

A Transverse - Longitudinal Study of Heights and Weights of Children in a Nigerian Village

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Summary

Omololu A, Hussain MA and Mbofung CA. Transverse—Longitudinal Study of Heights and Weights of Children in a Nigerian Village. *Nigerian Journal of Paediatrics* 1981; **8**: 70. Heights and weights, velocity of heights and weights of a group of village children, 0–5 years of age, measured serially between 1965 and 1975 are reported and compared with international standards and other groups reported from the same area. Analysis of the growth pattern of the children revealed that babies with low birthweights remained small up to the age of five years but their velocities of gain in weight and height were much faster compared with the heavier ones.

Introduction

Heights and weights of children are universally accepted as valuable indicators of nutritional status of young children.^{1,2} Longitudinal studies of heights and weights have been reported to be more valuable for nutritional surveillance than cross-sectional measurements. This usefulness of longitudinal studies in nutritional surveillance have been strongly advocated by WHO.³ Because of their importance in monitoring the nutritional welfare of young children and the paucity of longitudinal data on village children in Nigeria, a study of the heights and weights of children in a typical Western Nigerian village

was begun by us in 1965. The present paper reports (i) the mixed longitudinal heights and weights, (ii) the velocity of heights and weights and (iii) the heights and weights according to the birthweights of some of these children up to 5 years of age measured serially between 1965 and 1975.

Materials and Methods

The Community

The study was carried out in Osegere village, a typical Yoruba settlement, situated about 20km north east of Ibadan in the rain forest area of Western Nigeria. The socio-economic status of the villagers is poor and their main occupation is subsistence farming. Housing and sanitary conditions in the village are generally very unsatisfactory. Until 1978, the water supply was mainly provided by shallow wells with little

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protection from contamination. A rural health centre, situated in the village and staffed by two trained community nurses, provides the only medical facilities available to the people. All children born in the village are registered in the centre and encouraged to attend regularly for measurements of their heights and weights. During the visits, any sickness is recorded in a special record card for each individual child and appropriate treatment provided. A physician also visits the centre weekly to see any child referred by the community nurses. All children born in the village between 1965 and 1975 were recruited into the study but for the present analysis, only data from those who attended regularly were used.

All measurements of the heights and weights were taken between 8.30 a.m. and 12 noon by the two community nurses resident in the village. Children were weighed nude on a beam balance with a fixed graduated measuring rod. Infants and younger children were weighed on another beam balance with a sitting arrangement. The balances were regularly checked for accuracy. Heights or supine lengths of younger children were measured on a special wooden length board with a fixed headpiece and movable footplate. Weights and heights were recorded to the nearest 0.1kg and 0.2cm respectively. Measurements were made once a month, as near the birthdate as possible, till the child was 24 months and thereafter measurements were made every 3 months.

Analysis of Data

For preliminary analysis, the children were divided into two groups namely: selected and mixed. The selected ones were those who did not have any sickness at the time of the monthly measurement while the mixed group included all children irrespective of any sickness. Average heights and weights were calculated separately and for combined sexes, on a monthly interval up to 48 months and thereafter annually, up to 60 months. Statistical evaluation of these data showed no significant differences in heights and

weights between the groups and sexes, both separate and combined, at any age under study. For uniformity, easy reference and comparability to other studies, heights and weights are presented with sexes separate and combined. Height and weight velocities were calculated for all the children at three-monthly interval up to 30 months and thereafter at 6-monthly interval up to 60 months. All children with known birthweights were divided into 5 groups: A (3.5-5.0kg), B (3.0-3.49kg), C (2.5-2.99), D (2.0-2.49kg) and E (less than 2.00kg) and average heights and weights were calculated for each group at each age. Velocities for each of these groups were also calculated. For easy international comparison, the data were compared with the Harvard standards,⁴ since published data on heights and weights of elite Nigerian children,^{5,6} did not show any significant difference from the Harvard standards. The data were also compared with the data of Morley et al⁷ reported for another Nigerian village in the same region.

Results

Mean heights and weights of children, separate for each sex and combined for both sexes are presented in Tables I and II respectively. Male children were slightly heavier than females at birth but by the age of nine months, females were about 0.1kg heavier. This slight difference continued up to 13 months when the trend was reversed in favour of male children and remained so up to the age of 60 months. The females doubled their birthweight by 5 months and tripled it by 16 months while the males doubled theirs by 4 months and tripled it by 18 months. Similarly, the male children remained slightly taller than their female counterparts throughout the period of 60 months.

At no age was statistically significant difference found between the sexes for height and weight. The combined heights and weights also showed a similar trend. Comparison of heights and weights

TABLE I

Average Heights and Weights of Children in Osegere Village

Age (Months)	No. of Children	Male				Female				
		Weight (Kg)	SD	Height (cm)	SD	No. of Children	Weight (Kg)	SD	Height (cm)	SD
Birth	160	2.9	0.4	—	—	152	2.8	0.4	—	—
1	158	3.7	0.8	49.8	5.9	151	3.6	0.8	48.8	5.7
2	159	4.6	0.8	54.2	2.3	151	4.4	0.9	52.3	5.2
3	159	5.3	0.7	57.3	3.5	151	5.1	0.9	56.8	4.6
4	160	5.9	0.7	58.7	5.1	151	5.5	0.8	58.4	3.7
5	159	6.0	0.8	60.4	5.6	151	5.7	0.8	59.9	5.0
6	160	6.1	1.0	61.6	3.9	149	6.0	0.8	60.2	5.1
7	158	6.2	1.0	63.3	4.1	151	6.1	0.9	62.7	4.2
8	160	6.5	0.9	65.7	4.5	152	6.4	0.9	63.3	3.1
9	158	6.7	1.0	66.8	3.6	149	6.8	1.0	63.7	5.4
10	159	6.8	1.4	66.9	2.9	149	6.7	1.1	65.9	3.5
11	160	6.9	1.1	68.9	5.9	152	7.1	1.6	66.9	4.9
12	158	7.3	1.1	69.5	4.9	149	7.5	1.2	67.8	5.1
13	158	7.5	1.2	70.6	4.6	150	7.7	0.9	69.2	5.2
14	160	8.1	1.3	70.8	4.6	152	7.9	1.1	71.4	3.9
15	159	8.2	1.5	71.8	4.4	150	8.1	1.6	71.8	3.4
16	158	8.5	1.2	73.4	5.9	152	8.2	1.7	72.6	3.9
17	159	8.6	1.8	74.2	4.9	150	8.4	1.7	73.2	3.4
18	160	9.0	1.3	76.0	4.7	148	8.8	0.9	74.4	4.5
19	159	9.1	1.8	76.8	4.6	149	9.0	2.0	75.4	4.0
20	159	9.1	2.1	77.5	3.8	149	9.1	1.4	76.6	3.5
21	160	9.3	2.1	77.6	4.4	150	9.2	2.1	77.0	4.2
22	158	9.6	1.7	78.9	4.2	150	9.3	1.5	78.7	4.3
23	159	9.8	1.3	79.6	3.9	148	9.4	1.1	79.0	4.0
24	158	10.1	1.1	81.1	4.9	150	9.8	2.2	79.8	5.4
30	152	11.0	1.1	83.8	4.9	130	10.5	2.1	83.6	4.5
36	130	11.5	1.6	86.7	5.7	125	11.0	2.1	86.7	5.4
42	120	12.3	2.2	89.5	5.5	115	12.1	2.0	89.4	5.3
48	118	13.3	2.2	92.2	5.9	112	12.9	2.2	91.9	4.2
60	118	14.3	2.2	99.4	4.8	112	14.1	2.1	98.5	5.6

Total Number of Children Studied = 312
SD = Standard Deviation

TABLE II

Average Heights and Weights of Children (Combined Sexes) in Osegere Village

<i>Age (Months)</i>	<i>No. of Children</i>	<i>Weight (Kg)</i>	<i>SD</i>	<i>(cm) Height</i>	<i>SD</i>
Birth	312	2.9	0.2	—	—
1	309	3.6	0.8	49.3	5.8
2	310	4.5	0.8	55.5	3.7
3	310	5.2	0.8	57.0	4.1
4	311	5.7	0.7	58.6	4.4
5	310	5.8	0.8	60.1	5.3
6	309	6.0	0.9	60.9	4.5
7	310	6.1	1.0	63.0	4.1
8	312	6.4	0.9	64.5	3.8
9	307	6.7	1.0	65.2	4.5
10	308	6.8	1.2	66.4	3.2
11	312	7.0	1.8	67.9	5.4
12	307	7.4	1.1	68.6	5.0
13	308	7.6	1.5	69.8	4.9
14	312	8.0	1.2	71.1	4.2
15	309	8.2	1.5	71.8	3.9
16	310	8.3	1.5	73.0	4.9
17	309	8.5	1.7	73.7	4.1
18	308	9.0	1.7	75.2	4.6
19	308	9.1	1.7	76.1	4.3
20	308	9.1	1.8	77.0	3.7
21	310	9.2	2.1	77.3	5.3
22	308	9.5	1.6	78.8	4.3
23	307	9.6	1.2	79.3	4.0
24	308	10.0	1.7	80.5	5.1
30	272	10.7	2.0	83.7	4.7
36	255	11.3	2.0	86.7	5.6
42	235	12.2	2.0	89.5	5.4
48	230	13.1	2.3	92.1	5.7
60	230	14.3	2.2	99.0	4.7

Total Number of Children Studied = 312.
SD = Standard Deviation

with the Harvard and Nigerian standards respectively, showed that the children in our series were both shorter and lighter than their elite counterparts.

The average velocity curves for heights and weights compared with the Harvard standards are shown in Fig. 1. It will be observed that weight velocity was slower in our series compared with the Harvard standards and there were also more fluctuations in the curves. The average height velocity curves showed a similar pattern. The average heights and weights according to birth-weights are presented in Table II and Fig. 2 which clearly show that children who were born small remained so up to five years of age. However, a detailed scrutiny of the weight velocity indicated that the smallest ones gained much faster than the heaviest ones (Table III). Thus, the biggest babies (group A) doubled their weight by 7 months, tripled it by 27 months and quadrupled it by 36 months, while group B infants doubled theirs by 5 months, tripled it by 21 months, and quadrupled it by 39 months. Group C babies doubled theirs by 4 months, tripled it by 12 months and quadrupled it by 36 months, and group D babies doubled theirs by 3-4 months, tripled it by 12 months and quadrupled it by 27 months while the lightest ones, group E, doubled their weight by 2-3 months tripled it by 9 months and quadrupled it by 15 months. The rate of relative weights gain was therefore about twice faster in group E children compared to those in groups A and B.

Discussion

The results of the present study have shown similar patterns of heights and weights to those reported by Morley *et al.*,⁷ from Imesi-Ile, another village in Western Nigeria. The Imesi-Ile children were however, slightly heavier and taller than those in the present series. The statistical significance of the difference between the two groups could not be determined because Morley *et al.*,⁷

did not provide the standard deviation of the children's mean weights and heights. The observed difference may however, be due to better medical care provided at Imesi-Ile. All other conditions including feeding practices, appeared to be the same in both communities. Comparison of our data with the local elite children^{5,6} as well as with the Harvard standards,⁴ indicate that the Osegere children were not only shorter but also lighter. This agrees with the findings in studies reported from other parts of the developing world.⁸⁻¹⁰

Weight and height velocities in the present study appeared to be comparable to those of the Harvard standards⁴ up to 3-4 months of age. The main reason for this is probably the extremely satisfactory lactation performance of Nigerian mothers and the adequacy of breast milk for the nutritional needs of young infants. After 3-4 months of age, a slowing down of the growth rate became evident. Similar findings have been reported from other countries.¹¹⁻¹²

The slowest rate of gain in weight and height, appeared to coincide with the so-called transitional weaning period of 6-15 months of age. The reason for this faltering of growth after 3-4 months is due to inadequacy of breast milk and infection.¹³⁻¹⁴ Weight and height velocities of the Osegere children appear to be similar to those of the Oje children⁶ who come from a poor socio-economic environment in Ibadan town.

This is the first time that heights and weights in relation to birth weight have been reported for village children in Nigeria. Our data indicate that the children who are born small remain so at least up to 5 years of age. The smaller the child at birth, the faster is the relative rate of growth though this relative rate is not fast enough for a catch-up with the heavier group by the time they are both 60 months old. It is concluded from the present study that in the Nigerian village environment, the nutritional requirements of a small baby are much larger than those of a big one. Nutritional intervention should therefore be directed at pregnant mothers in order to improve the

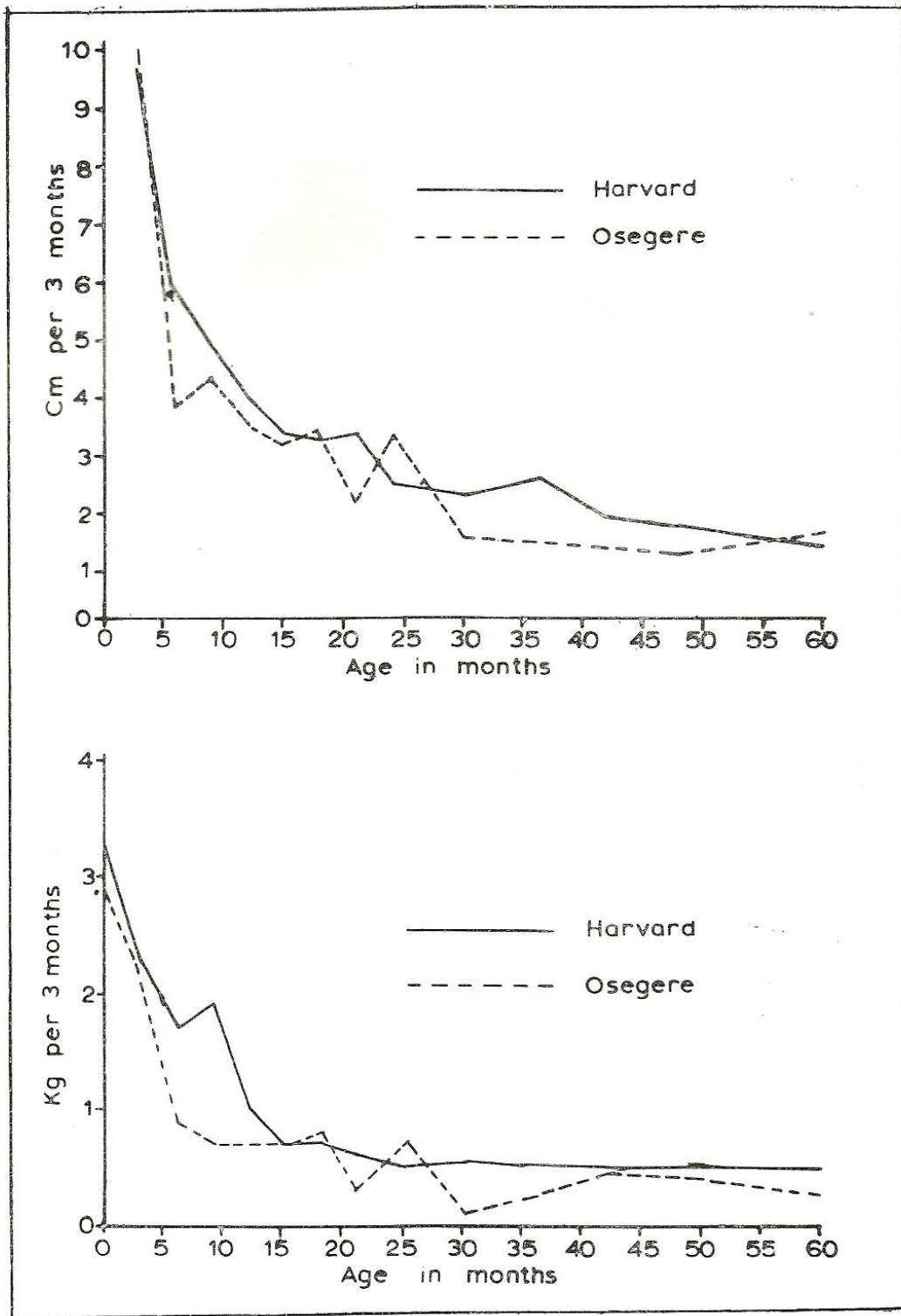


Fig. 1 Average height and weight velocities of village children aged 0-5 years

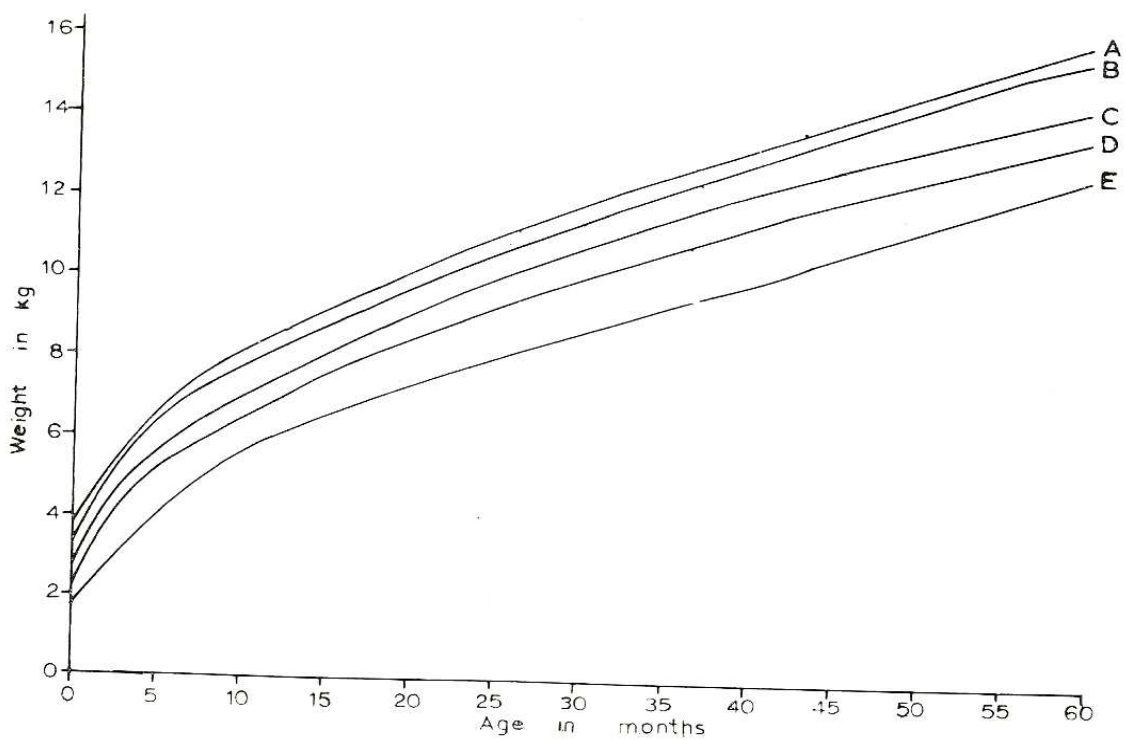
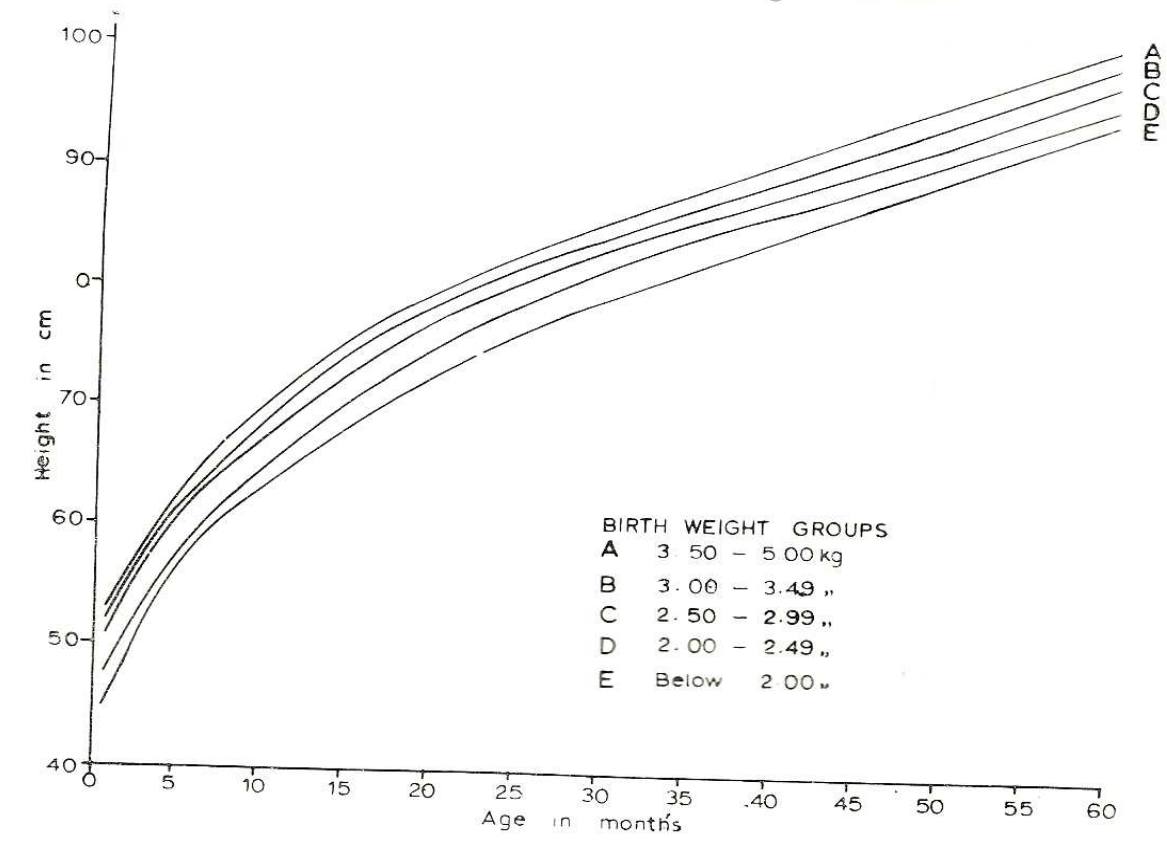


Fig. 2 Heights and weights of children aged 0-5 years according to the birthweights

TABLE III

Average Heights and Weights of Children at Osegere Village Grouped according to Birthweights (Sexes Combined)

Group	A		B		C		D		E	
Birth Weight	3.6-5.0Kg (n=27)		3-3.59Kg (n=68)		2.5-2.99 Kg (n=127)		2.0-2.49 Kg (n=71)		2.0 Kg (n=19)	
Age (Months)	Weight Kg	Height cm	Weight Kg	Height cm	Weight Kg	Height cm	Weight Kg	Height cm	Weight Kg	Height cm
Birth	3.7±0.4	*	3.2±0.2	*	2.8±0.3	*	2.3±0.3	*	1.7±0.28	*
1	4.4±0.7	53.3±2.5	4.1±0.5	52.6±2.3	3.6±0.6	51.1±2.2	3.0±0.6	47.8±3.1	2.2±0.1	44.9±2.4
2	5.3±0.6	56.2±3.1	4.9±0.7	55.2±1.7	4.4±0.8	53.5±4.1	3.9±0.6	50.7±2.4	2.7±0.4	46.9±1.7
3	5.8±0.5	58.6±2.6	5.5±0.8	58.1±4.7	4.9±0.7	55.7±5.3	4.5±0.5	53.9±2.3	3.7±0.5	51.8±1.3
5	6.8±0.6	63.3±2.7	6.5±0.9	62.4±12.2	5.7±0.9	60.0±13.2	5.3±0.8	57.5±2.6	4.3±0.7	54.6±1.5
6	7.0±0.8	64.9±2.7	6.7±1.3	62.3±3.0	5.9±0.8	61.6±2.6	5.5±0.8	59.4±2.4	4.4±0.7	58.2±1.0
7	7.2±1.1	66.1±2.1	7.0±1.1	64.8±2.7	6.2±0.8	63.3±2.9	5.8±0.9	60.4±3.8	4.6±0.9	58.3±2.4
8	7.7±0.8	68.4±2.7	7.2±1.1	66.5±4.7	6.5±0.7	64.4±3.0	6.0±0.9	62.9±2.9	4.9±1.0	60.7±1.9
9	7.9±1.0	69.2±2.5	7.5±1.2	67.6±3.1	6.7±1.1	65.7±2.7	6.2±0.8	63.6±2.5	5.5±0.5	62.5±0.9
10	8.0±1.0	69.5±12.7	7.8±1.0	69.0±4.1	6.8±0.8	66.7±2.6	6.5±0.8	64.8±2.4	5.6±0.4	63.3±1.1
11	8.3±0.9	70.8±2.7	7.9±1.2	70.0±3.2	7.0±0.8	67.5±2.3	6.6±0.9	65.9±2.8	5.7±0.9	63.4±1.6
12	8.4±0.9	72.2±2.9	8.2±1.0	71.3±3.9	7.4±0.8	68.0±2.5	6.7±0.9	66.5±3.3	5.8±1.1	64.6±2.4
15	9.2±0.8	74.3±2.1	8.6±0.9	73.4±2.7	8.2±0.8	73.5±4.5	7.6±0.9	70.3±3.2	6.±81.2	67.0±2.5
18	9.7±0.9	77.3±2.5	9.4±0.9	74.8±3.8	8.7±0.9	74.7±4.2	8.2±0.9	73.2±3.3	7.0±0.8	70.5±2.3
21	9.9±0.9	80.9±2.9	9.9±1.2	78.6±4.5	9.4±1.0	77.5±4.4	8.8±1.2	76.4±3.0	7.7±0.7	73.8±3.7
24	10.9±1.3	82.6±2.8	10.2±1.4	81.6±4.5	9.9±1.1	81.1±4.3	9.0±1.0	78.6±3.0	7.8±1.3	76.0±2.4
27	11.4±1.3	85.4±3.0	10.8±1.3	82.7±3.1	10.1±1.2	82.1±3.8	9.4±1.1	80.3±2.7	8.0±1.2	78.5±3.0
30	11.8±0.9	86.3±3.2	11.5±1.4	84.5±2.9	10.8±1.1	83.8±3.5	9.6±1.3	81.4±3.4	8.5±0.6	79.3±2.9
36	12.7±1.4	89.7±3.7	12.1±1.3	87.9±3.7	11.5±1.3	86.6±3.1	11.1±1.2	85.3±3.5	9.4±0.6	84.2±2.3
42	13.4±1.1	91.1±2.9	13.1±1.2	90.4±2.9	12.4±1.5	89.0±3.4	11.8±1.2	87.5±4.0	10.1±1.3	85.6±2.1
48	14.1±1.5	94.5±3.7	13.8±1.6	94.0±3.0	13.0±1.5	93.5±3.4	12.1±1.3	90.7±4.6	10.7±1.6	89.5±1.8
60	15.9±1.3	100.7±2.6	15.4±1.8	99.6±3.4	14.2±1.6	98.4±3.8	13.4±1.5	96.3±4.1	12.5±1.7	94.5±1.4

*Not recorded Total Number of Children studied =312. n= Number of children in the group

weights of their children, so as to offer these children a better nutritional start in life with a better nutritional potential to become bigger children even under the present unsatisfactory village circumstances.

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