting good eating habits.	47 (43.5)	34 (31.5)	20 (18.5)	1 (0.9)	4 (3.7)	108 (100)	4.1	1.0
Nutrition education competitions should be organised and conducted at school level to assist learners to make good food choices.	63 (58.3)	32 (29.6)	6 (5.6)	4 (3.7)	2 (1.9)	108 (100)	4.3	0.7
Nutrition education competitions should be organised and conducted at cluster level	50 (46.3)	37 (34.3)	13 (12.0)	5 (4.6)	2 (1.9)	108 (100)	4.2	1.0
Nutrition education competitions should be organised and conducted at district level.	47 (43.5)	43 (39.9)	13 (12.0)	1 (0.9)	2 (1.9)	108 (100)	4.3	0.9
Overall mean		4.3	0.9					

(Learners responded by ticking on a likert scale: 1 Strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree and 5 strongly agree. The data was entered on SPSS which computed the mean scores and standard deviations for all variables in Table 4.3.)

Integration of nutrition education into the school curriculum (Mean = 4.4, SD = 0.9), nutrition education competitions at school and district level (Mean = 4.3, SD = 0.7 and Mean = 4.3, SD = 0.9 respectively) are perceived as the most critical issues in promoting nutrition education. The overall mean (Mean = 4.3, SD = 0.9) depicts that all the principles in Table 4.5, one way or the other influence eating habits of adolescents and it is critical to use the different strategies for learners to be aware of the nutrition principles.

Standard deviation values between 0.7 and 1.0 indicate a narrow dispersion of data from the mean values. Many respondents were for the view of promoting nutrition education principles in various ways,

while only small numbers were not supportive of some of the principles.

### **Participants' recommendations on nutrition education among learners**

One of the participants had a feeling that the issue of nutrition education was very important and suggested that a multifaceted approach would enhance better understanding of the nutrition principles among learners. The participant shared the following views:

*I think they know why they should eat different foods. There should be subjects that teach them. They should be taught in the school nutrition programme. They should be taught in classes about nutrition. All teachers should be involved (TD).*

Teaching of nutrition education in classes was reiterated by another participant who expressed that:

*Each morning you can have a topic to talk about such as hygiene and healthy eating. They must emphasize the importance of the food provided in the NSNP and the disadvantages of fatty foods (TC).*

Another participant felt that it was important to teach nutrition education in grades 8 and 9. She also felt that all stakeholders of the nutrition programme were to play a role in promoting nutrition education. She suggested that some of the information be taught during assembly time when all learners are available. She had this to share:

*Learners must be taught nutrition education in grades 8 and 9. They must also be taught during assembly time where they must be given information of nutritious food items provided in the programme (TB).*

A different participant had the feeling that nutrition education had to be integrated into grade 8 Life Orientation curriculum covering basic aspects of nutrition. The participant also felt the need to involve nutrition specialists in addressing learners on nutrition issues. The participant commented that:

*They must be taught the basic knowledge of food groups, eating habits and drinking of water. That nutrition section should be in the Life Orientation curriculum in grade 8. Learners may have education excursions that are well planned so that the presenter will talk about aspects on nutrition. A person from the nutrition sector or a dietician can address learners on nutrition (PD).*

Generally, participants felt that no justice was being done to promote nutrition education among learners. They felt that some changes had to be implemented to promote nutrition education among learners.

## **Discussion**

Findings from participants and respondents revealed that most high school learners lacked the basic knowledge of nutrition education because they did not learn about it at high school. This was because nutrition education according to the study observations in schools in Eastern Cape was mainly taught at primary school and only to a few learners taking Life Sciences in the FET phase [27]. The study observations reveal that learners were being taught about good eating habits in Life Skills lessons and

were able to list healthy food groups and unhealthy groups such as fats and sugars [27]. The observations in Bronkhorstspuit District also indicate that nutrition was taught in Life Skills, Natural Sciences and Technology at primary school where topics like dietary habits, healthy eating, nutrients in food, food processing and hygiene, were included [31]. If such developments can be seen through the secondary school curriculum, learners' knowledge on healthy life styles will greatly be enriched throughout their adulthood. When most of the principles are only taught at primary school, it is possible that learners may not remember most of the concepts by the time they leave high school. Observations in China affirm that teaching nutrition education to adolescents improves their knowledge and attitude towards food [32].

Findings from qualitative data revealed that participants did not have adequate time to teach nutrition education since they were loaded with various subjects and grades that they had to teach. Study results in Bronkhorstspuit District in South Africa confirm time constraints among teachers and lack of resources for teaching nutrition education as constraining factors. This reflects that nutrition education cannot be taught if it is not part of the curriculum and if it is not being assessed. Lack of nutrition education is a great disadvantage to the economy in countries like South Africa where there is a prevalence of malnutrition (undernutrition and over-nutrition) and micronutrient deficiency [3, 13, 14].

Nutrition education has to be accompanied by supporting materials such as charts and relevant books and videos to assist teachers in imparting nutrition knowledge to learners [33]. It was worrisome to note that such supporting materials were not available in the schools visited. This limited the acquisition of nutrition knowledge among learners. This was contrary to the study observations in Eastern Cape and Mpumalanga, where posters on nutrition education were observed in school kitchens and classrooms [34]. Furthermore, the research findings are different from the study observations in Ghana School Feeding Programme, where nutrition education was partly achieved through the use of posters and songs promoting healthy diet [11].

Quality support materials may not be made available in schools unless nutrition education is integrated into the school curriculum [28]. The two departments (Departments of Health and Education) concur with recommendations from participants in the study, that nutrition education should be incorporated into the Life Orientation curriculum, which is done by all learners in each school [28]. Limiting nutrition education to Life Sciences curriculum only as was reported by some participants in the study will disadvantage all FET learners who do not take the subject.

Research findings from participants also reflected that the teacher coordinators, principals and food handlers had limited knowledge on nutrition education, hence, it was not easy to teach nutrition education among learners. This was affirmed in the study observation in public schools in South Africa, that Life Orientation teachers lacked the relevant nutrition education knowledge [17]. It is necessary to equip the teachers with the relevant knowledge and skills, especially as they train as teachers in various institutions. Nutrition education intervention programmes may be necessary in improving the nutrition knowledge of servicing teachers [17]. Nutrition education intervention programme in South Africa should

be based on South African food-based dietary guidelines, and should address issues of variety of foods in each food group, hygiene and sanitation, starchy foods, and eating plenty of vegetables and fruits every day, as the bases of meals [13]. Some researchers observe that nutrition education knowledge can be improved through training and engagement in healthy life style projects such as the school nutrition programme which unfortunately was not providing the relevant knowledge to the learners that participated in the study [17, 29].

Participants felt that teachers had an important role to play in promoting nutrition education. Teachers play an important role in modelling healthy eating behaviours for learners and adapting nutrition education topics to the specific needs and environment of learners [31]. Success of the school nutrition education intervention cannot be guaranteed without the support of the school environment and authority [36]. The department and the school authority have to source the relevant materials which should be maintained by teachers, learners and everyone in the school environment.

The school nutrition education has the potential to reduce nutrition related diseases like diabetes that can undermine prospects of sustained economic growth in the emerging economies like South Africa [31]. Nutrition education in schools could contribute in increasing the country's gross domestic product due to the reduction of chronic diseases among the population.

## **Conclusions**

Findings from the study revealed that learners lacked the basic knowledge of nutrition education. Furthermore, stakeholders of the school nutrition programme did not have adequate knowledge and time to teach nutrition education to learners and there were no resources to support nutrition education. These results highlight the need to incorporate nutrition education into the high school policy documents and to ensure that preservice teachers are adequately equipped with the necessary nutrition knowledge relevant for the high school learners. More so, there is need to provide nutrition education supporting materials that will assist both stakeholders and learners. Efficacy studies to gain insights into the content of nutrition education in the high school curriculum and to whom and how the content is taught are essential to clearly understand the knowledge deficiency among learners.

## **Implications For Research And Practice**

Ensuring that all students have the necessary nutrition knowledge requires comprehensive examination of the curricula in both primary and high school. Future research can examine nutrition content in both primary and high schools and how teachers teach the concepts. There is need to explore whether teacher training institutions are imparting the relevant and adequate nutrition knowledge skills to teachers to enable them to transmit their knowledge to learners The approach used in this study could be replicated in different provinces in schools with different socio-economic profiles.

If further research confirms the lack of nutrition knowledge among high school learners, the high school Life Orientation curriculum may warrant reevaluation. Including nutrition principles in the Life Orientation curriculum policy document may have significant impact in improving learners' knowledge. Intervention programmes in schools and social media may also help to improve learners' understanding of the principles. Health promotion media such as videos, posters or songs should be made available in schools.

## **Declarations**

### **ACKNOWLEDGEMENTS**

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### **ETHICAL APPROVAL AND CONSENT TO PARTICIPATE**

The data analysed in this study was collected between June and August 2017. An ethical approval was granted by the University Ethical Clearance Committee and the Head of the Department of Education KwaZulu-Natal. All interviews were conducted after participants gave consent, which was expressed through signing of the consent form.

### **CONSENT FOR PUBLICATION**

Consent for publication was obtained from all participants interviewed and respondents who completed the questionnaire. They all signed the consent forms seeking authority to publish anonymous data.

### **CONFLICT OF INTEREST**

The author declares that he has no competing interest.

### **FUNDING**

The study was not funded.

### **AUTHORS' CONTRIBUTIONS**

The article was written by Mafugu.T. who collected data, analyzed data wrote the article.

### **AVAILABILITY OF SUPPORTING DATA**

The datasets during and/or analysed during the current study is available from the corresponding author on reasonable request.

### **AUTHOR'S INFORMATION**

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