GROWTH PATTERN OF PRESCHOOL CHILDREN

LIVING IN TUBERS DIET AREA AND CEREALS DIET AREA OF CAMEROON

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INTRODUCTION

In forest region of southern Cameroon, staple diet consists mainly of tubers, starchy roots and plantains. In savannah region of northern Cameroon, staple diet is primarily millet and sorghum. (Figure 1)

As far as nutritional diseases are concerned, the Kwashiorkor is predominant in the South and so is Marasmus in the North. Nutritional aetiology of both diseases : global protein-energy deficiency for Marasmus, protein deficiency and protein-energy imbalance for Kwashiorkor, has been reconsidered for some years (James, 1977, Waterlow and Payne, 1975).

It seemed interesting for us to compare the nutritional status of young children from both districts and to look out for possible biological differences regarding cases of mild malnutrition. This first part presents some anthropometric tests of growth as nutritiona index (Tanner, 1976).

METHODS

245 children from 1 to 60 months old have been studied in South Cameroon and 235 children in North Cameroon. Sampling has been performed in order to assure 30 children minimum for each of seven age group. For each class of age, children has been taken at random. The anthropometric measurements were performed according to standard proceedings described by Jelliffe (1966). The results are expressed as percentage of Harvard Standards expected. (Stuart and Stevenson, 1959).

RESULTS

Figures 2 and 3 respectively show for both areas, the average weight and the average height for the average age of each class of age.

After ten months, a shift appears between the two areas concerning weight and height growth. At the same age, children from the North are smaller than southern children. Regarding the weight, as early as 5th month, results observed in both areas fairly shift from reference curve corresponding to the 50th centile of Harvard standard. It is the same for height in North while in South it remains very close to the reference curve up the 20th month.

For both areas, there isn't any recovery of weigth or height gap but on the contrary there is also aggravation of height gap. The previous observations are confirmed by the study of anthropometric data (table. 1). It can be noticed a significant difference of weight for age (WA) between children of both areas, very important between 13-48 months and which is about to reduce for 49-60. Regarding height for age (HA),the height difference between children of both areas appears as early as 7-12 months. It increases after 12 and continues then with accumulation of the deficit without any recovery.

Weight for height (WH) allows to take in account the consequence of the height gap per weight. In spite of this correction, a significant difference appears between children of both areas for the 13-36 months range.

Concerning each of these tests done, we have fixed a cut-off below which it is estimated that the weight or height gap can reflect malnutrition (table 2), (Delpeuch et al., 1980). Whatever test, deficient children are always more numerous in the North.

Distribution for HA and WH (figure 4) confirm the difference of growth between children of both areas. They always shift down to the lowest values compared to the Standards for northern area. However if the number of deficient children is higher in the North, the importance of gap is the same.

Table 3, presents a distribution of children from both areas according to Waterlow grid (Waterlow and Rutishauser, 1974). In order to keep sufficient number of children, some age ranges have been joined together. Except for 0-12 months in the North, distribution of children according to this classification differ in both areas. This table confirms the previous observations, after 12 months in the North, there are less normally growing children (neither wasted nor stunted) than in the South. Correlatively, stunted and stunted-wasted children are concerned, this point is evident regarding 37 to 60 months range children, emphasizing then the increase of height gap.

DISCUSSION

The WA and HA values are lower in savannah area than in forest area. except for height in the 0-6 months range. The fact that in that age range, the children's WA in the North is already different from the children's WA in the South allows to think that malnutrition appears before birth. Lechtig et al. (1975) have shown that an energy deficit during pregnancy leads to a diminution of birth weight. Besides, height at birth is less affected than weight by maternal malnutrition (Persson et al., 1978). So, the height gaps appearing after 6 months correspond to a growth retardation due to nutritional deficiency : breastfeeding being insufficient or food inadequate. On top of that it doesn't seem possible to recover this height gap in the nutritional context of this kind of area (Briers et al., 1975).

Weight and height being inferior in the North, we could consider that an association of those measurements would improve the noticed deficits compared to the South. This is partly true, except for the 13-36 months range. This age range correspond to the weaning time, transition period when child starts on grown up food more or less quickly. It is likely because of seasonal variations of the nutritional disponibilities of this area (Masseyeff et al. 1965), that the replacing diet given is insufficient. Besides, only crude milling sorghum, rich in crude fibers is eaten as a basic food (Cornu and Delpeuch, 1981). Therefore it is possible that this type of food leads intestinal troubles and malabsorption favouring malnutrition (Kondo et al., 1979). It also seems that a late weaning could lead a more important prevalence of the anthropometric signs of malnutrition (Jenkins, 1981). In the North though the protein supply is more important, they have season changes, alterning harvest period and solder period (periodic but well-balanced malnutrition). The energy requirements are rarely covered and protein can cover the needs in calories. In the South, there is no food shortage and the energetic requirements are for this reason covered.

Besides, we have shown in a longitudinal study (Cornu et al. 1980) that anthropometry at the age of 2 years, end of the weaning period, are closely linked to the growth during the first year. The anthropometric deficits for this age seem to be caused as by the pre-natal and neo-natal events as by those occured during the weaning period.

CONCLUSION

These two areas, with different climates and vegetations and so providing different feedings, seem to lead different consequences so much on weight gap as on height gap. Considering the nutritional values of cereals and starchy foods we could think that cereals as staple diet would favor better growth than tubers. On the contrary, our study shows that southern children are less deficient. However, these diffeeences concerning anthropometry touch much the number of children with weight or height gap than severity of this deficit.

ACKNOWLEDGEMENTS

The present work was carried out in accordance with the 1975 agreement between the National Office for Scientific and Technical Research (ONAREST) and the Overseas Office for Scientific and Technical Research (ORSTOM).

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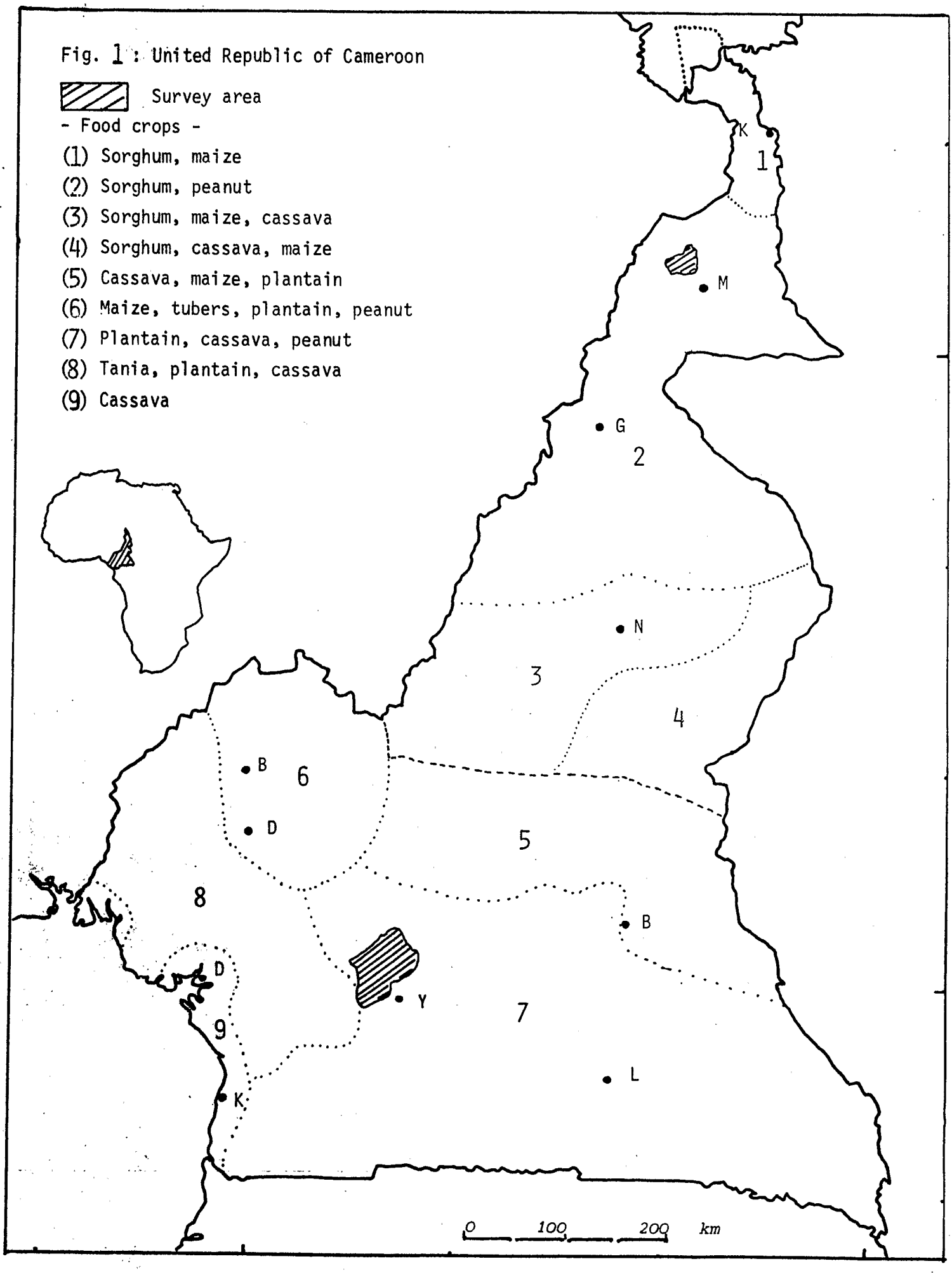
Fig. 1 : United Republic of Cameroon

Survey area

- Food crops -

(1) Sorghum, maize
(2) Sorghum, peanut
(3) Sorghum, maize, cassava
(4) Sorghum, cassava, maize
(5) Cassava, maize, plantain
(6) Maize, tubers, plantain, peanut
(7) Plantain, cassava, peanut
(8) Tania, plantain, cassava
(9) Cassava



From J.F. LOUNG, in ATLAS of United Republic of Cameroon ed. J.A. (Paris)

Fig.2. Mean measurements of weight from 0 to 60 months for North and South Cameroonian children (mean ± 2 SEM).

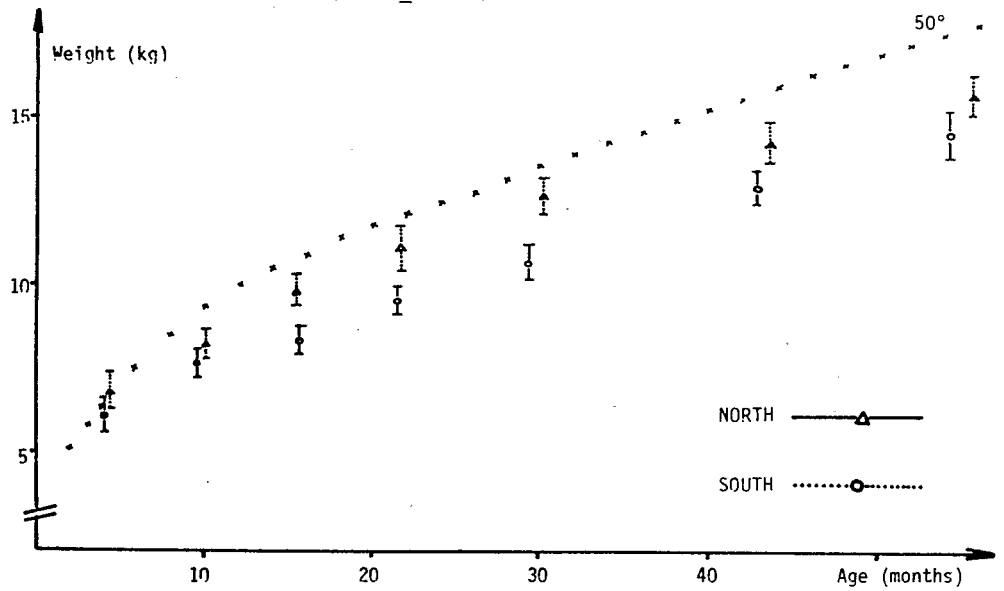


Fig.3. Mean measurements of height from 0 to 60 months for North and South Cameroonian children (mean ± 2 SEM).

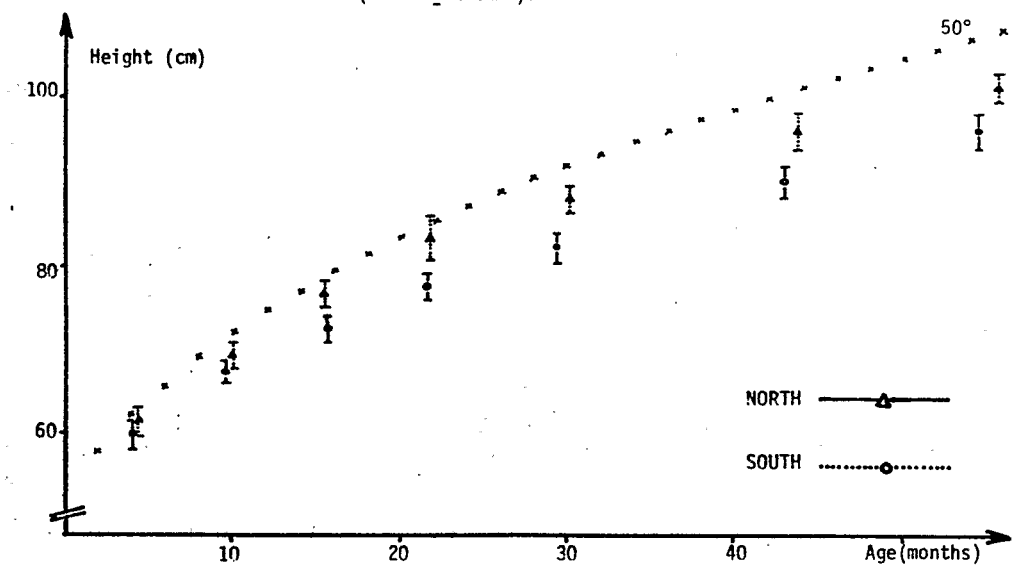


Fig.4. Distribution in per cent of the 50th percentile of Harvard Standards.

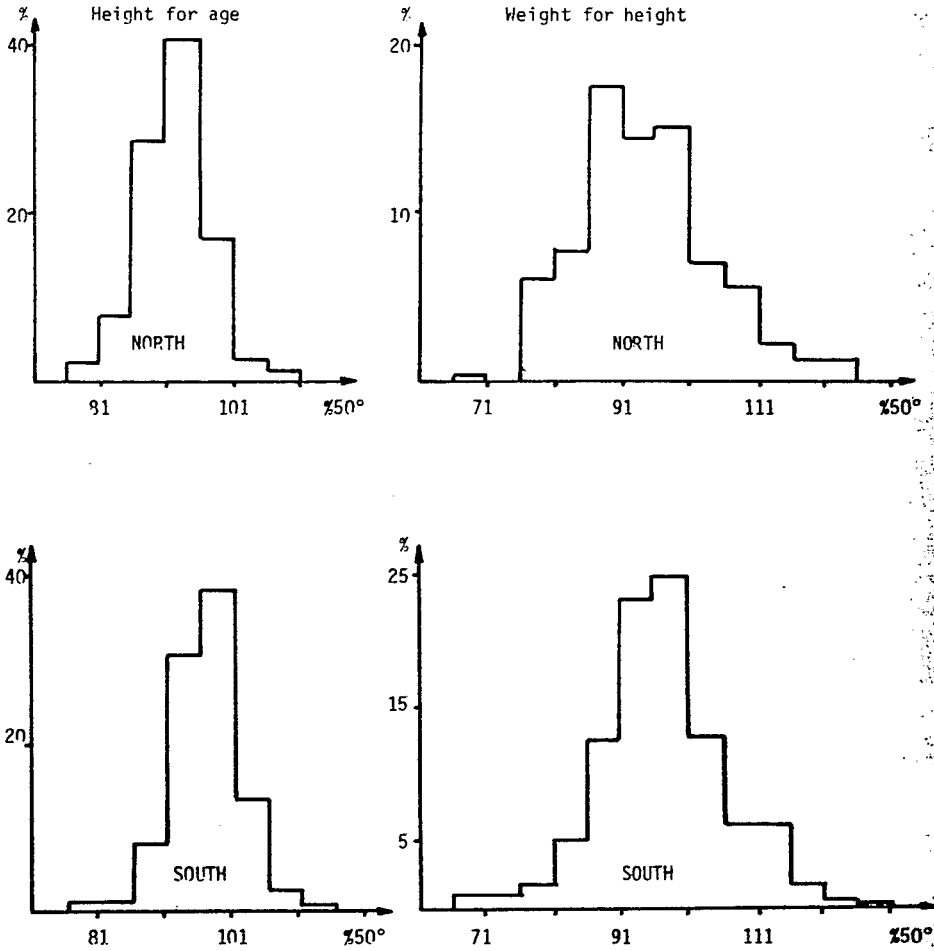


Table.1. Anthropometric data of children in per cent of 50° percentile of Harvard Standards(mean ± SEM).

Age range (months)	Number N	Number S	Weight for age North	Weight for age South	Height for age North	Height for age South	Weight for height North	Weight for height South
0 - 6	34	30	95.9 ± 2.8	104.4 ± 3.2 $^{+}$	97.2 ± 0.9	99.1 ± 1.6	101.5 ± 1.8	104.7 ± 2.1
7 - 12	36	33	84.2 ± 2.3	90.2 ± 2.4$^{(+)}$	94.8 ± 0.7	97.1 ± 0.8 $^{+}$	97.4 ± 3.1	96.1 ± 1.8
13 - 18	30	37	77.0 ± 1.6	90.9 ± 2.4^{+++}	91.8 ± 0.6	97.5 ± 0.9^{+++}	88.6 ± 1.0	94.5 ± 1.7^{++}
19 - 24	32	31	78.9 ± 1.6	92.1 ± 2.8^{+++}	91.5 ± 0.7	98.0 ± 1.4^{+++}	90.0 ± 1.2	94.3 ± 1.9$^{(+)}$
25 - 36	38	44	79.1 ± 1.9	92.0 ± 1.9^{+++}	90.3 ± 0.7	95.9 ± 0.9^{+++}	91.3 ± 1.5	97.5 ± 1.3^{++}
37 - 48	34	33	82.1 ± 1.5	90.0 ± 1.7^{+++}	89.7 ± 0.7	95.7 ± 0.9^{+++}	97.9 ± 1.4	97.0 ± 1.1
49 - 60	31	37	82.5 ± 2.2	88.5 ± 1.7 $^{+}$	89.9 ± 1.0	94.6 ± 0.8^{+++}	98.7 ± 1.6	97.4 ± 1.2

South significantly different of North for: +, $p < 0.05$; ++, $p < 0.01$; +++, $p < 0.001$.

Table.2. Percentage of children under 81 per cent of reference weight for age,91 per cent of reference height for age or 91 per cent of reference weight for height.

Age range (months)	Number N	Number S	Weight for age North	Weight for age South	Height for age North	Height for age South	Weight for height North	Weight for height South
0 - 6	34	30	20.6	3.3	5.9	0	17.6	6.7
7 - 12	36	33	47.2	12.2^{++}	22.2	6.1	38.9	27.3
13 - 18	30	37	63.3	27.0^{++}	40.0	5.4^{+++}	73.3	40.5^{++}
19 - 24	32	31	53.1	22.6^{+}	43.8	19.4^{+}	59.4	32.3^{+}
25 - 36	38	44	57.9	15.9^{+++}	50.0	13.6^{+++}	52.6	15.9^{+++}
37 - 48	34	33	55.9	12.1^{+++}	55.9	18.2^{++}	20.6	18.2
49 - 60	31	37	35.5	24.3	51.6	18.9^{++}	19.4	16.2

South significantly different of North for: +,$p < 0.05$; ++,$p < 0.01$; +++,$p < 0.001$.

Table.3. Distribution of children of both areas according to Waterlow grid.†

Age range (months)	Normal N	Normal S	Stunted N	Stunted S	Wasted N	Wasted S	Stunted wasted N	Stunted wasted S	χ^2 analysis signif.level	Tshuprow coeff.
0 - 12	46	51	4	2	14	9	6	1	NS	
13 - 24	11	38	10	5	25	22	16	3	0.001	0.31
25 - 36	13	33	5	4	6	5	14	2	0.01	0.32
37 - 60	25	47	27	11	5	10	8	2	0.01	0.26

† Normal children: Height for age >= 91%, Weight for height >= 91%
Stunted - : Height for age < 91%, Weight for height >= 91%
Wasted - : Height for age >= 91%, Weight for height < 91%
Stunted-wasted : Height for age < 91%; Weight for height < 91%