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NUTRITIONAL STATUS OF CHILDREN FROM CAXIUANÃ NATIONAL FOREST, BRAZIL

Ligia Amaral Filgueiras[1*], Hilton P. Silva[2] and Edson Marcos Leal Soares Ramos[3]

[1]Universidade do Estado do Pará, Departamento de Ciências Naturais, Belém. Brasil
[2]Universidade Federal do Pará, Programa de Pós Graduação em Antropologia. Belém. Brasil
[3]Universidade Federal do Pará, Programa de Pós Graduação em Segurança Pública, Belém. Brasil

ABSTRACT

Riverine populations of the Brazilian Amazon are considered invisible and vulnerable and their health conditions have been poorly studied. We analyzed the health of 138 children aged 0 to 9 years old living in and around the Caxiuanã National Forest, Melgaço municipality, Pará, Brazil. Anthropometric measurements, clinical examinations, and bioanthropological questionnaires were performed to compare to World Health Organization parameters. There was significant difference between boys and girls from 0 to 4 years old in Height for Age (p = 0.038), with slightly smaller boys. About 13.9% of boys, aged 0 to 4 and 10.5% of girls, aged 5 to 9 years old were severely undernourished. More than 33% of the population had -2 Z scores, indicating long-term food deficiency or severe disease. Almost 13% of children from 0 to 4 years old are at risk of overweight, characterizing the nutritional transition. Despite malnutrition dropping in the Brazilian child population, for riverine children, growth is precarious, as the social determinants of health continue to affect the quality of life of these populations. There is no environmental sanitation in the communities, most homes do not have internal toilet, there is little access to education and health, and the water used is still from river or wells. Although there are some public policies for these populations, the situation of children from Caxiuanã National Forest remains a reflection of other rural Amazonian populations, requiring firmer and continuous government interventions.

INTRODUCTION

In the Amazon, in addition to the enormous diversity of fauna and flora, human populations called caboclos, riverine, quilombolas, indigenous and non-indigenous, can be found. The riverine populations of the Brazilian Amazon are non-indigenous, peasant groups, who have gone through a process of miscegenation between the white colonizer, the indigenous native population and the enslaved black African (TRECCANI, 2006; ADAMS *et al.*, 2006; LIMA; PEREIRA, 2007; FREITAS *et al.*, 2011; SILVA *et al.*, 2016). These populations generally have specific ways of life, depend on and deeply understand nature and its cycles, and use relatively simple technology, having little impact on the environment. They are considered invisible and vulnerable populations due to their living conditions. In addition, Silva (2006) states that the main health researches in this region are concentrated in two major areas: (1) the capitals and other urban areas, such as Belém, Santarém, Manaus, Boa Vista and Rio Branco, and (2) indigenous populations.

Even though Brazil is facing malnutrition decreases, what can be observed is that studies on riverine and quilombola populations from the northern of Brazil have shown important values of child malnutrition and nutritional transition of these populations (SILVA, 2001; BRASIL, 2007; PIPERATA, 2007; SILVA, 2009; FILGUEIRAS; SILVA, 2013; PIPERATA *et al.*, 2013 GUIMARÃES; SILVA 2015).

MATERIAL AND METHODS

This is a quantitative, cross-sectional study, following work already carried out in the Amazon region on the health of riverine populations and others that have previously been conducted in the Caxiuanã National Forest (SILVA, 2001; PIPERATA, 2007; PIPERATA *et al.*, 2011; PIPERATA *et al.*, 2013; FILGUEIRAS; SILVA, 2013; TAVARES, 2014). The project was approved by the Research Ethics Committee of the Institute of Psychiatry of the University of Rio de Janeiro

(CAE 3304.0.000.249-07), on March 2009. After clarification on the research, the Free and Informed Consent Term (TCLE) was voluntarily signed for those over 18 years old and/or legal guardians of minors. The research subjects were not identified by their official names and their information will be kept confidential. The personal data collected, therefore, will not, under any circumstances, be published during or after the survey. In most cases, it was decided to visit the homes (active search). When this was not possible, schools, sheds and churches were chosen and so proceeded with the analyzes. Data on physical growth, sanitation, nutrition and clinical health were collected following the internationally accepted protocols described by Frisancho (1990, 2008), Weiner and Lourie (1981) and WHO (1995, 1997). The individual clinical evaluation was made by a health professional, following the methodology described by Silva (2001), through anamnesis and a complete clinical examination, with the help of a stethoscope, clinical thermometer, and sphygmomanometer for the adults. All collected data were incorporated into a database where statistical analysis could be performed using Excel, SPSS, WHO-ANTHRO (available free on the WHO website), and STATISTICA. All stages of the project followed the parameters of CNS Resolution No. 196/1996 (BRASIL, 2012). According to the Brazilian Institute of Geography and Statistics (IBGE) (BRAZIL, 2015), the State of Pará has 1,247,689,515 square kilometers. Its population is over eight million people (8,175,113), with a demographic density of 6.55, 43.14% of which are considered poor, with 0.472 Gini Index (which measures the degree of income concentration of a state), ranging from 0 to 1, that is, the closer to 1, the more concentrated the income. The Caxiuanã National Forest was created by the Decree-Law No. 194 of November 22, 1961. It has approximately 322,400 hectares of primary tropical forest, close to Caxiuanã Bay, between the Xingu and Tapajós rivers (SOARES; LISBOA, 2009). It is one of the categories of Conservation Units for Sustainable Use (UCs) that are part of the National System of Conservation Units (SNUC), established in July of 2000 by the Federal Government (SILVA, 2001; SOARES; LISBOA, 2009; SILVA, 2011). According to the Chico Mendes Institute for Biodiversity Conservation (ICMBio), the municipalities of Portel, Melgaço, Porto de Moz, Gurupá and Senador José Porfírio belong to the region of the Caxiuanã National Forest. Portel and Melgaço own 59% and 41% of the Unit, respectively. It is a land-based ecosystem, typically Amazonian, which is never flooded, with a system of black water rivers, defined by Morán (1990) as "rivers of hunger", as they are acidic and poor in nutrients (LISBOA *et al.*, 2013). In 1993, the Ferreira Penna Scientific Station (ECFP) was launched, in partnership with ICMBio, and has served as a support and research base for the Museu Paraense Emílio Goeldi (MPEG). ECFP has a small health service with a nursing technician to assist the population in emergency cases, injections, blood pressure measurement, among other simpler services. According to Lisboa (2002) and Piperata *et al.* (2011) there are seven communities in the Caxiuanã National Forest: Caxiuanã, Pedreira, Laranjal, Pracupi, Cariá, Ilha de Terra and Camuim. The houses are scattered, varying from 2 to 10 house groups along the river banks, in addition to some more isolated families, which are between 500m to 5 or more kilometers apart. They are made of wood, straw and clay bricks. The riverine population is represented by about 413 people (207 men, 206 women), of whom approximately 60% are children and adolescents aged 0 to 19 years old (LISBOA *et al.*, 2013). Locomotion in these environments occurs through "cascos" (small canoes), larger canoes and few people own motor boats at the time of data collection (RAMOS, 2001; SOARES; LISBOA, 2009). Economy is characterized by subsistence activities, such as hunting and artisanal fishing, cassava cultivation (*Manihot esculenta* Crantz) for own consumption and sale in nearby locations, açaí (*Euterpe oleracea*) extraction, small animal farming, temporary jobs in logging companies and at the Ferreira Penna Scientific Station, in addition to retirements and pensions. From 2003 on, many families began to receive benefits from the government (Cash Transfer Programs), such as the "Bolsa Família Program" (SILVA, 2009; PIPERATA *et al.*, 2011).

RESULTS

The studied population was composed of 138 children from 0 to 9 years old, 61 boys and 76 girls. Of these, children aged 0 to 4 years totalized 73, with 37 girls and 36 boys. Children aged 5 to 9 years old were 65, with 40 girls and 25 boys (Table 1). The boys to girls ratio was approximately 0.8.

Table 1. Total distribution of children from 0 to 9 years old, by age and sex category, from the Caxiuanã National Forest and surroundings, Melgaço, Pará, Brazil, 2016

CATEGORIES	CAXIUANÃ CHILDREN				
	♀	%	♂	%	Subtotal
0-4	37	50.68	36	49.32	73
5-9	40	61.54	25	38.46	65
SUBTOTAL	77		61		
TOTAL			138		

Source: Authors, 2016.

Table 2. Comparison of the Means, Standard Deviation and *t* Test of the analyzed parameters of the 138 children (77 girls, 61 boys) aged 0 to 4 and 5 to 9 years old from the Caxiuanã National Forest and surroundings, Melgaço, Pará, Brazil, 2016

	0 a 4 year old children					5 a 9 year old children				
	♀		♂		*p*-value	♀		♂		*p*-value
Parameters	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Age	2.14	1.4	1.78	1.48	0.292	6.85	1.27	6.92	1.32	0.834
Weight/Height	-0.14	1.74	0.07	1.27	0.554	-0.37	0.58	-0.39	0.68	0.887
Height/Age	-1.12	1.38	-1.78	1.28	0.038*	-1.65	0.87	-1.55	0.62	0.588
Weight/Age	-0.72	1.33	-0.97	0.88	0.352	-1.1	0.56	-1.07	0.48	0.837
BMI/Age	-0.07	1.8	0.22	1.33	0.442	-0.34	0.66	-0.33	0.87	0.970

Note:*There is statistical difference from *t* Teste, that is, when *p*< 0.05.

Table 2 shows the means, standard deviation and *t* Test of the analyzed parameters of children aged 0 to 4 and 5 to 9 years old from the studied communities. There was a significant difference between boys and girls from 0 to 4 years old only in the Height for Age parameter ($p = 0.038$), where boys are slightly smaller than girls. There was no significant difference between children aged 5 to 9 years old, but almost all parameters express negative mean values.

Piperata *et al.* (2011) studied children under two years old from Caxiuanã, and stated 36% were small for their age, but did not find children with a deficit in Weight for Height. They also observed that 12% of children were already overweight or obese. To complement this idea, the authors claim that, despite observing some positive changes in their seven year study in the nutritional transition (2002-2007) with the adult and sub-adult populations of Caxiuanã National Forest, the growth of

Table 3. Comparison of the percentages of the nutritional status of the parameters Height for Age and BMI for Age of children aged 0 to 4 and 5 to 9 years old from the Caxiuanã National Forest and surroundings, Melgaço, Pará, Brazil, 2016

0 to 4 year old children						
	Height for Age		BMI for Age			
SEX	Severe Undernourished	Undernourished	Severely thin %	Thin	Overweight Risk	Overweight
	< - 3SP	< - 2SP	< - 3SP	<- 2SP	< + 1SP	< + 2SP
Both sexes	9.7	33.3	2.9	8.6	12.8	2.9
Boys	13.9	44.4	2.8	8.3	11.1	2.8
Girls	5.6	22.2	2.9	8.8	14.7	2.9
5 to 9 year old children						
Both sexes	6.5	33.9	0	3.3	1.6	0
Boys	0	33.3	0	8.3	0	0
Girls	10.5	34.2	0	0	2.6	0

Source: Authors, 2016.

Table 3 shows the nutritional status of the studied population. No cases of obesity were identified in the population, but there are children from 0 to 4 years old already at risk of being overweight (2.9% for both sexes). Nevertheless, it can be observed about 13.9% of boys from 0 to 4 years old were severe undernourished, as well as 10.5% of girls from 5 to 9 years old. In addition, 44.4% of boys aged 0 to 4 years and 34.2% of girls aged 5 to 9 were undernourished.

DISCUSSION

The studied population, both 0 to 4 and 5 to 9 year old children, has high percentages in the -3 Z score: almost 14% of the 0 to 4 year old boys, 10.5% of the 5 to 9 year old girls and more than 33% of the children are in the -2 Z score, which indicates an apparent severe and prolonged process of energy loss, possibly associated with a long-term lack of food, food insecurity or a severe chronic disease. At the same time, it was observed that almost 13% of 0 to 4 year old children are at risk of being overweight, characterizing this population as facing nutritional transition. According to the WHO (1995), this state of malnutrition will potentially indicate future obese adults, if public health programs are not effectively implemented and made available to these populations. The social determinants of health directly influence the growth and quality of life of these children. Silva (2001, p.89) in his study of Caxiuanã, Aracampina and Santana children pointed out Caxiuanã children, in general, were in greater deficits, being smaller and lighter than those of Aracampina and Santana. It is noteworthy at that time (1996/97) 79.6% of children were in -2 Z score for Height for Age and 34.8% in -2 Z score for Weight for Age (SILVA, 2001). Silva (2001) states Caxiuanã children were always with negative scores in relation to other Amazonian populations and the WHO parameters. The main health problems observed were: intestinal parasites, diarrhea, anemia, acute respiratory diseases, dermatitis and cavities, while the adult population suffered from diffuse joint and abdominal pains, headaches, parasites and asthenia, mainly due to the lack of environmental sanitation, and use of river water, a source of concern for all residents, and possibly the origin of diseases (SILVA, 2001).

children in these populations does not appear to be improving, even with the use of government aid programs, such as Bolsa Família. In this research, the data corroborate with the findings of these authors: according to the survey carried out in 2009, this picture did not have great differences. It is important to note that Melgaço, where the Caxiuanã National Forest is located, has one of the lowest Human Development Indexes (IDH) (0.418) from Brazil (PNUD, 2013). In other words, the three pillars that make up the IDH (health, education and income) are seriously compromised in Melgaço, directly influencing the quality of life of the local population and its surroundings. The water used remains that from river or wells, in most cases. There are high rates of intestinal parasitism, which continue to exert great pressure on the nutritional status of children in general, but especially up to 5 years of age (SILVA, 2009; TAVARES, 2014). In general, traditional indigenous and non-indigenous rural populations in the Amazon have serious health problems (infectious-parasitic diseases - 50% prevalence in children up to 10 years old), respiratory tract disorders, nutritional deficiencies, highly compromised oral health, in addition to problems with environmental order such as the absence of sanitary sewage and treated water (SILVA, 2004).

Oliveira (2010) analyzed 203 riverine children under two years old from four cities in the State of Pará (Aveiro - Southwest region, Barcarena - metropolitan region, Cametá - northeast region and Santarém - Lower Amazonas region), and found out malnutrition reaches 35% reinforcing that malnutrition in Amazonian riverine populations is still serious due to the longer time of exposure to environmental risks. Further, according to the author, 2.8% of mothers were overweight, pointing to the nutritional transition these populations have been experiencing. Filgueiras and Silva (2009) investigated 76 children aged 0 to 5 years old from the Mamirauá Sustainable Development Reserve, in the State of Amazonas, northern Brazil, and found out that 41% were malnourished, especially girls, while 39.3% of the adult population were overweight, mainly women. This frame is very common in rural Brazilian populations: malnourished children living with overweight people in the same family, evidencing the nutritional transition

is becoming an important public health problem. In this article, the results are similar. It is noted, therefore, the health situation of this riverine population from Caxiuanã and its surroundings has changed little since the past decade, although there have been improvements in transport, energy, and an increase in purchasing power due to the government's income transfer programs, especially the Bolsa Família.

The health situation in the Amazon region is the result of historical, economic and social processes, with impacts on its forest resources, causing an epidemiological situation, where diseases such as intestinal parasites, malaria, tuberculosis, hepatitis, leprosy and others are always present. However, in addition to these factors, there is a lack of management capacity from the public health services, low technological incorporation, and great difficulties in allocating health (and education) professionals in the region. There has been a greater attempt to allocate financial resources to the northern region, in order to mitigate the difficulties in the health area;however, the values available for the Amazon are usually below the national average. This compromises the resource allocation and consolidation of SUS (Unified Health System), and characterizes the situation of inequality among the Brazilian regions (OLIVEIRA, 2008).

Final Considerations

It is important to highlight that the improvement of the economic conditions of the Caxiuanã National Forest population (income increasing) observed in the last decade has not meant a proportional improvement to the social determinants of health, principally in the first years of life. Children continue distant from the international parameters of a healthy population, with almost 33% of them with a -2 Z score, indicating there is growth delay, especially concerning the Heightforage parameter, showing chronic malnutrition. Furthermore, almost 3% of the population is already at risk of being overweight. Nonetheless, other variables also need to be considered such as the difficulties related to the environment of the Amazon region, such as periodic floods, which bring ecological, epidemiological, sanitary and biosocial challenges, and end up hampering the implementation of public policies favorable to this portion of the population. Albeit there is a certain effort on the part of the governments, the situation of the Caxiuanã National Forest population remains similar to that of other rural Amazonian populations, a situation that calls for more effective and continuous intervention by government agents, and for the planning and implementation of long term public policies, which effectively translate into improving the quality of life and health of local populations.

Acknowledgements

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