Original Article

An Assessment of Nutrition Education in Primary Schools and its Effect on Students Dietary Behaviors and Body Mass Index in Saudi Arabia

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Abstract:

Objectives: School-based nutrition education can provide children with the knowledge and skills to improve their dietary attitudes and behaviors. This study aimed to assess nutrition education provided to students by schools and its effects on their dietary behaviors and body weight. **Methods:** A multistage-stratified cross-sectional survey was conducted among elementary schools (N= 10) which were randomly selected in 2013, Saudi Arabia. 725 children were recruited in this study. A pre-tested questionnaire was administered and descriptive as well as binary logistic regression analyses were performed to demonstrate the findings. **Results:** Systematic school-based nutrition education program was not provided in all of the visited schools; also, there was no nutrition coordinator available in any of the surveyed schools. Only 55.8%, 11.6% and 17% of the total students stated they have been taught by school about healthy nutrition/diets, healthy methods of gaining weight and losing weight,

الملخص

الأهداف: التثقيف الصحي التغذوي في المدارس يهدف الى تزويد الأطفال بالمعلومات والمهارات اللازمة لتحسين خياراتهم الغذائية وتعزيز السلوكيات الغذائية الصحية لديهم، لذا هدفت هذه الدراسة أولاً إلى تقييم دور المدارس فيما يتعلق بالتثقيف التغذوي، وكذلك علاقة التثقيف التغذوي المدرسي من وجهة نظر الطلاب بعاداتهم الغذائية.

طرق البحث: تم إجراء هذه الدراسة الوصفية المقطعية عام ٢٠١٣، وتم اختيار عينة الدراسة عن طريق العينة الطبقية متعددة المراحل. وعلية فقد شملت هذه الدراسة ٧٢٥ من أطفال المدارس من ١٠ مدارس ابتدائية في الباحة للإجابة على الاستبيان وجمع المعلومات المطلوبة. تم استخدام منهج التحليل الوصفي لإظهار النتائج والانحدار اللوجستي لاختبار علاقة دور المدرسة في التثقيف التغذوي مع سلوكيات الاطفال التغذوية.

النتائج: وجدت الدراسة بأنه لا تتوفر برامج محددة ومتخصصة حول التغذية الصحية في جميع المدارس التي شملتها الدراسة، وكذلك لا يوجد منسق مسؤول (معلم او غيره) مكلف بأمور التغذية في كل هذه المدارس. كما بينت النتائج ان ٥٧,٨٪ فقط ذكروا أنهم تلقوا تعليم عن التغذية الصحية، و١١,٦٪ تلقوا تعليم عن الطرق الصحية السليمة لزيادة الوزن، و١٧٪ حول الطرق الصحيحة لفقدان الوزن. كما وجدت الدراسة بأن ٣١٪ من إجمالي الطلاب أفادوا انهم تلقوا دروس تثقيفية حول الموضوعات المتعلقة بسلامة الأغذية، و٢٤,٤٪ من الطلاب تعلموا عن كيفية إعداد الوجبة صحية. وتلخصت مصادر المعلومات الغذائية للطلاب على النحو التالي؛ الأسرة (٦٤٪) وسائل الإعلام (٥٩٪) تليها المدرسة (٥٤٪). وذكرت الغالبية العظمى من الطلاب (٩٦٪) بأنهم بحاجة إلى برامج تعليمية عن التثقيف الصحي الغذائي. وأظهر تحليل الانحدار المعياري بأنه لا يوجد هناك

respectively. Being taught about food safety topics and how to prepare healthy meals were reported by 31% and 24.4% of the students, respectively. Family (64%) and media (59%) were the most sources of nutrition information for children, followed by school and friends. The majority of students (96%) stated they need nutrition education programs in schools. Regression analysis showed that being taught in schools about healthy nutrition was only associated with children age (OR= 1.1, 95% CI: 1.0 – 1.2, *p*= 0.039). No differences were detected between the group who stated being taught about healthy nutrition and who stated not being taught concerning their dietary behaviors and BMI. **Conclusions:** Schools were found to be not functioning efficiently in providing nutrition education for students. There is a great need to establish school-based nutrition education including school nutrition coordinators in Saudi Arabia.

Keywords: Dietary habits; Health education; Nutrition knowledge; Public health, School health.

فروق ذات دلالة إحصائية بين المجموعة التي ذكرت انها تلقت دروس حول التغذية الصحية والمجوعة الأخرى التي ذكرت أنها لم تتلقى أي دروس عن التغذية الصحية من خلال المدرسة فيما يتعلق بسلوكياتهم الغذائية ومؤشر كتلة الجسم.

الاستنتاجات: هناك حاجة ماسة لتحسين دور المدارس فيما يتعلق بالتعليم والتثقيف الصحي التغذوي. كما وهناك حاجة ماسة إلى مجموعة متكاملة من البرامج التغذوية لتعزيز التغذية عند الاطفال وطلاب المدارس في المملكة العربية السعودية.

الكلمات المفتاحية: التثقيف الصحي، التثقيف الغذائي، طلاب المدارس، الصحة المدرسية، الصحة العامة.

Introduction:

Healthy nutrition is a cornerstone for people health and wellbeing. On the other hand, unhealthy nutrition behaviors are core contributors to chronic diseases and health problems (WHO, 2015). Thus, without proper healthy nutrition, achieving a good state of health might be unattainable. However, there are two major kinds of nutritional problems; those due to inadequate intake of some essential nutrients, and those due to an excessive intake of food or certain type of nutrients (FAO, 2005). Healthy diet helps protect against malnutrition in all its forms (WHO, 2015).

Epidemiological and clinical studies have established that diet and nutritional behaviors

play an important role in the etiology of major chronic diseases. For instance, it has been long reported that the risk of cardiovascular diseases can be decreased by healthy eating (WHO, 1990), as well as other non-communicable diseases (NCDs), including diabetes, stroke and cancer (WHO, 2015). Furthermore, it has been reported that fruits and vegetables contain variety of vitamins, minerals, and other compounds that have been inversely associated with (CVDs) risk factors (Miller, 2000; Genkinger, 2004). According to World Health Organization, low fruit and vegetable intake are estimated to cause about 11% of stroke and 31% of ischemic heart disease worldwide (WHO, 2002). Moreover, fruits and vegetables are good sources of fibers, and high intakes of fibers induce weight loss (WHO, 2003). In addition, consuming milk and dairy products daily can be a protective factor because it contains various essential minerals and vitamins. Children who drink milk and dairy products tend to have better overall nutritional status (Ballew et al., 2000; Bowman, 2002).

Health, nutrition, and education are three fundamental pillars for growth and development (WHO, 2005), and they are interconnected. Healthy nutrition may affect intellectual development and learning performance. For instance, it has been reported that children who are hungry or who have poor diet are likely to: suffer from vitamin and mineral deficiencies (e.g. vitamin A, iron, iodine), grow slowly, have little energy to play or do physical work, have short attention spans and do less well at school (FAO, 2005). Previous studies reported relationship between school children nutritional status as well as dietary behaviors and their cognitive test scores or school performance. It has been reported that inadequate nutrient intake was associated with poor academic behavior and performance (Anzman-Frasca et al., 2015). Moreover, review studies suggested that breakfast consumption might enhance students' cognitive function, memory, test grades and school performance (Rampersaud et al., 2005; Adolphus et al., 2013).

Furthermore, it has been suggested that nutrition education in schools and school teachers are important in providing health education and improving a healthy lifestyle (Shah et al., 2010). Nutrition education has also been effective in creating positive attitudes towards fruits and vegetables among children (Wall et al., 2012; Prelip et al., 2012). Higher nutrition knowledge of the children was significantly associated with higher vegetable intake (Asakura et al., 2017). A whole-school approach toward healthy dietary behaviors can provide children and adolescents with the knowledge and skills and how best to implement them both within and outside the school setting (WHO, 2006). Nutrition education is defined as any educational strategies designed to enhance nutritional knowledge to facilitate voluntary adoption of healthy food choices. Nutrition education is important because it has the potential to prevent diseases and improve individuals' health.

Generally, eating behaviors are established during this period, and as many health related behaviors may persevere throughout adulthood. It has been stated that the progress of children's behaviors relies on actions carried out in school (WHO, 2006). This is widely acknowledged in developed countries and has created several initiatives throughout the European countries. Unfortunately, it can be clearly noticed that school environment and school health services (e.g. nutrition services, school nutrition education, etc) still not receiving the required attention by the education authorities and policy makers in Saudi Arabia as well as other developing countries. In the light of the above, and due to the lack of studies concerning school nutrition education in our region, it was necessary to conduct such study. It is hoped that this study will help to inform policy makers about nutrition education in schools.

Methods:

This cross-sectional study was conducted to assess nutrition education in schools from students' perspective in Al-Baha city, southwestern Saudi Arabia in 2013. The sample was drawn from primary schools using a multi-stage stratified sampling technique. At the first stage, a simple random-sampling procedure was used to select the schools (N= 10). At the second stage, a simple stratified random-sampling design technique was used to recruit students from different grade levels. All students in the selected classes were invited to participate in the study. Finally, 725 schoolchildren, aging from 7 to 12 years old were recruited in this study.

Students were asked separate questions regarding the role of schools in nutrition education as following: Have you been taught in school about healthy diet/nutrition?; Have you been taught in school about healthy way of gaining weight? Have you been taught in school about the healthy methods of losing weight? Have you been taught in school about food safety? Have you been taught in school how to prepare a healthy meal?. Body mass index (BMI) was calculated using the equation BMI = (weight [kg]/height [m2]). It is worth to mention that the study was first piloted among small sample of schoolchildren (n=32) who were not included in the main study. From the pilot study, it has been found that the children were not aware of their family socioeconomic status such as their parents' education level and family income, which limit the analyses performed in this study.

Data were entered, edited and analyzed using SPSS version 22. Frequencies of all responses were calculated. A binary regression analysis of being taught in schools about healthy nutrition with regard to other nutrition related behaviors were performed. A p-value < 0.05 was considered statistically significant in this study. Permission was obtained from the Education Directorate. The data were collected anonymously and the privacy and confidentiality of the data was strictly maintained.

Results:

The total sample included in this study was 725 children and the mean age was 9.8

years, ranged between 7–12 years old (S.D = 1.6). Table 1: shows that 55.8% of the total students stated they have been taught about healthy nutrition/diet. Moreover, only 11.6% and 17% stated they have been taught about the healthy methods to gain or lose weight, respectively. Only 24.4% and 31% reported being taught in schools about the healthy way to prepare healthy meal and about food safety (e.g. how to safely prepare and store food), respectively.

Table 1: Students perception to the schools role with regard to nutrition education

Items		
Taught in school about healthy nutrition/diet		
	No.	%
Yes	419	55.8
No	306	42.2
Total	725	100.0
Taught in school about healthy way of gaining weight		
	No.	%
Yes	84	11.6
No	641	88.4
Total	725	100.0
Taught in school about the healthy methods of losing weight		
	No.	%
Yes	123	17.0
No	602	83.0
Total	725	100.0
Taught in school about essential food safety		
	No.	%
Yes	225	31.0
No	500	69.0
Total	725	100.0
Taught in school how to make healthy meals		
	No.	%
Yes	177	24.4
No	548	75.6
Total	725	100.0

Among the different nutrition information sources, family (64%) and media (59%) were reported as the most sources of nutrition information among children. Schools came as the third source of nutrition information (54%) followed by friends (24%), (Figure 1). Moreover, out of 725 students participated in this study, 96% stated that they need nutrition education program (Figure 2).

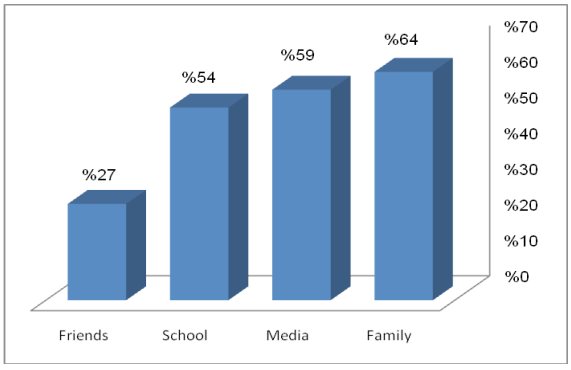


Figure 1: Sources of nutrition information among schoolchildren

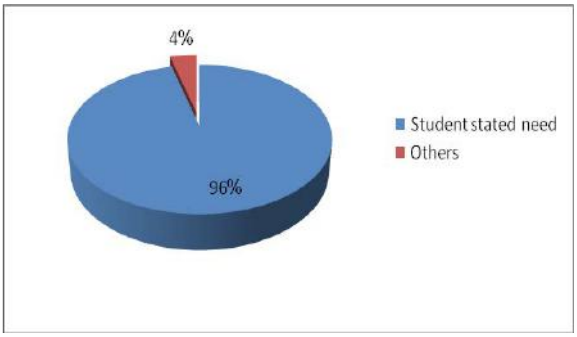


Figure 2: Students self - reported need for nutrition education programme.

Table 2, represents the binary logistic regression analysis of the students perception of being taught from schools about the healthy nutrition with regard to many correlates variables. The analysis showed that being taught in schools about healthy nutrition was associated positively with children age (OR= 1.1, 95% CI: 1.0 – 1.2, p = 0.039). On the other hand, there were no differences between the group who stated being taught about healthy nutrition/healthy dietary and

the group who stated not being taught from schools about healthy nutrition with regards to their dietary behaviors of consuming fruit daily (OR= 1.1, 95% CI: 0.7 – 1.6, $p = 0.549$), consuming vegetables daily (OR= 1.0, 95% CI: 0.7 – 1.4, $p = 0.997$), consuming milk and dairy products (OR= 0.9, 95% CI: 0.6 – 1.2, $p = 0.373$), consuming sweets daily (OR= 1.3, 95% CI: 0.9 – 1.9, $p = 0.115$), consuming soft drinks daily (OR= 1.4, 95% CI: 0.9 – 2.2, p= 0.078), energy drinks daily (OR= 0.8, 95% CI: 0.4 – 1.7, p= 0.595), eating high fat food every day (OR= 1.0, 95% CI: 0.8 – 1.5, p= 0.877), consuming fast food regularly (OR= 0.7, 95% CI: 0.5 – 1.1, p= 0.196), and students BMI (OR= 1.0, 95% CI: 0.9 – 1.1, p= 0.868).

Table 2: Regression analysis of students perception of being taught about healthy eating in schools and student's dietary behaviors and BMI

Variables	OR. [C.I.]	*P*- value
Age	1.1 [1.0 – 1.2]	0.039
BMI	1.0 [0.9 – 1.1]	0.868
Consuming Fruit Not every day Every day	 Ref 1.1 [0.7 – 1.6]	 0.549
Consuming Vegetables Not every day Every day	 Ref 1.0 [0.7 – 1.4]	 0.997
Consuming Milk Products Not every day Every day	 Ref 0.9 [0.6 – 1.2]	 0.373
Consuming Sweets Products Not every day Every day	 Ref 1.3 [0.9 – 1.9]	 0.115
Consuming Soft-Carbonated Drinks Not every day Every day	 Ref 1.4 [0.9 – 2.2]	 0.078
Consuming Energy drinks Not every day Every day	 Ref 0.8 [0.4 – 1.7]	 0.595
Consuming Fast Foods Not Regularly Regularly	 Ref 0.7 [0.5 – 1.1]	 0.196
Consuming High Fat Foods Not every day Every day	 Ref 1.0 [0.7– 1.5]	 0.877

Discussion:

This study indicated that school-based nutrition education was not found to be offered in all the visited schools. Also, unlike many countries world-wide, this study revealed that nutrition coordinators were not available in any of the visited schools. About 55.8% of the total students stated they have been taught during their school days about healthy nutrition/ diet, and only 24.4% and 31% reported being taught about how to prepare healthy meal and learned about food safety. Also, the majority of the school children (96%) stated that they need school-based health education program regarding healthy diet and nutrition. These results highlight the urgent need for school-based nutrition education program in Saudi Arabia. As a result, school-based nutrition education should be established, enhanced

and promoted, which can lead to improve children dietary behaviors and contribute to health improvement. It has been reported that healthy nutrition behaviors in childhood can improve people well-being, learning ability and leading to better academic performance (WHO, 2006). School-based nutrition education can improve dietary behaviors that affect young people growth, health and intellectual development (CDC, 1996). It has been reported that many children and adolescents grow up without learning the basic skills of how to arrange for a healthy diet (WHO, 2006), which may increase their tendency of eating out, encouraging the consumption of snacks with poor nutrient content, large portions of meals and high calories. Therefore, nutrition program interventions need to occur early in childhood in order to prevent overweight and unhealthy eating behaviors and the adverse health effects (St-Onge et al., 2003), and school-based nutrition education programs must become a national priority (CDC, 1996).

In addition, this study found that the majority of the students were not taught about the healthy methods of gaining or losing weight. Unhealthy losing weight practices have long been reported among children (Mellin, 1988; Maloney et al., 1989). In United States, it has been reported that many young people practice unsafe weight-loss methods (CDC, 1996). The use of dieting and weight control methods among young people has grabbed many public concerns, due to the associated negative physiological and psychological consequences (WHO, 2006). Therefore, children and adolescents should learn about the danger of harmful/unhealthy weight-loss techniques and about the health ways of maintaining a healthy weight (CDC, 1996). Thus, these findings highlight the need for school-based nutrition education taking into account many related issues such as the healthy methods of maintaining ideal weight, ineffectiveness and unhealthful weight-gain and weight-loss practices among children.

The logistic analysis (Table 2) showed that students perceptions of being taught in schools about healthy nutrition was only associated positively with an increase in children age. This positive association might be attributed to the effect of students' school grades or their cognitive development, experiences and awareness. On the other hand, there were no differences between the group who stated being taught about nutrition/healthy dietary behaviors and the group who stated not being taught concerning their dietary behaviors and students BMI. This might be due to the lack of efficient school-based nutrition education (e.g. scientific, effective, continuous and systematic) and the absence of nutrition coordinators in schools, which this study has revealed. In addition, these findings beg the questions of the effectiveness and the bear equality of nutrition education that those students receive and perceive from schools. Nutrition education in schools and school teachers are important in providing health education and improving a healthy lifestyle (Shah et al., 2010), which in turn

can improve children dietary knowledge and behaviors. Similarly, it has been stated that higher nutrition knowledge was significantly associated with higher vegetable intake among children (Asakura et al., 2017). Family dietary behaviors and social/culture influences can have a great effect upon children dietary knowledge, attitudes and behaviors. Consistent associations were found between parent and children's eating behaviors and children attitudes (Brown and Ogden, 2004). Moreover, children's eating behaviors are strongly influenced by surrounded physical and social environment (Patrick and Nicklas, 2005); including availability and easily accessibility to healthy food and several socioeconomic and sociocultural factors such as parents' background and education have strong influence upon children dietary behaviors.

As this study revealed (Figure 1), family and media were the most common sources of nutrition information among children. Unfortunately, schools were reported came as the third source for nutrition information followed by friends. Similarly, it has been reported elsewhere that the students' knowledge of food and nutrition was insufficient, and most of the nutrition information was obtained through the media (Brook and Tepper, 1997). In line with that, the radio and TV, followed by family/ friends were the most sources of nutrition information (Charlton et al., 2004). The finding that the media is popular source of nutrition information amongst children may have both negative and positive implications. On one hand, media can send important nutrition messages and reach many children and schools easily. Which reaches on the other hand, it has been reported that about half of the nutrition information advertisements in food and beverage was misleading or related to inaccurate (Byrd-Bredbenner and Grasso, 2000). Therefore, policy makers should pay more attention, use the media more effectively to design, and promote healthy nutrition information in order to improve people dietary behaviors. Additionally, it has been suggested that there is a necessity to develop consumer education programs to equip people with the skills needed to evaluate the validity of nutrition information presented via the media (Byrd-Bredbenner and Grasso, 2000).

The overall findings indicate that there is crucial need for more extensive effort. In particular, opportunity exist for development of appropriate school-based nutrition education so the messages received by students are effective, consistent and aimed at motivating children to choose a healthy diet. Schools can offer effective, efficient and better opportunities than any other setting to promote and support healthy eating. It has been reported that school nutrition education serves as a means to advise families and community members about ways to prevent malnutrition and promote health (WHO, 1998). Nutrition education has been shown to have a significant effect in fostering healthful dietary behaviors (Berg, 1993). A significant impact of educative nutrition intervention on

knowledge and behavior were documented (Shah et al., 2010; Fahlman et al., 2008). A whole-school approach toward healthy dietary behaviors can provide children and adolescents with the knowledge and skills and how best to implement them both within and outside the school setting (WHO, 2006).

The challenge in education is not about to get children into school nowadays, but also to improve the overall quality of school environment, school services and address students' needs (Alsubaie and Omer, 2015). Therefore, school environment must be of central interest to policy makers and Ministry of Education in Saudi Arabia. However, there are some evidences that schools in Saudi Arabia suffer and lack of some environment measures (Alsubaie, 2014a; Alsubaie, 2014b). Investments in schools are predicted to yield benefits to individuals, communities and nations as a whole (WHO, 1998).

Some limitations should be highlighted. First, this study was based on questionnaire cross-sectional design, which might be subjected to over reporting or under reporting. Second, according to Saudi culture and education system male and female are separated in schools, consequently it was not allowed for male investigators to access female schools or contact female students. Therefore, female schools and students were not included in this study.

Conclusion:

This study revealed that school-based nutrition education program is lacking, insufficient and ineffective. Therefore, there is a great need for school-based nutrition education and consistent health education programs to be established in schools to promote healthy nutrition and improve children dietary behaviors.

It is hoped that this study can serve as a reference point for future research in the field of nutrition education in Saudi Arabia. Further and extensive in-depth studies exploring nutrition education in schools and its barriers, correlates and determinants are highly needed.

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Conflict of interest

The researchers declared that they have no competing interest.

Ethical approval statement

The study aims and protocol were explained to schools principals and teachers to allow and encourage students to participate in this study. Moreover, the study aims and questionnaire were explained to students. Schools and students' participation in the study was voluntary. Moreover, there was no intervention given or administered to the participants.

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