

Research Article

Case-Study: Nutritional Status and Contextual Factors in the Food Security of Teenager Students in Cartagena (Colombia)

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Abstract: The main goal was to determine the nutritional status and the contextual factors related to food security in teenagers from the educational institution Ciudadela 2000 (Cartagena). An anthropometric assessment (107 teenagers) was done to determine the nutritional status and a questionnaire was used to identify main issues regarding contextual factors (economic, mobility, environmental and sociocultural). The nutritional status: height-for-age index (78.3%) and BMI-for-age index (83%) indicated that most of the participants presented an adequate nutritional status. However, 18.9% of the participants presented a risk of low height and 2.8% presented low height for the age. Regarding the BMI-for-age index, participants presented a risk to thinness (8.5%) and overweight (7%). Regarding contextual factors, 68% of the teenagers indicated concerns related to food purchase and limited income for this. Additionally, 52% of the teenagers indicated that the food purchased at home did not last enough and that there was no money to buy more. On the other hand, 88% of participants indicated that there is an easy mobility to local markets for food purchase. Moreover, the teenagers presented hygiene habits intended to avoid cross-contamination of consumed food. However, there is environmental contamination close to the educational institution or to their homes. Finally, nutritional problems were more evident in lower socioeconomic levels (levels 1 and 2), but malnutrition caused by food excess was present in teenagers who belonged to a highest evaluated (level 3) socioeconomic level.

Keywords: Economic factor, environmental factor, mobility factor, nutritional status, sociocultural factor, teenager

INTRODUCTION

The adolescence is defined as a life period of an individual that includes the ages between 10 to 19 years old. During this period there is an increasing requirement of energy and nutrients. Therefore, the adolescence constitutes a period of great vulnerability and risk to physiological changes, since during this time there are a number of biological transformations that influence in the nutritional requirements and needs of each individual. These changes can be reflected in a positive or negative way in the nutritional status of human organisms. According to this, Veiga *et al.* (2013) have indicated that the interest regarding teenagers food intake is increasing and highly important since eating behavior and diet in this stage are associated with an increased risk of chronic diseases in adulthood. Moreover, teenagers are vulnerable to nutritional deficiencies caused by the organism's increased demand for nutrients required for the

development and growth of human body. This increased demand of nutrients results from an increased corporal growth speed, achieving the maximum peak of bone mass. Thus, at this point, the human body achieves 50% of its final weight, 25% of its size and 50% of its skeletal mass. Nutritional deficiencies at this stage of life can be caused by the lack of iron, calcium, zinc and vitamins, such as vitamin A, C, D and E, as well as those of the B complex (Veiga *et al.*, 2013).

Together with the physiological changes, there are changes in the corporal composition depending on the gender of the individual. In this regard, there is a notable increase in lean body mass in male individuals, while in female individuals there is an increased percentage of fat body mass; Consequently, female individuals present lower requirements of energy and nutrients than male individuals (Martín-Aragón and Marcos, 2016).

On the other hand, during this period of life, there are constant changes regarding eating habits, food

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preferences and choices. In this regard, Martínez-Roldán *et al.* (2005) have indicated that teenagers constitute a vulnerable population from the point of view of nutritional status, due to the different factors that teenagers face during this time, such as publicity pressure, improper slimming regimens, pressure related to beauty patterns and physical aspects, irregular schedule in the consumption of food due to school pressure, among others. Hence, teenagers can acquire inappropriate eating behavior, which includes suppression of some meals, development of preferences for a specific group of food, such as fat and sugar and in excessive amounts (Adaya *et al.*, 2013). Therefore, there is an increasing need to determine food practices and lifestyle in the aforementioned population. In this regard, the study of the nutritional status of teenagers that belong to socially vulnerable communities, approaching the concept of food and nutritional security, is of special concern.

Food security is defined by the Nutrition Institute of Central America and Panama (Instituto de Nutrición para Centroamérica y Panamá, INCAP) as an individual status in which people have permanent and equal opportunity to have physical, economic and social access to the required food, in quantity and quality necessary for the proper biological development, ensuring a general status of well-being that allows individual growth (Delgado *et al.*, 2002).

On the other hand, sometimes what is consumed not necessarily meet the nutritional requirements of individuals, since it might be that the ingested food does not provide the required nutrients needed biologically by the human body. This can result in multiple degenerative situations, such as a notable loss of weight or a difficulty to maintain a proper weight. As a consequence nutritional problems, such as food intake disorders and the development of non-communicable diseases, are manifested, which lead to a condition of food insecurity.

According to Wanden-Berghe *et al.* (2012), the basic causes of these problems are directly related to the lack of food access, lack of knowledge regarding healthy eating habits, as well as limited education and sanitary conditions of the surrounding environment. Specifically, the proper food access in enough quantity and quality is mandatory to ensure an optimal physiological, cognitive and emotional development from childhood to adulthood. However, the optimal individual development can be affected by the economic condition and developmental context in which the individual is inserted. One of the main reasons for food insecurity is related to limited economic resources (Cook and Frank, 2008). Thus, there is a special connection between poverty, low income and food security, being these three concepts closely related (Guardiola and González-Gómez, 2010). In this regard, the vulnerability related to food

insecurity is interpreted as the existence of a social, economic and cultural risk, as well as a lack of safe food that allows meeting the nutritional requirements of the population.

Several factors can lead a population to food insecurity. It might be by a limited food production in certain regions or countries, or in other cases due to low family income, which limits the access to basic food. This is reflected as a high level of food insecurity causing undernourishment problems, especially in the teenage population of low income. As a result, this population presents retarded growth, limited cognitive development and low scholar level (Belot and James, 2011).

Therefore, the main goal of this research was to determine the nutritional status and contextual factor that influence the food and nutritional security of the teenage population (between 15-17 years old) of the educative institution Ciudadela 2000, in Cartagena (Colombia).

MATERIALS AND METHODS

This research study was an observational and descriptive study, of a transversal character, being qualitative and quantitative.

The studied population was constituted by 299 teenager students from high school (Colombian school levels: 9°, 10° and 11°), with a sample of 107 students from the educational institution Ciudadela 2000, in Cartagena (Colombia). All teenagers participated in the study voluntarily. The nature and purpose of the study were explained to all participants and all of them signed an informed consent.

Determination of the contextual factors incidents on food security: Participant observation was used for the data collection, which allowed complementing and registering all details of teenagers.

Moreover, the questionnaire developed by the USDA (Moncada and Ortega, 2006) to measure the food insecurity was applied to teenagers in order to determine the contextual factors that have incidence in their food and nutritional security status. The used scale was slightly modified by the researchers in order to make the questionnaire more comprehensible to teenagers, preserving the numerical equivalents used by the USDA, which are as follows: Always = Each month; sometimes = Some months but not every month; rarely = only 1 to 2 months.

Additionally, elements from sociocultural, environmental, mobility and economic point of view were considered for the study of the factors that have incidence in the food and nutritional security of teenagers. This allowed the construction of the collective knowledge related to the different factors.

Table 1: Patterns of growth and development

Index	Range	Category
Height-for-age	<-2	Low height for age
	≥-2 a<-1	Risk of low height for age
	≥-1	Suitable height for age
BMI-for-age*	<-2	Thinness
	≥-2 a<-1	Risk to thinness
	≥-1 a≤1	Normal
	>1 a≤2	Overweight
	>2	Obesity

*: In the BMI index: +1DE is equivalent to a BMI of 25 kg/m² at 19 years old and +2 is equal to a BMI of 30 kg/m² at same age

The socioeconomic levels established in Colombia were considered for analyzing the economic factor. This classification reflects socioeconomic differences and their hierarchy. In this regard, the Colombian National Department of Statistics (DANE) indicated that socioeconomic levels 1, 2 and 3 correspond to social levels in which individuals have limited income and they are beneficiaries of public welfare regarding the payment of the public services. Socioeconomic levels 5 and 6 are higher social levels, which are constituted by individuals with increasing income; they are contributors to the economic welfare for lower levels. On the other hand, people who belong to the socioeconomic level 4 do not have to pay an additional contribution for welfare, but instead, they have to pay what the company of public service indicates for their consumption (DANE, 2012).

Determination of the nutritional status of teenagers:

The direct evaluation of the nutritional status of teenagers was determined by anthropometric measurements. In this regard, nutritional status was determined by height-for-age index and BMI-for-age index. The obtained data allowed the identification of optimal nutritional status, thinness, overweight or obesity. The analysis was done according to the Colombian resolution 2121 from 2010 (Colombia, 2010). The anthropometric measurement was done using a digital scale (SECA®) to determine participant's weight and stadiometer (SECA®) to determine participant' height. The anthropometric patterns (Colombian Resolution 2121) used as reference were adopted by Colombia for the new patterns of growth and development of the World Health Organization-WHO 2006-2007 (Table 1).

Ethical aspects: The ethical aspects of this study were assessed by the Ethical Committee of the University of Sinu (Universidad del Sinú, Seccional Cartagena) according to the Colombian Resolution 8430 (Colombia, 1993).

RESULTS AND DISCUSSION

General characteristics of teenager participants: The nourishment process plays an important and essential

role in the whole cycle of individual development (Danelon *et al.*, 2006). In this regard, the adolescence is an evolutionary period of life, in which has an end in the biopsychosocial maturity of individuals (Bertin *et al.*, 2008). According to the concepts traditionally accepted by the World Health Organization (WHO), the adolescence is a period of life that takes place between the ages of 10 to 19 years old of individuals, in which late adolescence ranges from 15 to 19 years old (Pérez and Santiago, 1999).

During this study, 40.7% of the participants were male individuals, while 59.3% were female. Additionally, 32% of the participants presented ages between 15 years old, 48.1% corresponded to 16 years old and 20% to 17 years old.

Context factor:

Economical aspect: According to ICBF (2010), the socioeconomic situation at homes has a direct effect on the food and nutritional security of families; this is due to the fact that family income is one of the main factors that determine food acquisition. In this regard, questions related specifically to this factor were applied to the participants.

Initially, the frequency distribution of teenagers regarding their socioeconomic level was determined. Obtained results showed that 75.9% of the participants belonged to the socioeconomic level 1, followed by 22.2% who belonged to the socioeconomic level 2 and 1.9% who belonged to the socioeconomic level 3.

Another factor that should be remarked it the ability to generate income by any of the productive members of the family. According to this, the results from the Colombian National Nutrition Status Survey have indicated that the ability to generate income is an essential factor to have access to food in the required quality and quantity in order to meet the nutritional requirements of all family members (ICBF, 2010). Thus, specific questions related to this context were done to the teenager participants. Applied questions included: have you been worried about finishing the food before getting money to buy more?; did not the food in your home last and did your family have any more money to buy additional food?; did your family buy the cheapest food because your family has little money?; Could your family have a balanced food intake?; did you eat enough? (Fig. 1).

According to obtained results, 68% of participants were concern about finishing the food before their families being able to get more. Additionally, 52% of the participants indicated that sometimes the food at home did not last and their families had no additional money to buy more.

Moreover, 30% of the participants indicated that their families always buy cheap food (associated with low nutritional quality) because of limited income. However, 45% of the participants indicated that rarely

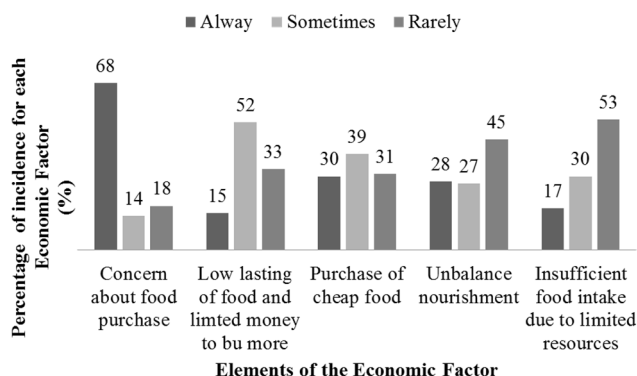


Fig. 1: Questions related to the economic condition of participants

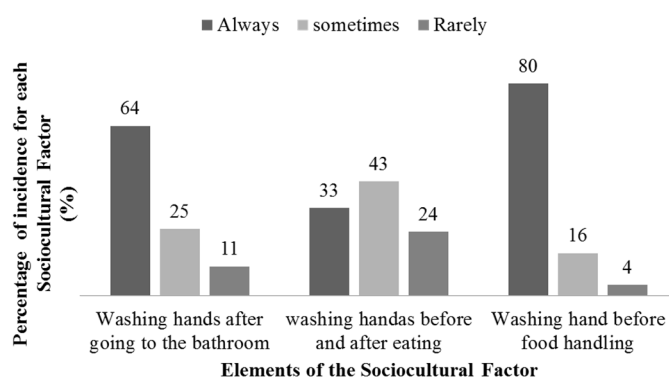


Fig. 2: Questions related to the sociocultural factor of participants

they had an unbalanced food intake, which shows limited knowledge regarding nutritional and healthy diet. Finally, 53% of the participants indicated that they eat enough food although they have limited income conditions. Overall, these results show that limited income constitutes an important factor that is reflected in a high concern of teenagers regarding food purchase.

Context factor:

Environmental and sociocultural aspect: One of the fundamental axes of food and nutritional security is the quality and safety of food products, which is determined by cultural practices of individuals related mainly to hygiene and availability of natural resources (such as water and clean environment). These resources are considered as essentials in order to ensure hygiene and disinfection practices in food dealing process. In this regard, the water accessible to participants' families was safe drinking water from the Cartagena's water system. This water meets the requirements of the national Colombian legislation related to drinking water (Act 1575 in Resolution 2115 from 2007, Ministry of Social Protection).

Moreover, according to the CONPES 113, which contains the Colombian National Food and Nutritional Security Policy, defines the axis of quality and safety of food as a set of characteristics of food products that ensure them to be safe for consumption (Colombia,

2008). To achieve this set of characteristics it is mandatory to meet certain sanitary conditions applied to the whole process of food transformation. One of these conditions is water access. Moreover, the practices that are related to these conditions are washing hands before eating and preparing food, washing food and washing hands after going to the bathroom (Fig. 2).

From this, results showed that 64% of the teenagers always washed their hands after going to the bathroom. However, only 33% of the participants indicated that washed hands before and after eating, which indicated that this habit should be reinforced.

On the other hand, a positive factor is that 80% of the teenagers indicated that people at home in charge of cooking and dealing with food always wash them before preparing it. From this, it can be noticed that participants have a degree of knowledge regarding food hygiene in order to avoid cross-contamination.

Regarding the environmental factor, 91% of the participants indicated that there is environmental contamination, such as garbage, dirtiness, waste, dirty water, among others) close to their homes or their institution. Moreover, 87% of the participants indicated that there are mosquitos, rodent, or any kind of insects close to their homes. As a positive factor, 81% of the participants indicated that they have in their houses Sanitary and sewerage services (Fig. 3).

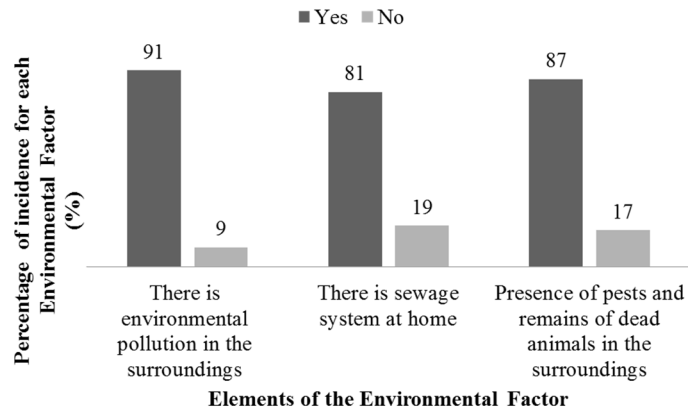


Fig. 3: Questions related to the environmental factor

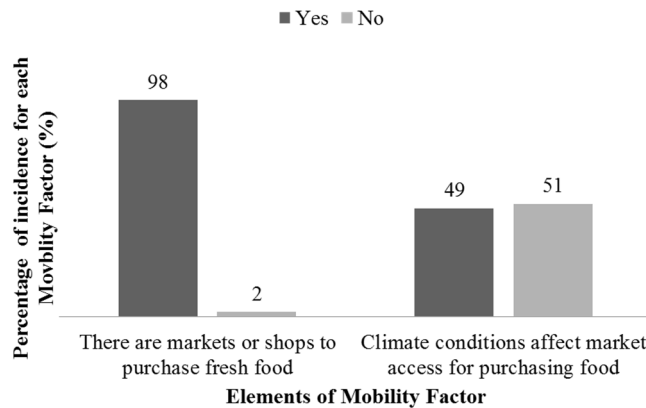


Fig. 4: Questions related to the mobility factor

In this regard, there was observed the need to improve the environmental conditions, especially those related to waste management, which might allow diminishing the incidence of pests.

Context factor:

Mobility aspect: Another fundamental axis of food security is the food access, which is defined in the CONPEs 113 (Colombian National Policy of Food and Nutritional Security) as “all the possibilities that people have to achieve proper and sustainable nourishment”. Besides the economic factor as a fundamental key to ensuring the access, other factors can be highlighted as determinants of food access, such as the availability of food markets in societies in which they have no options for food purchase, as well as the mobility of consumers to reach those markets and finally satisfy their nutritional needs (Colombia, 2008; Truchero, 2015).

Therefore, the study of these factors allows determining whether individuals of a specific society are exposed to food deserts. In this regard, a food desert is a situation in which there is a lack of food markets that allow food purchase by consumers (Truchero, 2015). In this study, two questions related to this topic were done. These questions intended to emphasize on

the existence of fresh food in local markets and the effect of climate conditions on mobility to reach those markets (Fig. 4).

Obtained results showed that 98% of the participants had close food local markets in which they can have access to fresh food. Additionally, 88% of the participants indicated that the mobility to those food markets is easy (data not shown). Moreover, 51% of the teenagers indicated that climate conditions did not affect the access to food in those markets, while 49% indicated the opposite. These results indicated that although some participants perceived some limitations regarding food access caused by climate conditions, there is no evidence of food deserts in their area.

Nutritional status:

Nutritional status according to the height-for-age index: Regarding anthropometric measurements of participants and considering the height-for-age index, it was observed that 78.3% of the participants had proper levels for this parameters and thus an adequate nourishment, 18.9% presented a risk of low height for their age and 2.8% presented low height for their age.

Regarding the nutritional status of female participants, results showed that 81% of the participants

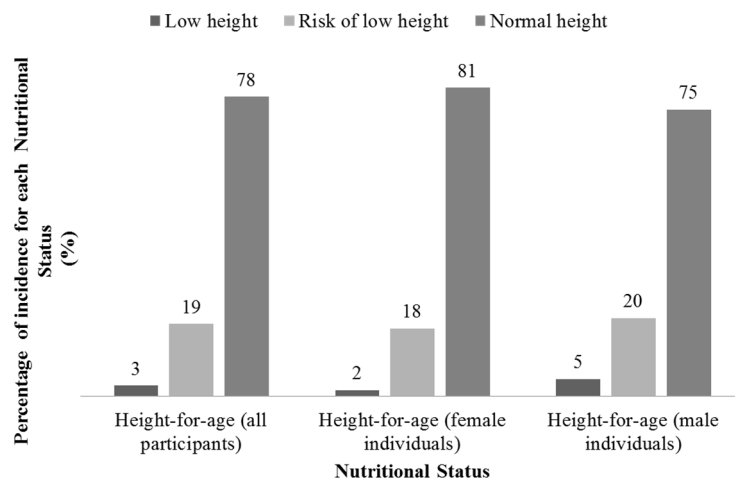


Fig. 5: Nutritional status of participants according to the height-for-age index

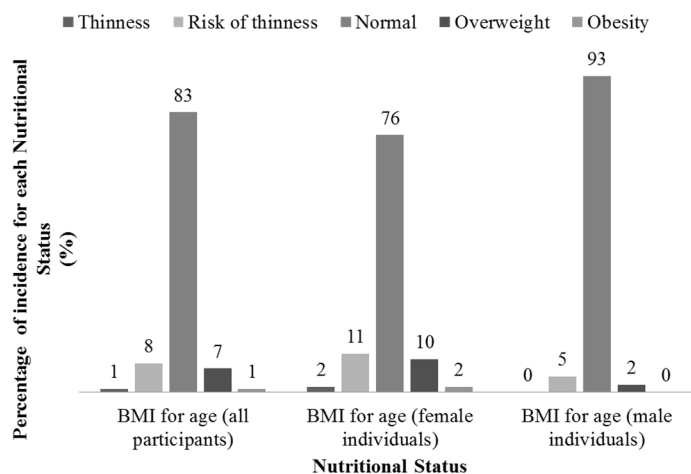


Fig. 6: Nutritional status of participants according to the BMI-for-age index

within this group presented normal values for the height-for-age index, while 18% presented a risk of low height and only 2% presented low height for their age. Regarding male participants, results showed that 75% of the participants within this group presented adequate values of this index, while the 20% presented risk of low height and only 5% presented low height for the age (Fig. 5).

Hence, malnutrition conditions were observed in participants from both genders. In comparison to the Colombian national tendencies observed for this index, the percentage found in this study is lower than the value reported at the national level for children from both genders (10%) with ages ranging from 5 to 18 years old (ICBF, 2010).

Nutritional status according to the Body Mass Index (BMI) for age index: Regarding the nutritional status of participants, results showed that 83% of the participants presented an adequate BMI for their age, 8% presented a risk to thinness, 7% presented

overweight, 1% presented thinness and 1% presented obesity (Fig. 6).

When results were analyzed by gender, it was observed that 93% of the male participants had an adequate BMI, 5% presented a risk to thinness and 2% presented overweight. On the other hand, 76% of the female participants had an adequate BMI for their age, 11% presented a risk to thinness, 10% presented overweight and only 2% had obesity, thus malnutrition caused by excess and deficit affected female participants in major percentages.

Socioeconomic level and nutritional status: The analysis of the index for nutritional status “height-for-age” together with the socioeconomic level of participants showed that 76.3% participants from level 1 presented a major risk to stunted growth, followed by 21.7% of the participants from the level 2 and 1.8% of the participants with adequate index, from the level 3. This is directly related to the increased concern manifested by some of the participants regarding food

purchase and the limited income conditions at home, which is a common characteristic of the lower socioeconomic levels.

Regarding the analysis of the index for nutritional status “BMI-for-age” together with the socioeconomic level of the participants, results showed that 83% presented an adequate BMI index for their age, these participants belonged to 1, 2 and 3 levels. However, 7.5% of the participants from the socioeconomic level 1 presented a risk to thinness, while 1% of participants from this level was on thinness status already. On the other hand, 1% of the participants from level 1 was found obese, as well as 5.6% of the participants from level 2 and 1% of the participants from level 3.

Hence, these results indicated that 83% of the participants presented an adequate BMI for their age, showing a favorable effect on their health. However, 8.5% of the participants were on the risk of thinness. According to ENSIN 2005, at national level 3% of the population presented thinness; however, this situation changed in 2010 when only 2.1% of the population was reported with this status (ICBF, 2010).

Regarding overweight (6.6%) and obesity (0.9%), 7.5% of the students presented excess of weight. According to ENSIN 2010, at national level 25.9% of the population has overweight and this phenomenon has increased in the last 5 years (ICBF, 2010). Regarding the nutritional status, 2.8% of the population was reported as stunted growth and 18.9% as having a risk of stunted growth, as informed by ENSIN 2010.

Regarding the socioeconomic level analyzed together with the “height-for-age” index, 1.88% of the participants were from level 1 and they presented a high prevalence of stunted growth. Thus, these results evidence that the nutritional status is closely related to participants’ socioeconomic conditions and that this situation increases the level of concern among teenagers regarding food purchase at home.

CONCLUSION

This case-study showed that a meaningful percentage of teenager participants presented a risk to low height-for-age index since they were found under the average standard value established by the OMS. However, most of the teenagers were found in between normal parameters for this nutritional index. On the other hand, the analysis of the nutritional status and the socioeconomic level showed that nutritional problems by food deficit were caused mainly in participants at levels 1 and 2. While malnutrition caused by food excess was found in participants from socioeconomic level 3.

Schools and educational institutions constitute interesting spaces for promoting changes in the eating habits, although homes are also fundamental sceneries for stimulating habits changes in this context. Main

strategies that arise as alternatives for promoting positive changes in educational institutions include:

- Development of new research studies among teenagers, in order to identify other factors that can affect their life quality and their nutritional status.
- Implementation of local food and nutrition monitoring program specifically for teenagers, allowing the identification of teenagers at risk of malnutrition.
- Organization of extracurricular activities intended to achieve parents and other family members, in order to promote healthy eating habits at home.

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CONFLICT OF INTEREST

Authors disclose that there is no conflict of interest.

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