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Anemia and Nutritional Status of Preschool Children: Comparison between Two Childhood Education Centers in Botucatu City, Brazil

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Abstract

Background and Aim: Anemia is responsible for major problems in child growth and development, requiring identification and appropriate management to reduce complications and promote the overall health of children. Moreover, nutritional deficiencies also represent a major public health concern, and can lead to irreversible consequences for children. The aim of the study is to assess the prevalence of anemia, overweight and obesity in preschool children and compare two Municipal Childhood Education Centers (CEC), one located in a suburb of the urban area and the other one in a rural area in Botucatu city, Brazil.

Methods: A total of 151 children in the urban CEC and 31 children in the rural CEC were evaluated. Anthropometric measurements and nutritional status according to sex and age using the Body Mass Index were performed. The diagnosis of anemia was performed through the fingerstick hemoglobin level using the Bhemoglobin-meter device. The cutoff point was 11.0 g/dl according to recommendations for the age group from 4 to 72 months. Database was performed in Excel and analyzed using the Statistical Analysis System (SAS).

Results: A significant association was found between CECs and nutritional status and anemia, with higher prevalence of overweight children and with anemia in the urban CEC (p=0.002).

Conclusions: Anemia remains as a childhood public health problem despite all efforts through policies against it. Obesity and overweight in childhood really reveal alarming data just at preschool age. Surveillance and combating measures should be taken as a public policy involving different sectors besides health.

Keywords: Anemia; Nutritional status; Child; Preschool; Childhood education center

Introduction

The institutional care for children in Brazil and in the world has throughout its history conceptions been quite different concerning its social purpose. This fact has influenced, even today, the opinions of parents, teachers and other citizens about the meaning of work from these educational child care providers [1]. In a country where education is very important, childhood education must also be of utmost importance [1].

The social context from the latest decades, in which women are increasingly coming into the work market, has demanded new options for care of babies and small children. Although variations exist among different cultures, one of the main options of care chosen by families is the day-care center. Initially, day-care centers in Brazil were associated with care assistance for low-income populations and the work was of assistance nature, focusing feeding, hygiene and physical security of children. That reality has changed, and an increase in the number of day-care centers and maternal schools has occurred in all social classes. Even mothers, who do not work out, started seeking these spaces for children socialization. Consequently, day-care centers were increasingly acquiring an educative nature and an appropriate place to promote full growth and development of children [2].

Childhood education centers are appropriate institutions to monitor the development and growth of children and, by means of appropriate interventions, to promote health [3].

Thus, the challenge to integrate health and education of preschool children has required development of proposals involving different professionals.

Nutritional deficiencies, especially protein-energy malnutrition, overweight and obesity are infant health problems. Nutritional status influences growth and child development, therefore, nutritional assessment of this population is of utmost importance to identify risk groups and promote appropriate interventions.

Anemia is defined as the condition in which the hemoglobin content in the blood is below normal, as a result of lack of one or more essential nutrients especially iron. It is an important nutritional disorder and a major problem of child health. Hemoglobin is responsible for transporting oxygen in the blood, and its reduction brings serious repercussions on growth and development of children [4].

Recent studies have shown a significant reduction in child malnutrition and an increase in overweight and obesity in children, called "nutritional epidemiological transition" as a result of increased consumption of high fat and sugar foods [5]. The intake of pre-cooked meals, like "fast foods" or snacks and processed foods is partly attributed to this change, in which the rush of everyday life and the search for practicality took the place of healthy and proper meals.

There are differences between urban and rural areas concerning eating habits and specific customs from each region, which are linked to demographic and socioeconomic changes.

According to Brazilian research based on population data, people from urban areas consume more processed foods, while people from rural areas consume fresh foods [6]. Besides food, activities and games for children also influence their maintenance energy, and consequently, the nutritional status.

Physical activities such as running and jumping rope were disregarded amid computers, television and video games, generating a great physical inactivity in children in the world today, also motivated by high rates of violence and insecurity on the streets of cities in Brazil [7].

Therefore, proper assessment of the nutritional status and level of anemia in children, followed by relevant counseling on lifestyle habits, including diet and physical activities aimed at children and their families, is of great importance to reduce current health problems, mainly related to the cardiovascular system, and promote overall health of children.

Aims

Evaluate prevalence of anemia, overweight and obesity in preschool children and compare two Childhood Education Centers (CEC) located in urban and rural areas in Botucatu city, São Paulo state, Brazil.

Methods

A cross-sectional study was performed in two CECs from 2014 to 2015, in Botucatu city, São Paulo state, Brazil. This study was approved by the Research Ethics Committee of the Botucatu Medical School/ UNESP.

The study was conducted in two CECs, a urban CEC located in the suburb of Botucatu city and a rural CEC about 30 km far from the city implemented to assist children resident in a fishing village. The urban and rural centers had 160 and 40 children registered, respectively, and all of them were invited to attend the study.

The CECs in Brazil include preschool children as of 4 months old, after mothers finish the maternity leave, until 72 months old when children start the elementary school [8].

All children registered in the urban and rural CECs were evaluated after the person responsible for them had signed the Written Informed Consent Form (WICF).

There was no refusal of the participants, but in the meeting where the researchers presented the study and the WICF was given, 5.6% and 22.5% of the children's responsible people from the urban and rural CEC, respectively, were missing. Therefore, the numbers of children included in the study were 151 in the urban CEC and 31 in the rural CEC.

Data collection was carried out in the own CECs during the regular period that the preschool children attended them. For weight measurements a digital scale (Toledo®, SP, Brasil) was used with 199.95 kg maximum weighing capacity in 0.05 gram divisions. Height was measured using an anthropometric ruler of the scale, or length was measured with a horizontal anthropometer with 1-mm increment for the children less than 1.05 meters [9].

Anthropometric measurements were performed, and nutritional status evaluated according to sex and age using the Body Mass Index (BMI). These values were plotted into new curves proposed by WHO and the 2006 BMI and BMI z-score determined by the WHO or WHO Antrho and AnthroPlus software [10]. Nutritional status based on the results was: thin, normal weight, overweight, at risk of overweight or obese. Children with BMI greater than +1 SD were considered overweight, and at risk of overweight depending on the child be less than or more than 60 months; and BMI greater than +2 SD was defined as obesity. Thinness was defined as BMI below -2SD according to age and sex. Short stature: child height below -2 DP [11].

The diagnosis of anemia was performed by evaluating fingerstick hemoglobin level using the B-hemoglobinometer device (HemoCue®, Ängelhom, Sweden), which is portable validated bench equipment in peripheral blood. It requires small blood volume (20μL) and allows achieving immediate results. The cutoff point was 11.0 g/dl for the age group from 4 to 72 months. Less than 9.0 g/dl hemoglobin level was considered moderate/severe anemia [12]. Procedure gloves, lancets and micro cuvettes, all disposable and of single use were used for collection of biological material.

Database was performed in Excel and analyzed by the Statistical Analysis System (SAS), nonparametric Chi-square test, Fisher exact test and Mann-Whitney test [13].

Results

A total of 151 children in the urban and 31 children in the rural CEC were evaluated. These numbers represent all children who attended the CEC and whose parents\guardians authorized blood exams and anthropometric assessment as explained in the Method section.

The prevalence of anemia was 23% in urban CEC. Of these, 55% have mild anemia, 44% moderate and 1% severe. The average amount of hemoglobin is 11.1g/dl (± 1.2). The average age was 23.4 (± 6.8) months.

Table 1 shows the results of nutritional and hemoglobin assessments of each CEC and differences according to sex. A significant association was found between CEC and nutritional status and anemia, with higher prevalence of overweight children and with anemia in the urban CEC (p=0.002).

Although the frequency of children up to 6 years old with altered nutrition diagnosis was not statistically significant, the value was high. Overweight and obesity was 29% in the rural CEC and 46% in the urban CEC, including children at risk of overweight.

	Childhood Education Center				P
	Rural		Urban		
	N=31	%	N=151	%	
Sex					
Female	15	48	71	47.0	0.89
Male	16	52	80	53.0	
Anemic*					
Yes	2	8	23	23.0	0.01
Nutritional Status (IMC)**					
Thin	0	0	1	1.0	0.01
Normal	17	71	62	53.0	
Overweight risk	0	0	31	27.0	
Overweight	5	21	18	15.0	
Obese	2	8	5	4.0	

*Missing frequency=04 children in the rural and 51 children in the urban CEC; **Missing frequency=07 children in the rural and 34 children in the urban CEC.

Table 1: Nutritional status and diagnosis of anemia for each Childhood Education Center.

Discussion

The fact that researchers have been promoting health education activities in the urban CEC for five years, and just started them in the rural CEC in 2015 was the important reason, we believe, for the lower number of authorizations for evaluations when both centers are compared (94.4% versus 69.0%). Therefore, the link between education and health sectors is an important factor for adherence to studies and interdisciplinary projects.

Malnourished children (thinness) are currently considered a punctual issue, and overweight and obesity are a major concern as they have been reported at early ages. Brazil, like other developing countries, is currently experiencing a nutritional transition which is often determined by poor eating habits. Therefore, there is a tendency for reducing malnutrition associated with an increase in overweight at different stages of life [14].

In the urban CEC, the frequency of thinness (1%) is likely to be a result of children with chronic malnutrition, or any health problems that limited their growth, requiring better individual analysis of each case, which is the reason for referring these children to the pediatrics outpatient follow-up.

The prevalence of anemia in the urban CEC was considered high. Despite lack of comprehensive national studies, regional data have shown a substantial increase in the prevalence of anemia in Brazil. That increase is observed in children from all ages and socioeconomic levels.

Iron deficiency and anemia are caused by negative iron balance in the body. In contrast to the low global prevalence of anemia in childhood, it was found that the prevalence of anemia in children living in the suburbs of major North American cities is similar to the prevalence observed in developing countries [15], such as that found in this study.

Therefore, it is necessary to promote referrals to specific treatment for diagnoses of nutritional changes, and drug treatment of children diagnosed with anemia together with the activities of health education.

Feeding practices are associated with anemia in children [16,17]. In particular, fruits contain minerals and vitamins that stimulate iron absorption [18]. Data from the Consumer Expenditure Survey for 2002-03 [19], which considered the state capitals, showed that Rio Branco had the second lowest household availability of fruits and natural juices. Consequently, this situation exposes children from Rio Branco to anemia risk, especially through iron deficiency.

Children and adolescents in the study corroborate that Brazil as well as the world are experiencing a "nutritional epidemiological transition" which occurs worldwide [20] and increases the number of children and adolescents with nutritional diagnosis of overweight or obesity, rather than malnutrition/thinness in specific areas, either municipal or state areas, and simultaneously the increase in overweight and obesity in children.

This designation is characterized by a reduction in communicable diseases and an increase in chronic non-communicable diseases. Therefore, we experience two extremes of malnutrition in the same scenario: malnutrition because of lack, and obesity because of excess, what can be named as a nutritional paradox [21].

Therefore, nowadays, obesity and overweight are important problems of Public Health because of high prevalence in Brazilian adults and mainly in children and adolescents.

External socio-environmental factors have been considered of greater relevance concerning prevalence of obesity than genetic factors. Considering the major external factors for development of obesity, we

can highlight the prolonged intra or extra uterine exposure to lack of food, leading to malnutrition and tendency to later obesity; the nutritional transition based on changes from the traditional to contemporary pattern (preference for industrialized foods), and the urban life style, characterized by sedentariness of the population [22].

Urbanization and greater access to ready or pre-made food with low nutritional value can explain the higher prevalence of disorders found in our study in urban areas, while ancient practices of adequate feeding , such as eating more grains and vegetables have been still maintained in rural areas.

We believe that changes in eating habits of those who live in urban areas, associated with inadequate physical activities have contributed to changes in health diagnoses, while in rural areas or fishing villages, people still maintain a nutritionally adequate diet.

Important consequences from those changes are the excess weight, atherosclerosis and arterial hypertension-related diseases; adult-related diseases, which are initiated in the childhood and are associated with obesity [23].

Today, there is no doubt that a preventive approach should be initiated still in the childhood and adolescence. Besides being a beneficial intervention, the healthy feeding and life style habits are established during the childhood, leading to a reduction in sedentariness and to an increase in physical activities [24].

In Brazil and developed countries, the prevalence of obesity is growing strongly in both childhood and adolescence, and tends to persist during adulthood: About 50% of obese children at 6 months old and 80% of them at 5 years old will remain obese. In addition, scientific evidence has revealed that atherosclerosis and arterial hypertension are pathological processes initiated during childhood, and feeding and physical activity habits are established in this age period [25,26].

Conclusion

Anemia remains as a childhood public health problem despite all efforts through policies against it, such as, promotion of maternal breastfeeding, food fortification and prophylactic use of iron supplementation in the first year of age.

Obesity and overweight in childhood really reveal alarming data just at preschool age. Surveillance and combating measures should be taken as a public policy involving different sectors besides health.

Monitoring the nutritional profile helps to foster an attitude of surveillance and guidance in health promotion actions, individually and collectively. Nutritional counseling to caregivers and family is very important to reduce complications and promote overall health of children.

Authors' contributions

All authors have made substantial contributions to the study and endorsed data and conclusions. CRBF identified the research question, contributed to data collection, conducted the analyses and wrote the article with BLM. FTVF contributed to data collection. BLM, LRA, MMC and FNM contributed to data collection and literature review. All authors have read and approved the final manuscript.

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