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Food Insecurity and Nutritional Status in the Population of High Degree of Poverty in Northeast, Brazil

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1. Introduction

If, in terms of globalized markets, the worldwide availability of food is surplus, at the level of many developing countries and regions, mainly in relation to the social groups and families of low socioeconomic conditions, the irregular access to a basket of sufficient and adequate products for a good health condition and nutrition becomes problematic and thus represent an insecurity situation. It is estimated that more than 800 million people live in this condition (FAO, 2006). The analysis of this situation gathers national food balance sheets (per capita availability), studies on family budgets, income/food prices ratio and consumer surveys at family level, as indicators of monitor labor market and of basic food basket (FAO, 2002).

However, the contingent of families and their members who are not considered safe regarding to physical and economic regular access for full care on their food consumption needs would be much higher than reported on a world scale, regions, countries or areas under adverse socioeconomic conditions (Melgar-Quiñonez, et al., 2005). In this context, situations on food insecurity can be identified by several conditions, such as hunger, malnutrition, specific needs, overweight, diseases caused by inadequate diet and consumption of products harmful to health, such as pesticides, heavy metals, fungi, bacteria and others contaminants.

Currently, situations of hunger as a consequence of food insecurity process is no longer configured as a predominant problem on natural resources limitation or technical knowledge, but the distortions in the production and distribution of wealth between regions, countries and social classes. Thus, the control on food and nutritional situation moves out of the geographical areas where it has traditionally been described to a political dimension, involving human development principles and rights (Valente, 2003).

In reality, the current concept of food security represents a holistic intersectorial and multidisciplinary principles, involving the whole chain of events that goes from food production, consumption and biological use of energy and nutrients, enabling the

nutritional status of individuals, families and population characterization. This way, as for citizenship rights, food security considers as ideal the access to all people, in all places during the whole time, a basic set of food in suitable quantity and quality to meet the energy, macro and micronutrients recommendation needs, thus ensuring a desirable health and nutritional condition (CONSEA, 2006). It is explicit, also that these more specific goals should be accomplished in the context of other rights, such as health, education, culture, participation, ecological preservation and ideally, the exercise of an ethically professional activity and culturally validated as a condition for its legitimacy. It would be (or will be) a citizenship mandate which includes as the most innovative aspect of human development and sustainability.

2. The epidemiological transition and food and nutrition security

Although, epidemiological transition can be considered as an old process, its definition, concept and object of study are still recent. In the sixties, Frederiksen (1969) made important contributions to understanding the economic and demographic transition and more recently, Popkin (1993) for the definition of the nutritional transition.

In essence, the epidemiological transition constitutes the inverse of a historic stage in the evolution of human nosography replacing the predominance of infectious diseases and nutritional deficiencies by a model characterized by the hegemony of non-transmittable chronic diseases combined with overweight and obesity. Therefore, excess of high caloric food make up the unhealthy food pattern, such us high consumption of salt, sugar, saturated fatty acids and calories derived from alcohol intake associated to a recent historical sedentary condition:.

Brazil represents in a worldwide level, a very illustrative example on epidemiological transition, especially in the nutritional field, by means of the speed process, the characterization of a hybrid model (double load of diseases) and its pan-geographic and pan-social diffusion and above all, marked on atypical or paradoxes occurrence.

In relation to the first aspect, it should be noted that, while in the most developed countries in Europe (the Nordic, as an illustration), the epidemiological transition took more than 80 years (i.e. four generations) "to complete its life cycle". In Brazil the same process practically configured itself in around 40 years, less than two generations. On the other hand, the nutritional change occurred in Brazil in little more than three decades, minimized the large geographical differences (South and Southeast Regions, on the one side and the North and Northeast by another), in addition to reducing morbidity nutritional patterns to little significant values between the richer stratum and the poorest layer of the population (Monteiro, et al., 2002).

Also the improvement of the income with the participation of female labor, and the increase in household budgets by cash transfer of the Federal Government Programs, such as the *Bolsa Família* Program (family stipend) is considered an important strategy to combat hunger and poverty, promoting the income increase and giving greater autonomy to families in meeting their needs (Marques, 2005).

From this perspective, with a goal to analyze the behavior of the nutritional status in the context of great changing process, it was considered interesting to focus into two states

(Pernambuco and Paraiba) in the Northeast, the poorest region of the country, with more than 80% of the families classified below the poverty line or with an income of less than one dollar per capita. Two municipalities distinguished by their socio-environmental conditions, remarkably unfavorable were chosen: Gameleira (Sugar-cane region of Pernambuco State) and São João do Tigre (Semi-arid region of Paraíba State). Two decades ago, São João do Tigre was already classified as the poorest municipality in Brazil, while Gameleira is below the 10th percentile in Human Development Index (HDI) in the State of Pernambuco. In addition to this criterion, both cases were considered in their great dependence on rural economy. Because of that, the urban population suffers greatly the unfavorable effects on their agriculture crises'. In Gameleira, the mass of unemployment during the off-season period of sugar cane plantation (March/August); and in São João do Tigre, a livestock zone and multi-agriculture food, the dry season (usually in August till January) demarking a critical cycle in years of crop failure and livestock farming produced by the great drought of the semi-arid weather. What is the situation on food insecurity for these populations? How do they classify the relation to nutritional status from the anthropometric point of view? In the context of nutritional transition, how is the intercession between the nutritional status and food insecurity?

In our opinion, the answer to these three questions make the study uniquely interesting and have important implications for understanding the nutritional transition process in Brazil.

3. The study context

The Sugar-cane region in Pernambuco presents for more than three centuries a social environmental framework of high poverty. This framework has historical roots on sugar-cane monoculture, aggravated by the inadequate use of natural resources and lack of investments in human development (Pernambuco's Government, 2003).

Even with the Federal Programs of cash transfer, in most households where the income is from these (53% of the population belonging to the *Bolsa Família* Program), much of the population lives in poverty, considering that 54% are considered poor by the Social Exclusion Index, which is calculated by deprivation of essential services (education, clean water, sanitation and garbage collection) (Lemos, 2007; Pernambuco's Government, 2011).

The framework of morbidity and mortality in the Sugar-cane region is typical for low-income populations with high incidence of infectious, parasitic diseases, and infant mortality with a growing increase of morbidities of the more developed areas, such as non-transmittable chronic diseases (NTCD's) (Cavalcanti et al., 2002).

The municipality of Gameleira is located in a geographic area of a typical traditional sugar economy: monoculture with high income concentration, unstable labor market between the high employment status (September/March) and the off-season period (April/August), when there is a decrease of manual labor, establishing a critical period of high under or unemployment (Lira, 2006).

For 2007, according to the estimates of the Demographic Census, the municipality had a population of 26.281 inhabitants, which 69.4% reside in the urban area and 30.6% in the rural environment. Even in the urban space, the economic activities are found to be closely dependent on the effects and the demands of the sugar-cane industry (IBGE, 2008a). For

2000, the illiteracy population rate for ages 15 years or more was of 37.8%, households that had water supply connected to a treatment network was 60%. The household sanitary facilities connected to a sewage network were 27.7% and only 46.9% of the garbage was collected (Brasil, 2006a). According to PNUD (2006), the HDI at the municipality was 0.590, represented by sub-indices on education (0.648), longevity (0.627) and income (0.496), with 73.6% of the families living in absolute poverty condition (Pinto, 2007). In 2005, the mortality rate due to diseases of circulatory system was more than twice the number of deaths due to infectious and parasitic diseases.

In another context, geographical reasons (lack of rain, irregularity temporal and spatial rainfall and poor soils) associated with historically unfavorable economic and social factors, having more than half of its inhabitants under the poverty line, as well as the persistence of political and cultural models marked by anachronism, makes the Brazilian semi-arid region a mesoregion potentially more exposed to food insecurity risks and overall and specific nutritional deficiencies (Batista Filho, 2006a).

Effectively, within the overall picture of poverty in the region, the ecological, economic and social problems, and their consequences for the population are exacerbated by a striking asymmetry of the families living in the Occidental Northeast, known as the Drought Polygon. In this context, the scarcity of water is a strong obstacle to the socio-economic development and even for the survival of the population. The cyclical occurrence of droughts and its catastrophic effects are too well known and date back to the beginning of Brazilian history (Beltrão et al., 2005).

São João do Tigre is located in a micro-region of Old Cariris, in the State of Paraíba, composing a conglomerate of municipalities that in the last ten years represented one of the poorest areas in the Northeast, and for this reason, it was chosen for this study (Batista Filho, 2006b).

In 2007, the municipality had an estimated population of 4,578 inhabitants, distributed in the proportion of 28% in the urban area and 72% in rural environment. In 1991, the Human Development Index (HDI) was 0.488, in 2000 rising up to 0.527, represented by the sub-indices on education (0.590), longevity (0.517) and income (0.475) (PNUD, 2006; IBGE, 2008b). According to the 2010 census, 35.8% of the population aged 15 and older was illiterate. In the same year, only 13.1% of households found themselves connected to public water supply and 36.7% of the houses lacked sanitary facilities (IBGE, 2010). Regarding to death causes, in 2005, the main component was a group of diseases of the circulatory system, surpassing more than nine times to infectious and parasitic diseases (Brasil, 2006b).

In 2004, while the per capita income in the State of Paraíba was R$ 4.165,00, São João do Tigre had reached only R$ 2.648,00 (a dollar is equivalent to more or less R$ 1.80 reais) (Lemos, 2007). With this income level, the municipality is classified as the eighth poorest in the entire state, occupying the 216th position in the ranking of 223 municipalities in the State of Paraíba. Life expectancy was 51 years old, one of the lowest in the country, showing a difference of less 20 years in relation to a national average of 71 years of age. Infant mortality rate (71 to 1000 live births) was almost two and a half times higher than found in Brazil (29/1000) (Batista Filho, 2006b). Although there has been an economic improvement in the country as a whole, this region remains as one of the poorest in the country.

4. Methodological procedures

This study was conducted in two municipalities based on three projects funded by the National Council for Scientific and Technological Development (CNPq). The field research was carried out simultaneously for the three projects during the period of March to June 2005 in the municipalities of Gameleira in Pernambuco and São João do Tigre in Paraíba. This is a cross-sectional study, with families including under-five children. The study consisted of socio-economic data, health, nutrition and feeding of children and their families through home visits, clinical and biochemical examinations were performed in local health units.

4.1 Sample and field work

For the sample calculation, was taken into account a prevalence of approximately 60% of food insecurity to the Northeast, on the basis of the PNAD results, 2004 (IBGE, 2006), estimating a maximum error of 5% for a significance level of 95% with an increase of 10% to compensate possible losses, resulted in a minimum sample of 440 families for each municipality. The Statcalc program of Epi info, version, 6.04 was used for this calculation.

The final sample was composed of 501 families in Gameleira (PE) and 458 families in São João do Tigre (PB).

The survey was carried out by interviewing the household head of the family, using a questionnaire, which contained records of the family members, the socio-economic conditions, characteristics of the housing and children's health conditions and food insecurity situation.

Initially, a pilot study was done with 30 families, aiming, in addition to test the data collection instrument and to train the field workers for anthropometric and laboratorial assessment. Free and informed consent of the family members was obtained, including the authorization of the parent or a guardian responsible for the children.

With the objective to verify the consistency of the information, at the end of each working day, the interviewers reviewed and codified the questionnaires in the sector itself, in order to detect possible failures of filling out which required the immediate return to the homes to recover correct information.

4.2 Nutrition variables and food security

The anthropometric assessment was performed according to the technical procedures recommended by the World Health Organization (1995). The body weight was obtained by using digital scales with a capacity for 150kg with a precision of 100g. The children that could not walk yet were weighed in the arms of the companion, whose individual weight was deducted by the total weight of the companion/child.

The children under two years of age were measured in the supine position using an infantmeter with amplitude of 100cm and subdivisions of 0.1cm. Children older than two years were measured standing up and barefoot using a stadiometer with amplitude of 200cm and subdivisions of 0.1 cm. For the adults a Stanley tape with amplitude of 200cm and subdivisions of 1cm was used. All the people studied were weighed and measured without wearing shoes and minimum of clothing.

Variables	Gameleira		São João do Tigre	
	n	(%)	n	(%)
Per capita family income				
≥ 0,25	256	35.3	235	42.8
< 0,25	469	64.7	314	57.2
Matenal Schooling (years)				
≥ 4	312	43.0	326	59.6
0-3	413	57.0	221	40.4
Geografic area				
Urban	351	48.4	305	53.4
Rural	374	51.6	266	46.6
Type of floor				
Tiles/Cement	539	74.3	494	86.5
Mud	186	25.7	77	13.5
Drinking water				
Mineral/Boiled/Filtered/Chlorinated	415	57.2	497	87.0
Without treatment	310	42.8	74	13.0
Sewage disposal				
Public network	355	49.0	312	54.6
Latrine	370	51.0	259	45.4
Colour TV				
Yes	340	46.9	290	50.8
No	385	53.1	281	49.2
Mobile phone				
Yes	116	16.0	12	2.1
No	609	84.0	559	97.9
Motorbike				
Yes	20	2.8	171	29.9
No	705	97.2	400	70.1

Table 1. Socio-economic and household characteristics of under-five children's families. Gameleira – PE and São João do Tigre – PB, 2005

To ensure the accuracy of the measurements, there were two measures of weight and height taken from each person in a condition that the difference between the assessments should not exceed 0.5cm for height and 100g in weight. If these limits eventually were not accurate, a repeated measurement was done and taken the closest values and their average was used for the registration. The interviewers worked in pairs to check the anthropometric measures.

For the nutritional status assessment of children, the Anthro 2007 software was used (WHO, 2007) and children were classified by height-for-age (H/A); weight-for-age (W/A) and body mass index-for-age (BMI/A), expressed in Z-score. The reference standard for classification on weight measures and height was that of the World Health Organization (WHO, 2006), adopting the following cut-off points: Malnutrition: < -2 Z-scores; Nutritional Risk: -2 Z-scores to < -1 Z-scores; Adequate: -1 Z-score to < 2 Z-scores; Overweight: ≥ 2 Z scores.

The instrument used to collect data on food security was the Brazilian Scale of Food Insecurity (EBIA), adapted from a model used in the United States Department of

Agriculture/USDA (Wehler et al., 1992). This tool was previously validated in samples for Brazilian urban and rural populations (Segall-Corrêa, et al., 2007). This is a one-dimensional scale of food insecurity perception that captures the progressive worsening of food access and shows intermediate levels in which families make use of strategies of distributing smaller quantities of food to their members, worsening the nutritional quality and the diet diversification aiming to reduce costs. By these strategies, even with the suppression of some meals, children are saved in less severe situations (Bickel, et al., 2000).

The instrument used to diagnose food (in)security is a 15 questions centrally focused on the experience of the last three months of possible food shortage at various levels of intensity, ranging from concern about lack of food to spending the whole day without eating. Each affirmative response to the questionnaire corresponds to one point and the sum of the points represents the scale score (0-15 points). Scores are classified in levels: 0 (zero) – food security; 1-5 mild food insecurity in families with children under 18 years old; 6-10 moderate food insecurity in families with children under 18 years old; 11-15 severe insecurity in families with children under 18 years old. The sum of positive numbers responses to questions yields a score or gradient of food security or insecurity (Sampaio et al., 2006).

4.3 Analysis of the data and ethical aspects

The data was typed in double entry with the purpose of checking its validation using the Epi Info statistical program. To analyze the internal consistency of the variables, Cronbach's Alpha was used with a minimum acceptable value of 0.85 through the Statistical Package for Social Science (SPSS), version 12.0.1. To verify the association between categorical variables chi-square test was used.

The projects were approved by the Ethics Committee of the Instituto de Medicina Integral Prof. Fernando Figueira (IMIP), attending the standards norms on research involving human beings - Resolution 196/96 of the National Council of Health. Clarification was also provided on the confidentiality of the data. The term of free and informed consent was signed after the interviewee consented in answering the questions and authorizing blood collection.

5. Results

In both municipalities, the food insecurity situations presented exceptionally high frequencies. In other words, food security was found in 11.8% and 12.7% of the families in Gameleira and São João do Tigre, with small variations between urban and rural areas. There was a high occurrence of moderate and severe forms of food insecurity, especially in Gameleira, where 64.4% and 76.5 % of the families were categorized to moderate and severe forms of food insecurity in rural and urban areas. In São do Tigre these food insecurity degrees were of 70.7% and 55.2% in rural and urban areas (Figure 1).

The results presented in figures 2 and 3, show that in São João do Tigre (14.7%), but especially in Gameleira, children's height was the most impaired anthropometric indicator (16.5%). Overweight was at least three times higher compared to the deficit of weight taking into account the body mass index-for-age.
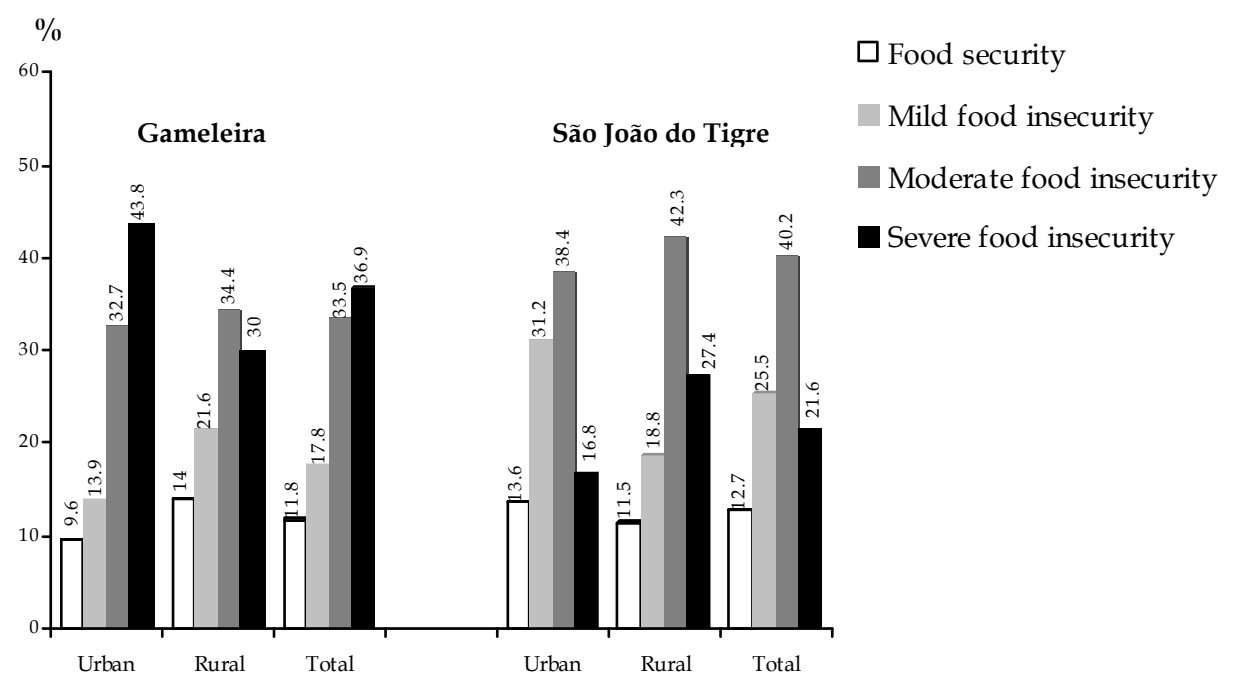
Fig. 1. Prevalence of food (in)security in the families of two municipalities in the Northeast of Brazil, 2005.
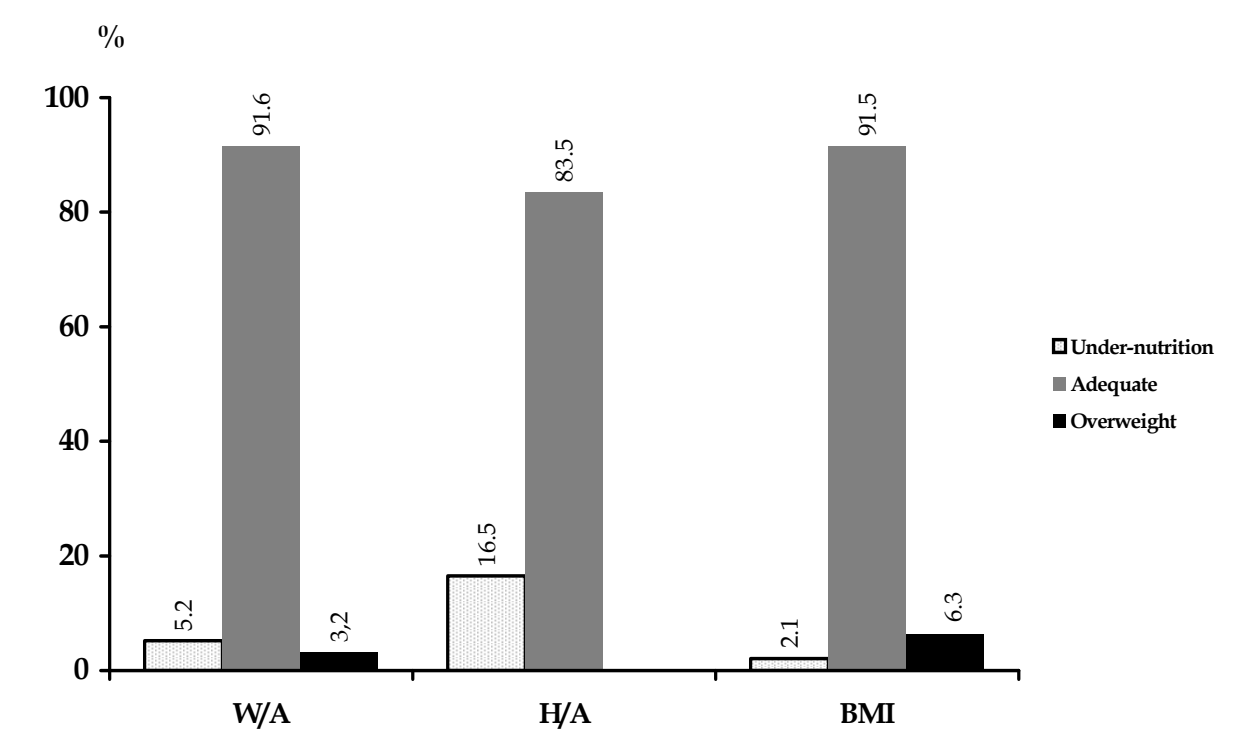

Fig. 2. Nutritional status of under-five children in urban and rural areas according to weight-for-age, height-for-age and body mass index-for-age. Gameleira (PE), 2005
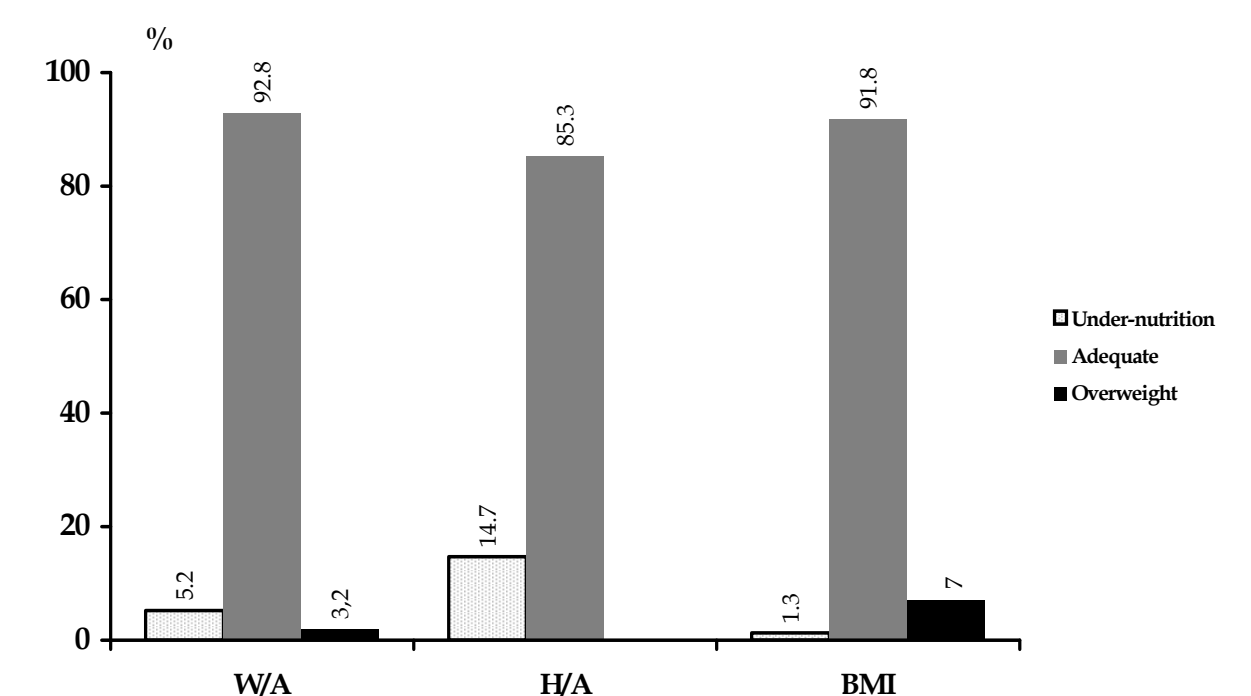
Fig. 3. Nutritional status of under-five children in urban and rural areas according to weight-for-age, height-for-age and body mass index-for-age. São João do Tigre (PB), 2005

In Table 2, the relationship between food (in)security and nutritional status (height-for-age deficit), shows that there is no statistically significant association according to the studied locations.

Food (in)security	Height-for-age				
	Under-nutrition		Adequate		Total
	N	%	n	%	N
Gameleira (PE)[a]					
Food security	8	12.1	58	87.9	66
Mild food insecurity	19	17.8	88	82.2	107
Moderate food insecurity	33	14.2	200	85.8	233
Severe food insecurity	55	18.9	236	81.1	291
Total	**115**	**16.5**	**582**	**83.5**	**697**
São João do Tigre (PB)[b]					
Food security	7	10.6	59	89.6	66
Mild food insecurity	16	12.0	117	88,0	133
Moderate food insecurity	40	17.7	186	82.3	226
Severe food insecurity	19	14.3	114	85.7	133
Total	**82**	**14.7**	**476**	**85.3**	**558**

Chi–square: [a] $p = 0.36$ e [b] $p = 0.35$

Table 2. Relationship between categories of food (in)security and nutritional status of under-five children. Gameleira (PE) and São João do Tigre (PB), 2005

6. Final considerations

In addition to the internal consistency of the results expressed by the Cronbach's Alpha coefficient in the two studied locations, four other aspects show the importance, the relevance and interest of the results of this study.

The first one confirming the adverse socioeconomic characteristics of the two populations, related to poverty indicators: very low family income and maternal educational level, and unfavorable housing and sanitation condition. These epidemiological indicators characterizes the diversity of unequal situations that unfortunately still prevails in Brazil.

Moreover, it is observed that approximately 90% of the studied families were classified under the condition of food insecurity, having the majority framed cumulatively within the moderate and severe categories of insecurity. These most adverse conditions, were prevalent in Gameleira, where exceptionally concentrates the best agricultural soils, the largest production of wealth per hectare, per capita income and the longest regular periods of rainfalls in the Northeast. But, on the contrary to the physical geography, economic and technological resources of agro-industrial production such as aggregated values, Gameleira represents the worse adverse situation in terms of food security aspects and nutritional status of their children.

Therefore, it is clear that monoculture of sugar-cane although an exceptionally advantageous activity from the economic point of view, producing good prices on domestic and foreign markets, continues maintaining its character of social stigma recognized historically, since the Colonial times in Brazil with the sugar mills until the Empire and the two Republics (XIX and XX centuries), remaining currently with sugar mills plus alcohol fuel distilleries.

In contrast, in the semi-arid there are poor soils, irregular and scarce rainfall, low level of technology with the hoe moved by man as the agricultural implements mostly used for cultivating lands, and a system of family labor basically developed for self consumption, the food security situation is much less unfavorable. This is the conclusion to be drawn in the results especially when it is considered to be compared to moderate and severe forms of food insecurity. Without a doubt, it is an interesting reflection pointing to a remarkable theme to analyze both situations. In fact, the conditions are well distinct: the Sugar-cane region which is a landowner plantation, monoculture and traditionally focused on the foreign market, in contrast to the semi-arid with dry climate, soils of shallow depth and great fragmentation of small land units. Beside these observations, it should be taken in consideration that at the national level, a large majority of children (66.6% in the urban areas and 56.4% in rural areas) have lived in households with food security (IBGE, 2010). Therefore, the study presented here is a scenario substantially different from that one found in Brazil as a whole, where food security is about 12% only.

In the two studied populations the children height deficit constitutes the most relevant nutritional problem. However, it stands out that the values found in Gameleira and São João do Tigre are higher than those reported at a national level and even in the Northeast region (Brasil, 2009). Even so, it represents a considerable advance in the reduction of malnutrition compared with the situation before 2000. Body mass index-for-age deficit which characterizes current forms of weight deficit in these populations marked by the degree of

poverty the results are fully compatible with data reported for Brazil, which are under 2%. In other words, even in dramatically poor populations, acute malnutrition represents a situation which is virtually controlled in the country since 1989 (Monteiro, et al., 1992; Batista Filho, et al., 2007).

Another non expected result is the high prevalence of normal anthropometric measurements of children according to weight-for-age and body mass index-for-age. The results are equivalent to the international standard of reference (WHO, 1995). This could be, at first, an epidemiological nonsense: the coexistence of high prevalence of food insecurity with a surprisingly favorable anthropometric normality in children. This apparent paradox has already been pointed out in recent results characterizing a peculiar moment of fast nutritional transition process in Brazil (Brazil, 2009).

With this regard food insecurity as a subjective event seems to have its own logic: job insecurity, income, family instability, doubts on social protection network and community solidarity. It would be explained more in the field of social psychology and cultural anthropology and less by the physical anthropology approach or in relation to the somatometry reference indicators, used here for children's nutritional status assessment.

Different indicators of food and nutritional situation should be considered, so that their interpretation would be more emphasized to the complementarily character of both indicators, as to their discrepancy in disagreement between EBIA scale and nutritional status results. In an allegorical language: it is disappearing rapidly the physical consequences of malnutrition, but still remains in people's memory and in the culture of the community the subjective sequelae of food insecurity. This would be a stigma of their own social psychology.

A fourth question may be considered in relation to the characteristic of nutritional transition process. It is evident that even both studied location with markedly unfavorable living condition great changes have been occurring in the Brazilian nutritional reality over the past two decades. It is a systemic process that is practically reaching all the locations in all social classes, even though there are still certain differences. Without a doubt, the sharp decrease on birthrate, the improvement in family income having the participation of female workforce in the job market, the increase in family budgets by official programs of cash transfer (*Bolsa Família* and Food Basket Programs), and access to basic health care, all together have been helping to explain these changes even in the poorest population.

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Food Insecurity and Nutritional Status in the
Population of High Degree of Poverty in Northeast, Brazil
109

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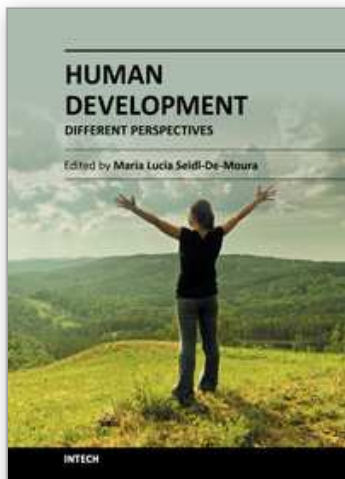
Human Development - Different Perspectives

Edited by Dr. Maria Lucia Seidl-De-Moura

Human development has different meanings depending on the area we focus on. To the psychologists it is the ontogenetic process of individual development. It considers systematic psychological changes that occur in human beings over the course of their life span. To sociologists and economists, among others, the main consideration is the macro-level of countries or regions and their development conditions related to human needs. Our book has two parts. The first one is entitled "Development in the ontogenesis" and it consists of three chapters whilst the second is "Human development: contextual factors", also including 3 chapters. Together, the two parts give the readers a panoramic view of very complex subjects and complement each other. Researchers of ontogenetic development cannot ignore that contextual factors are the basis of this process. On the other hand, social scientists worried about the macro variables need to remember that they are dealing with people, who are affected one way or another by those variables and whose development is the product of biology and culture.

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