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PREFACE

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is an autonomous, international, philanthropic and non-profit centre for research, education and training as well as clinical service. The Centre is derived from the Cholera Research Laboratory (CRL). The activities of the institution are to undertake and promote study, research and dissemination of knowledge in diarrhoeal diseases and directly related subjects of nutrition and fertility with a view to develop improved methods of health care and for the prevention and control of diarrhoeal diseases and improvement of public health programmes with special relevance to developing countries. ICDDR,B issues two types of papers: scientific reports and working papers which demonstrate the type of research activity currently in progress at ICDDR,B. The views expressed in these papers are those of authors and do not necessarily represent views of International Centre for Diarrhoeal Disease Research, Bangladesh. They should not be quoted without the permission of the authors.

ABSTRACT

Growth and development studies had been continued for 3 years in the village Meheran of Matlab P.S. Usual anthropometric measurements were obtained monthly up to 12 months and then after each quarter. History of diet, socioeconomic status and illness were obtained regularly. Erruption of teeth was also observed and recorded.

The measurements of weight, height, head, chest, arm, Hb% and craniococcys length have been recorded and tabulated.

These measurements are close to Boston standard at birth. These remain parallel during the 1st quarter of life. With the increase in age the gap between Boston standard and this group widens up and the 90th percentile measurements fall below the Boston standard specially from the 5th month.

Dietary supplementation was poor. Children born with low birth weight could not attain the measurements of children born with higher birth weight up to 3 years of age. This trend may be reflected in later life.

The children, who died earlier than other were mostly born with low birth weight and they continued to have lower birth weight than the other till they died. So, proper nutrition of the expectant mothers and proper supplementation of food from the third month of life of every children are most essential for growth and development.

INTRODUCTION

Anthropometric data allows one to assess the nutritional status of a community; but there is a paucity of longitudinal physical growth data on infants and children in Bangladesh. Many studies have been done in other countries (3-8). Compared to physical growth data of other countries our children appeared thinner and shorter. To understand these anthropometric differences of our rural children with that of other countries we felt the necessity of examining these factors, though in a miniature scale, in a rural village of our surveillance area. Since over 91% of the people in Bangladesh are rural, we had commenced this study from October 1973 in a rural area where the date of birth of all children were known and the people were cooperative. In addition to collecting anthropometric measurements we intended to see if other factors like diarrhoeal illnesses or diet during infancy and low and high birth weight had significant influence on the growth of children. Age of dentition had also been included in the study (CRL working paper No. 8).

MATERIALS AND METHODS

The study village Meheran is located in Matlab P.S. of the Comilla district. This is a low economic Hindu area consisting primarily of fishermen, cultivators and small businessmen. This

is situated on the bank of a canal far away from any urban area. The village had been under the surveillance of Cholera Research Laboratory (CRL) since 1966. According to the census, conducted by CRL in 1974, the population of the village was 1934 (1). All new-borns had been included in the study except a few who had migrated out or refused cooperation. In addition, some children born earlier whose dates of birth were known had also been included. There were 401 children in our study including the deads and migrants. A central clinic had been established in the village where the infants were brought for measurements of height, weight, chest, head, midarm and Hb%. Dentition was observed, enquired for dates and recorded during every visit. A trained field worker and two locally trained dais worked in the clinic. Every expectant mother was followed-up and measurements of the newborns and estimation of the haemoglobin of both the mother and child were made within 1-5 days of birth. A single person conducted the study and the same set of instrument was used. The instruments were adjusted and compared with other instruments from time to time. The socio-economic data of the families were recorded at the time of entry to the study. The history of illness, diet and dentition were recorded during regular clinic visits and also during unscheduled visits to the free clinic for medical care. History of illness was mainly recorded by bi-weekly home visits by the same clinic worker. During the first year measurements were made at monthly interval and thereafter every 3 months. Medicines were supplied for

minor illnesses. Children were referred to the CRL field hospital at Matlab for major diarrhoeal illness. From all diarrhoeal patients Rectal Swabs were collected for culture. Haemoglobin was estimated by using the Shallie Halden Haemoglobino-meter. A field supervisor helped the clinic man from time to time. The clinic was visited by a physician weekly for supervision, consultation and follow-up of sick children. Qualitative record of supplementary diet was maintained from the mothers.

RESULTS

The data for Tables 1-4 are derived from 401 children. But it varied for different age and sex groups. Table 1 shows the 10, 50 and 90th percentile measurements of weight, height, head, chest, arm, cranio-coccys, and legs length from birth through 1 year of age. The gain in weight at 50th percentile level for the 1st, 2nd, 3rd and 4th quarters of 1st year of life are 85%, 23%, 7.5% and 7.5% respectively. The quarterly increase in height at 50th percentile level are 21%, 10%, 5% and 4.5%. The gain from birth at the end of 1 year of life in weight, height, head, chest, arm, cranio-coccys and leg lengths are 163%, 45%, 28%, 37%, 36%, 39% and 57% respectively.

Table 2 is continuation of Table 1 which shows the 50th percentile gain in weight, height, head, chest, arm, ccl and

TABLE 1

GROWTH AND DEVELOPMENT, MEHERAN: ANTHROPOMETRIC MEASUREMENTS FROM BIRTH TO 1 YEAR

Measurement	Percentile	Age												
		Birth	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m
Weight kg.	10th	2.0	2.7	3.3	3.9	4.3	4.6	4.8	5.0	5.1	5.2	5.3	5.4	5.5
	50th	2.6	3.4	4.1	4.7	5.1	5.5	5.8	6.0	6.1	6.3	6.5	6.6	6.7
	90th	3.1	4.2	4.9	5.6	6.2	6.6	6.9	7.1	7.3	7.5	7.7	7.8	7.9
Height cm	10th	44.1	48.2	51.6	54.1	55.7	57.6	58.9	60.1	61.1	62.0	62.7	63.6	64.0
	50th	47.0	51.2	54.5	56.8	58.8	60.8	62.4	63.6	64.5	65.3	66.6	67.2	68.1
	90th	49.4	54.0	57.3	60.1	62.1	64.3	65.5	66.9	67.7	69.3	70.0	70.9	72.5
Head cm	10th	31.6	34.1	35.6	36.9	37.6	38.5	39.3	40.0	40.2	40.6	40.9	41.2	41.3
	50th	33.8	36.0	37.5	38.7	39.7	40.5	41.1	41.7	42.0	42.5	42.9	43.2	43.4
	90th	35.5	37.5	39.0	40.4	41.3	42.3	42.9	43.5	43.8	44.3	44.8	45.0	45.5
Chest cm	10th	27.6	30.7	33.0	34.3	35.1	36.1	36.3	36.6	37.3	37.8	37.7	38.3	39.1
	50th	30.5	33.8	35.9	37.4	38.1	39.1	39.5	40.2	40.2	40.6	40.9	41.2	41.2
	90th	32.7	36.1	38.3	39.7	40.7	41.9	42.4	42.8	43.0	43.3	43.7	44.0	44.8
Mid Arm cm.	10th	7.5	9.0	9.6	10.0	10.2	10.3	10.3	10.5	10.6	10.5	10.4	10.5	10.6
	50th	8.9	10.4	11.3	11.7	12.0	12.1	12.3	12.3	12.2	12.1	12.2	12.1	12.1
	90th	10.1	11.8	12.6	13.1	13.5	13.7	13.8	14.0	13.7	13.6	13.7	13.5	13.7
C.C.L.cm.	10th	27.7	30.5	32.6	34.1	35.1	36.1	36.6	37.3	37.8	38.3	38.6	39.0	39.1
	50th	30.2	32.7	34.6	35.9	37.1	38.2	38.9	39.6	40.1	40.6	41.1	41.5	41.8
	90th	32.4	34.7	36.5	38.3	39.3	40.6	41.0	41.7	42.1	42.7	44.1	43.2	43.9
L.L. cm	10th	15.1	16.7	18.1	19.2	19.9	21.0	21.4	22.1	22.7	23.1	23.4	24.0	24.6
	50th	16.9	18.6	20.0	21.0	22.0	22.7	23.5	24.2	24.6	25.3	25.8	26.0	26.6
	90th	18.9	20.6	21.9	23.1	23.8	24.7	25.6	26.1	26.7	27.4	27.8	28.4	29.0
Hb. %	10th	14.2	9.9	8.6	8.9	9.1	9.3	9.3	8.6	8.6	8.8	8.8	8.2	8.7
	50th	20.3	13.5	11.7	11.8	11.9	11.7	11.5	11.5	11.5	11.4	11.5	11.0	11.3
	90th	22.0	17.8	14.5	13.7	14.2	14.1	13.7	13.9	13.8	13.9	13.9	13.6	13.8

TABLE 2

GROWTH AND DEVELOPMENT, MEHERAN: ANTHROPOMETRIC MEASUREMENTS FROM 15 MONTHS TO 48 MONTHS

Measurement	Percentile	Age 15m	18m	21m	24m	27m	30m	33m	36m	39m	42m	45m	48m
Weight kg.	10th	6.0	6.1	6.7	7.1	7.5	7.6	8.0	8.1	8.5	8.6	9.0	9.0
	50th	7.2	7.5	8.0	8.5	8.9	9.2	9.6	10.1	10.3	10.6	10.9	11.3
	90th	8.3	8.7	9.2	9.5	10.2	10.6	11.2	11.5	11.9	12.7	12.8	13.2
Height cm.	10th	65.8	67.5	70.5	71.5	73.5	74.8	75.8	78.2	79.2	80.9	82.0	82.7
	50th	69.9	72.7	74.3	76.4	78.4	80.3	82.0	83.7	85.1	86.4	87.9	89.1
	90th	74.4	76.7	78.8	81.0	83.5	85.2	87.0	88.8	90.5	92.1	93.4	94.7
Head cm.	10th	42.2	42.5	43.1	43.6	43.8	44.1	44.2	44.7	44.7	44.9	45.1	44.9
	50th	44.1	44.5	45.0	45.3	45.8	46.2	46.3	46.4	46.7	46.9	46.8	47.0
	90th	46.1	46.7	47.3	47.3	47.8	48.2	48.5	48.5	48.7	48.8	48.9	48.9
Chest cm.	10th	39.5	40.5	41.5	42.2	42.9	43.3	44.1	44.1	44.5	44.8	45.4	46.1
	50th	42.5	43.3	44.2	44.8	45.6	46.0	46.8	47.3	48.0	48.3	48.7	49.2
	90th	45.2	46.0	46.7	47.3	47.9	48.7	48.6	49.9	50.2	51.2	51.7	52.2
Mid Arm cm.	10th	10.9	11.0	11.1	11.2	11.2	11.5	11.5	11.6	11.6	11.5	11.9	12.0
	50th	12.4	12.4	12.7	12.9	12.7	13.0	13.1	13.3	13.4	13.3	13.6	13.7
	90th	13.8	13.9	13.9	13.9	13.9	14.6	14.6	14.7	14.7	14.8	15.3	15.6
C.C.L. cm.	10th	40.0	40.9	41.5	42.6	42.9	43.1	44.1	44.9	45.4	45.4	46.4	46.7
	50th	42.7	43.2	44.1	44.8	45.4	46.2	46.8	47.6	48.0	48.7	49.0	49.6
	90th	45.0	45.8	47.0	47.6	48.5	49.3	49.9	50.8	51.6	52.0	52.0	52.8
L.L. cm.	10th	25.3	26.2	27.9	28.9	29.7	30.5	31.3	32.3	32.7	33.6	35.0	35.2
	50th	27.6	29.1	30.4	31.8	33.0	34.1	35.1	36.1	37.1	38.0	38.8	39.5
	90th	30.2	31.6	32.9	33.9	35.5	36.8	38.2	38.9	39.9	41.0	42.0	42.8
Hb.%	10th	7.9	8.3	8.1	8.0	8.4	8.7	8.6	9.0	9.0	9.3	9.2	9.0
	50th	10.9	11.0	11.1	10.9	11.2	12.1	12.1	12.0	12.5	12.2	12.1	12.1
	90th	13.5	13.5	13.7	13.9	13.9	14.1	14.3	14.6	14.9	14.6	14.8	14.8

leg from the end of 1st year to 4th year. These gains for the succeeding 3 years are 68%, 31%, 7.5%. 18%, 7%, 19% and 49% respectively. The increases in weight, height and leg lengths are remarkable but the acceleration is considerably less than the 1st year of life in all respects.

Table 3 is the continuation of table 2 which shows similar data from the end of 4th year to 7th year of life. The 50th percentile increases during this period of 3 years for weight, height, head, chest, arm, cranio-coccys and leg are - 27.5%, 16%, 3%, 8%, 0%, 11.6% and 23% respectively. The percentages of gain during these 3 years are less than the previous 3 years of life.

Table 4 (continuation of former table) shows the 50th percentile gains from the end of 7th year to the 10th year of life. These are 38%, 16%, 2.3%, 6%, 20%, 12% and 19% respectively for weight, height, head, chest, arm, cranio-coccys and leg lengths. The percentages of growth during this period are the same level with the previous 3 years.

Table 5 shows the weight gain in children having high birth weight and low birth weight. This is an arbitrary grouping, for the high birth weight is in fact not high compared to other countries. It however, shows that the children born with higher birth weight tend to maintain the higher weight than the lowest birth weight group for three years.

TABLE 3

GROWTH AND DEVELOPMENT, MEHERAN: ANTHROPOMETRIC MEASUREMENTS FROM 51 MONTH TO 84 MONTH

Measurement	Percentile	Age 51m	54m	57m	60m	63m	66m	69m	72m	75m	78m	81m	84m
Weight Kg.	10th	9.4	9.9	10.1	10.6	11.0	11.2	10.8	12.0	11.9	12.6	12.3	12.9
	50th	11.7	11.9	12.2	12.4	13.0	13.2	13.0	13.3	14.1	14.3	14.5	14.3
	90th	13.7	13.7	14.8	15.1	15.0	15.8	16.4	16.3	16.3	16.7	16.9	17.0
Height cm.	10th	83.4	84.7	87.3	88.0	88.1	90.2	91.7	93.6	94.3	94.4	95.5	96.3
	50th	90.6	91.9	93.3	94.9	96.3	97.7	98.6	100.0	100.5	102.0	102.7	103.1
	90th	96.2	97.3	99.1	101.4	102.3	103.7	104.9	106.7	107.4	108.8	109.7	112.3
Head cm.	10th	45.1	45.2	45.3	45.6	45.8	45.7	45.7	45.8	45.8	45.4	46.2	46.0
	50th	47.2	47.4	47.5	47.7	47.9	48.2	47.8	48.3	48.2	48.5	48.5	48.4
	90th	49.5	49.7	49.3	49.9	50.2	50.1	50.1	50.3	50.6	50.3	50.3	50.2
Chest cm.	10th	45.8	47.1	47.2	47.6	48.5	48.2	48.5	48.8	49.1	49.7	50.5	50.5
	50th	48.7	49.7	50.5	51.0	51.2	51.4	51.2	51.6	52.1	52.0	52.7	52.9
	90th	51.8	52.5	53.1	54.0	53.9	55.1	54.8	55.3	54.5	54.9	55.9	55.6
Mid Arm cm.	10th	11.9	12.4	12.4	12.8	12.4	12.4	12.3	12.5	12.2	12.3	12.8	12.6
	50th	13.7	13.7	14.0	14.0	14.0	14.0	13.8	14.1	14.1	14.2	14.1	13.2
	90th	15.5	15.2	15.6	15.6	15.3	15.4	15.6	15.5	15.7	15.7	15.8	16.2
C.C.L.cm.	10th	46.7	47.8	48.2	49.0	48.9	49.5	49.9	50.4	51.0	50.9	51.8	52.3
	50th	50.1	50.7	51.3	52.0	52.5	53.3	53.5	53.9	54.6	54.9	55.1	55.4
	90th	53.2	53.6	53.9	55.0	55.4	56.1	56.3	57.2	57.5	58.3	57.9	58.4
L.L.cm.	10th	35.7	36.9	38.4	39.0	39.6	40.9	41.5	41.9	42.5	43.3	43.9	43.8
	50th	40.3	40.9	41.9	42.8	43.5	44.1	45.0	46.2	45.9	47.0	48.1	48.5
	90th	44.1	45.4	46.5	47.0	47.8	48.7	49.4	51.3	51.6	51.8	52.7	54.8
Hb.%	10th	9.2	8.5	8.6	8.5	9.3	8.9	8.7	9.1	9.4	8.9	8.4	9.3
	50th	12.6	12.1	12.3	12.3	12.3	12.2	11.9	11.9	12.5	12.3	12.1	11.9
	90th	14.8	14.7	14.4	14.7	14.7	14.6	14.1	14.6	14.5	14.6	14.7	14.3

TABLE 4

GROWTH AND DEVELOPMENT, MEHERAN: ANTHROPOMETRIC MEASUREMENTS
87 MONTH TO 120 MONTH

Measurement	Percentile	Age 87m	90m	93m	96m	99m	102m	105m	108m	111m	114m	117m	120m
Weight Kg.	10th	12.9	13.0	13.4	13.2	14,1	15.1	14.4	15.3	17.6	18.4	18.7	19.3
	50th	14.9	15.0	16.0	15.5	15.9	16.7	16.8	17.6	18.9	18.8	19.3	19.9
	90th	16.9	17.3	18.5	17.5	18.1	18.3	18.4	18.9	19.6	19.8	19.4	20.5
Height cm.	10th	95.9	99.3	101.1	101.4	102.7	103.0	105.8	109.9	109.8	110.3	109.2	118.6
	50th	104.5	106.0	107.6	106.0	108.2	110.2	110.5	112.0	116.9	113.5	116.6	119.8
	90th	112.3	114.4	115.9	115.0	115.3	117.8	117.8	118.7	120.1	119.0	119.9	121.0
Head cm.	10th	46.1	46.3	46.1	45.8	46.4	46.6	46.6	45.6	45.2	45.5	49.0	48.3
	50th	48.1	48.0	48.4	48.2	48.5	48.6	48.0	47.6	49.0	49.0	49.7	49.5
	90th	50.0	50.1	50.4	50.2	50.3	50.1	49.6	49.7	49.9	49.9	50.4	50.7
Chest cm.	10th	50.2	50.8	52.0	51.4	51.8	52.4	54.0	53.3	53.3	55.0	54.0	54.4
	50th	53.1	53.4	54.0	54.0	53.9	55.0	54.0	55.1	55.0	55.0	55.4	56.0
	90th	56.1	57.2	56.4	55.5	55.8	56.9	56.6	56.9	58.3	59.0	56.0	57.6
Mid Arm	10th	12.9	12.9	12.7	13.0	13.4	13.7	13.5	14.4	14.9	15.4	15.4	15.2
	50th	14.2	14.2	14.5	14.3	15.0	14.5	14.5	14.6	15.3	15.6	15.5	15.8
	90th	15.4	15.8	16.2	15.6	15.5	15.8	15.5	15.8	16.1	16.8	15.6	16.4
C.C.L. cm.	10th	52.3	53.4	56.8	52.8	52.9	53.2	55.5	55.3	56.5	56.5	54.8	61.6
	50th	54.6	56.7	57.1	57.0	57.9	58.6	58.5	59.5	60.0	57.8	59.0	61.8
	90th	58.6	59.2	59.6	60.1	60.3	61.2	60.6	62.0	61.8	60.6	61.3	62.0
L.L. cm.	10th	44.9	45.4	46.0	47.2	47.0	49.7	50.3	51.2	53.2	53.8	54.8	56.4
	50th	50.4	50.2	51.1	50.1	50.8	52.5	52.5	55.0	56.9	55.7	57.2	57.8
	90th	56.1	55.7	55.8	55.1	55.5	57.0	57.1	57.1	58.3	58.4	58.9	59.2
Hb. %	10th	8.2	7.9	9.0	8.8	9.0	8.2	9.0	8.1	8.3	10.3	8.7	7.5
	50th	11.4	12.0	12.0	12.0	12.4	12.3	11.7	10.0	10.0	10.0	8.9	8.0
	90th	14.2	14.5	14.6	13.8	14.1	14.6	14.2	13.6	12.4	11.0	9.1	8.5

TABLE 5

AVERAGE WEIGHT GAIN IN LOW AND HIGH BIRTH WEIGHT GROUPS BY AGE

Age	LOW BIRTH WEIGHT (up to 2.033 kg) No. of obs.	Mean weight in kg.	HIGH BIRTH WEIGHT (kg. 2.066-over) No. of obs.	Mean weight in kg.
Birth	54	2.018	68	2.886
1 mo	50	2.822	65	3.895
2 mo	47	3.563	58	4.560
3 mo	43	4.283	58	5.155
4 mo	40	4.908	49	5.666
5 mo	36	5.252	46	6.017
6 mo	36	5.634	41	6.262
7 mo	31	5.665	40	6.433
8 mo	35	5.69	37	6.581
9 mo	34	5.737	32	6.640
10 mo	30	5.824	31	6.778
11 mo	32	5.975	30	6.980
12 mo	31	6.102	31	7.050
1/3 mo	29	6.514	27	7.425
1/6 mo	22	6.887	25	7.780
1/9 mo	20	7.267	22	8.350
2/0 mo	18	7.955	19	8.842
2/3 mo	14	8.491	16	9.268
2/6 mo	10	9.002	11	9.938
2/9 mo	3	9.300	9	10.140
3/0 mo	-	-	7	10.692

Though there is none with high income in the village they have been grouped on the basis of comparative income. Table 6 shows the weight changes in low and higher income groups. These groups have been constituted on the basis of total yearly income per head from all sources. It shows that the weight gain in these two groups were almost similar though in fact the weight in richer groups was slightly higher. Coefficients of regression of weight on age were calculated for the two groups. The difference of the coefficients was not statistically significant.

Table 7 shows the Haemoglobin percentages by age between children born with higher and lower birth weight. It shows that the children born with low birth weight have higher percent of Hb. initially. But by the age of 4 month they fall below the children born with higher birth weight.

The figure I(a) shows the gain in weight by Meheran children at 10, 50 and 90th percentile levels. The Harvard standard weight (2) is much higher than the 90th percentile weight of Meheran children. Figure 1(b) shows the weight from the age of 2½ to 7½ years. The differences with the Boston data are more marked here.

Figure I(a) shows the changes in height of Meheran children. Though to a lesser extent, the pattern is identical here as in the weight data. Figure 2(b) shows the same trend

TABLE 6

AV. WEIGHT GAIN IN LOW AND HIGHER INCOME GROUPS

A G E	Weight of Children in Low Income Pamilies (Up to Tk.360/yr/person)	Weight of Children in Higher Income Families (Over Tk.533/yr/Persons)
	Kg.	Kg.
Birth	2.46	2.50
3 Month	4.51	4.55
6 "	5.64	5.73
9 "	6.17	6.28
12 "	6.54	6.77
15 "	6.97	7.08
18 "	7.29	7.46
21 "	7.72	8.09
24 "	8.45	8.50
27 "	9.00	8.88
30 "	9.60	9.55
33 M	9.82	9.87

TABLE 7

PERCENTAGE HAEMOGLOBIN IN CHILDREN BORN WITH LOW AND HIGH BIRTH WEIGHT BY AGE

	Low Birth wt. (up to 2.33 Kg.)		High Birth wt. (2.66 Kg. +)	
Age	No. of Children	Mean HB%	No. of Children	Mean Hb%
Birth	54	18.65	65	18.25
1 month	50	13.52	65	12.81
2 months	47	11.50	58	11.44
3 "	43	11.17	57	10.92
4 "	40	11.28	49	11.49
5 "	36	11.13	46	11.29
6 "	37	11.03	41	11.23
7 "	31	10.71	40	11.45
8 "	35	10.19	37	11.24
9 "	34	10.56	32	11.80
10 "	30	10.55	31	11.39
11 "	32	10.27	30	10.96
12 "	31	10.59	31	10.81
15 "	29	10.38	26	11.31
18 "	22	10.32	25	11.54
21 "	20	10.08	22	10.86
24 "	19	9.84	19	10.47
27 "	13	9.75	16	9.68
30 "	10	9.76	11	10.20

from 30 to 90 months of age. The differences in length with that of children in western countries also wideness with the increase in age. Figure 3 shows the yearly gain in length of craniococcys part and the lower part (leg) of the body from birth to 12 years of age. The length of the lower limbs have been arbitarily derived by deducting the craniococcys length from the entire body length. It appears that the growth in the length of lower limbs exceeds the growth of the craniococcys length from the beginning of the 2nd year of life.

Figure 4 shows the average variation in weight between living and dead children. Twenty six children died at varying ages up to the time of this analysis. The weight of the dead children have been compared with the living children of the same age groups. It shows that those who died out started with a lower birth weight and there were fluctuations of their weight during their life time. Before death the weight fell rapidly. Figure 5 shows the differences in heights between children survived and died. There are some differences in heights also. It appears that the ones with poorer physique died and the better ones survived.

The next figure 6 shows the differences in mean weight between children of low birth weight and high birth weight groups. Children born with high birth weight maintained higher weight at least up to the age of 36 months of age.

Figure 7 shows the differences in Haemoglobin percentages between children born with low and high birth weight by age. It shows that though Hb% is initially higher in low birth weight group it falls below the high birth weight group by 4th month of age. The coefficients of regression (from 3 months and onward) of two groups do not differ significantly.

DISCUSSION

Many longitudinal studies (3,4,5,6,7,8) on growth and related factors have been conducted all over the world. But none have been done in Bangladesh. In this report we have presented mostly the anthropometric data. This group is nearly representative of the commoner classes of rural Bengali children. The urban children specially from the middle and higher socio-economic group may have a better standard of weight and height than this group. We, however, wish to present the standard of this village in near future.

The growth patterns alone are interesting. Percentage weight gain of Meheran children by quarter are 84, 22, 9

and 7% for both sexes during the 1st year of life. For height the growth by quarter are 20, 10, 5 and 5% for both sexes. For Boston children these are 68, 33, 20 and 11% for weight and 20, 10, 7 and 6% for height. The growth during the 1st 3 months is identical with the Boston children. Then the Meheran children begin lagging behind. Boston children are almost 1 kilogram heavier than Meheran children at birth. By the end of the 5th year they are about 6 kilograms heavier. The average Boston children are 4 centimeters longer at birth and the standard ones are 14 centimeters taller by the fifth year.

Although Meheran children start with a lower standard the pattern of growth is quite parallel during first 5 months of age between Meheran and Boston (Harvard) children. The Boston children maintain the uniform rate of growth through the succeeding years whereas Meheran children fall back from the age of 5 months. Meheran children depend entirely on breast feeding up to some months of age. When additional food is needed with the decrease of production of breast milk very few of the children are provided with proper and adequate supplementation. The supplementations are poor, inadequate and irregular during this period. This may be the cause of plateauing of anthropometric curve from this age. It is apparent that the children with high birth weight tend to maintain higher weight for 3 years of life. This difference in weight

may continue throughout their life time. The children who died had lower weight from birth till death than the average living group of the same village. So, birth weight, is an important factor for growth and development.

The rural Meheran children are way below the standard of developed countries. Low birth weight and poor supplementation at proper time seem to be responsible along with other causes for the lower physical standard of this group of children. The expectant mothers therefore, need proper nutrition and the children need proper supplementation along with breast-feed from the 3rd month of life.

FIGURE I(a)

WEIGHT OF MEHERAN CHILDREN (SEXES COMBINED)

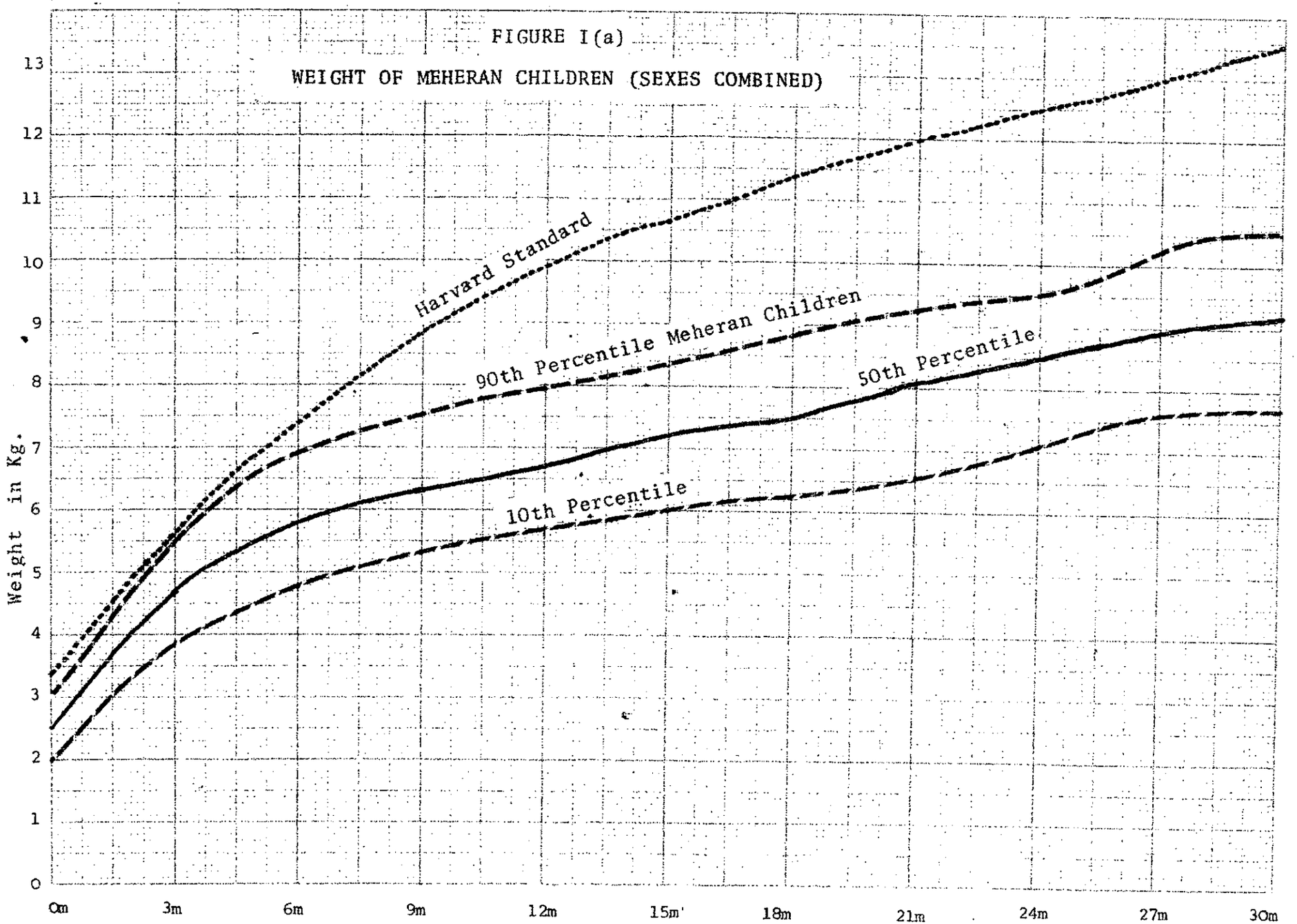
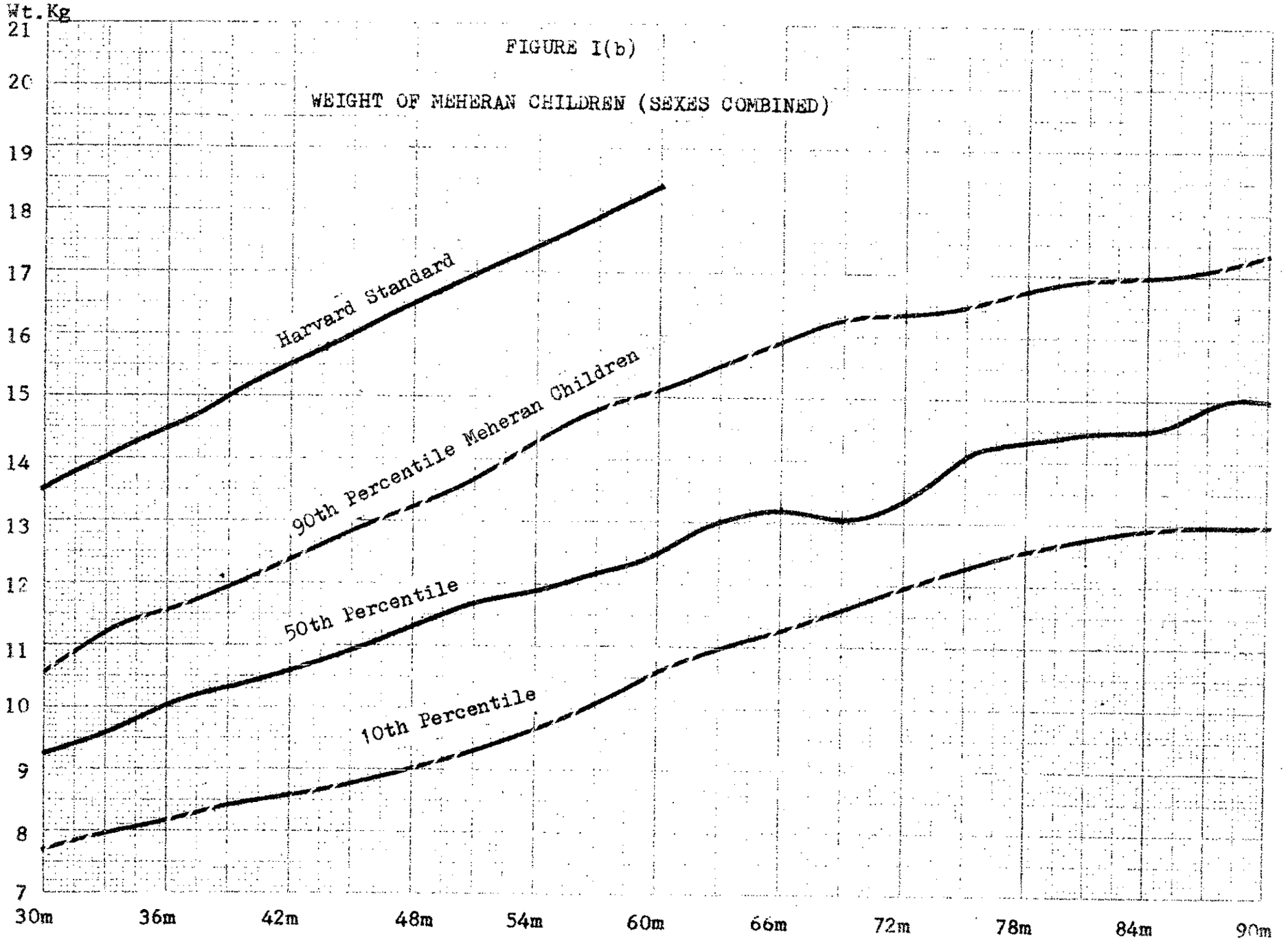


FIGURE I(b)

WEIGHT OF MEHERAN CHILDREN (SEXES COMBINED)



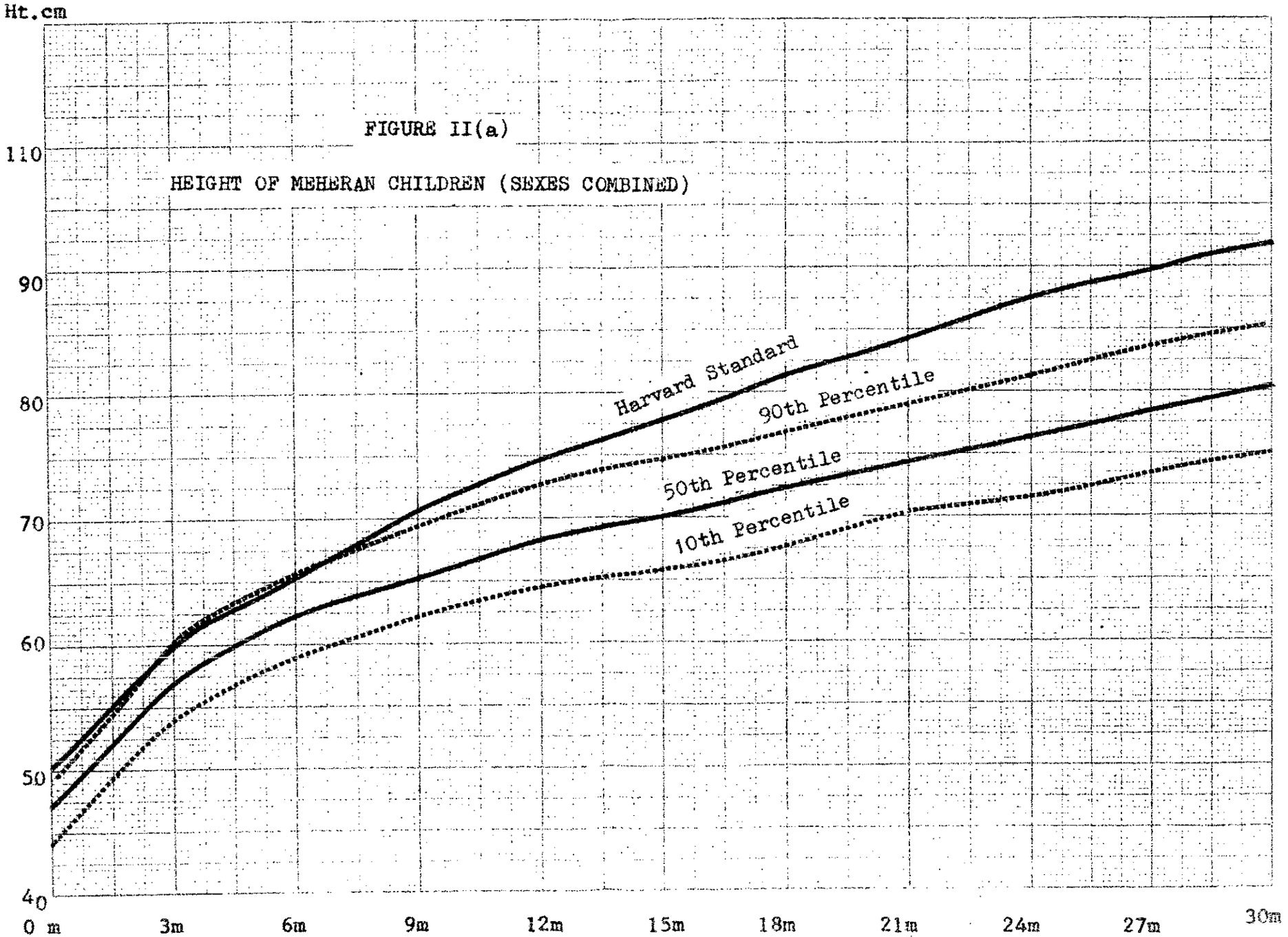
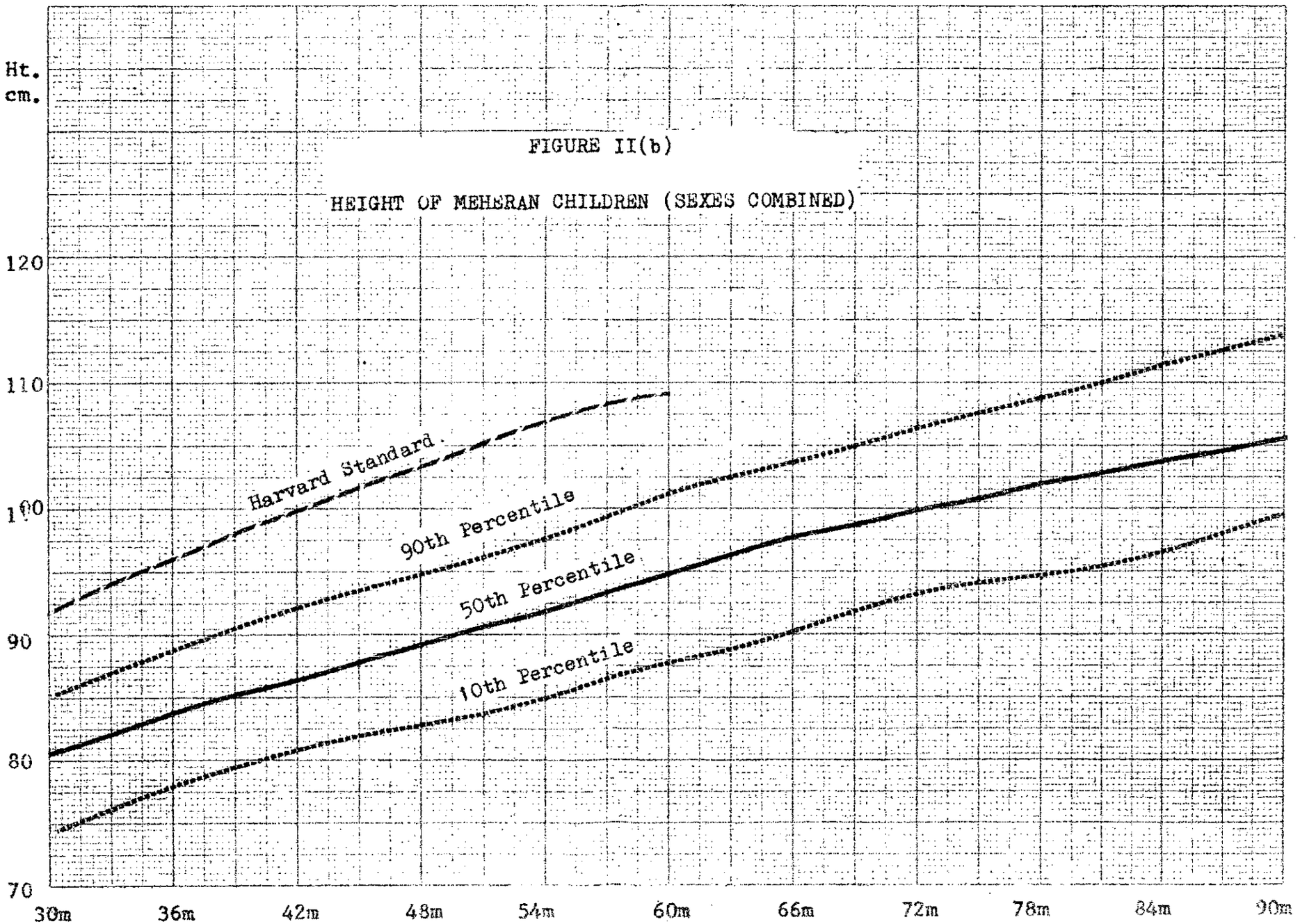


FIGURE II(b)

HEIGHT OF MEHERAN CHILDREN (SEXES COMBINED)



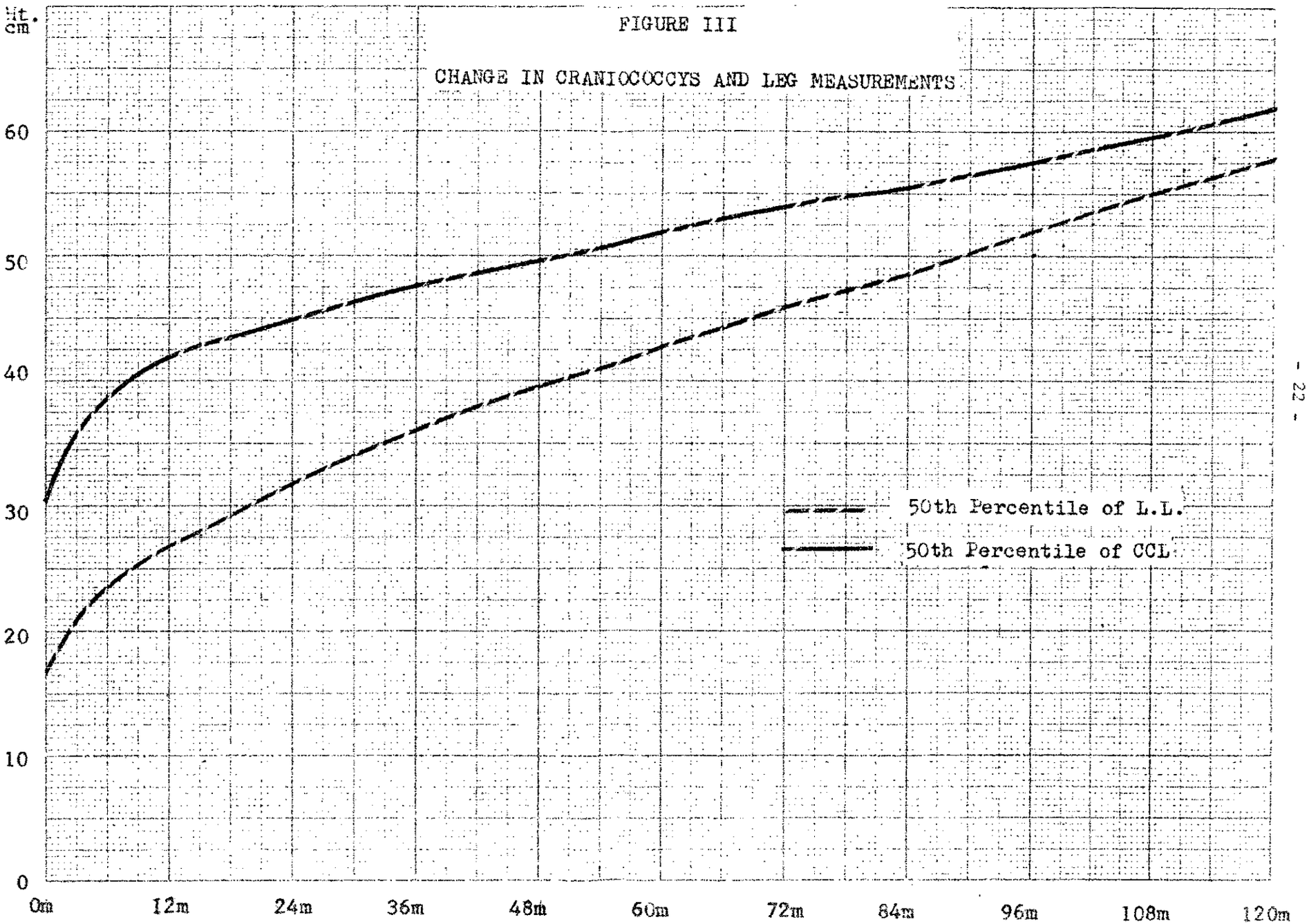


FIGURE III

CHANGE IN CRANIOCOCCYS AND LEG MEASUREMENTS

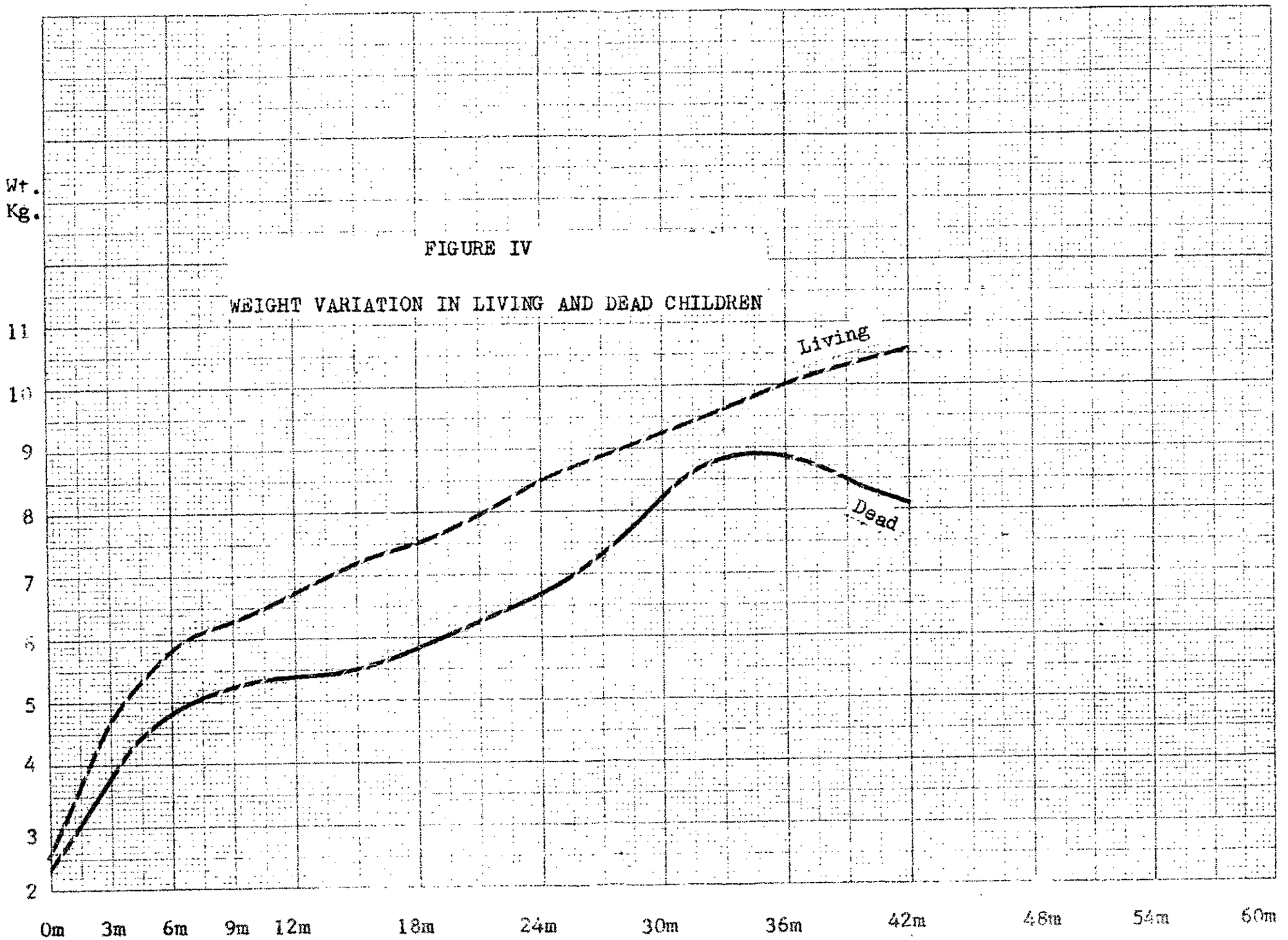


FIGURE IV

WEIGHT VARIATION IN LIVING AND DEAD CHILDREN

FIGURE V

HEIGHT VARIATION IN LIVING AND DEAD CHILDREN

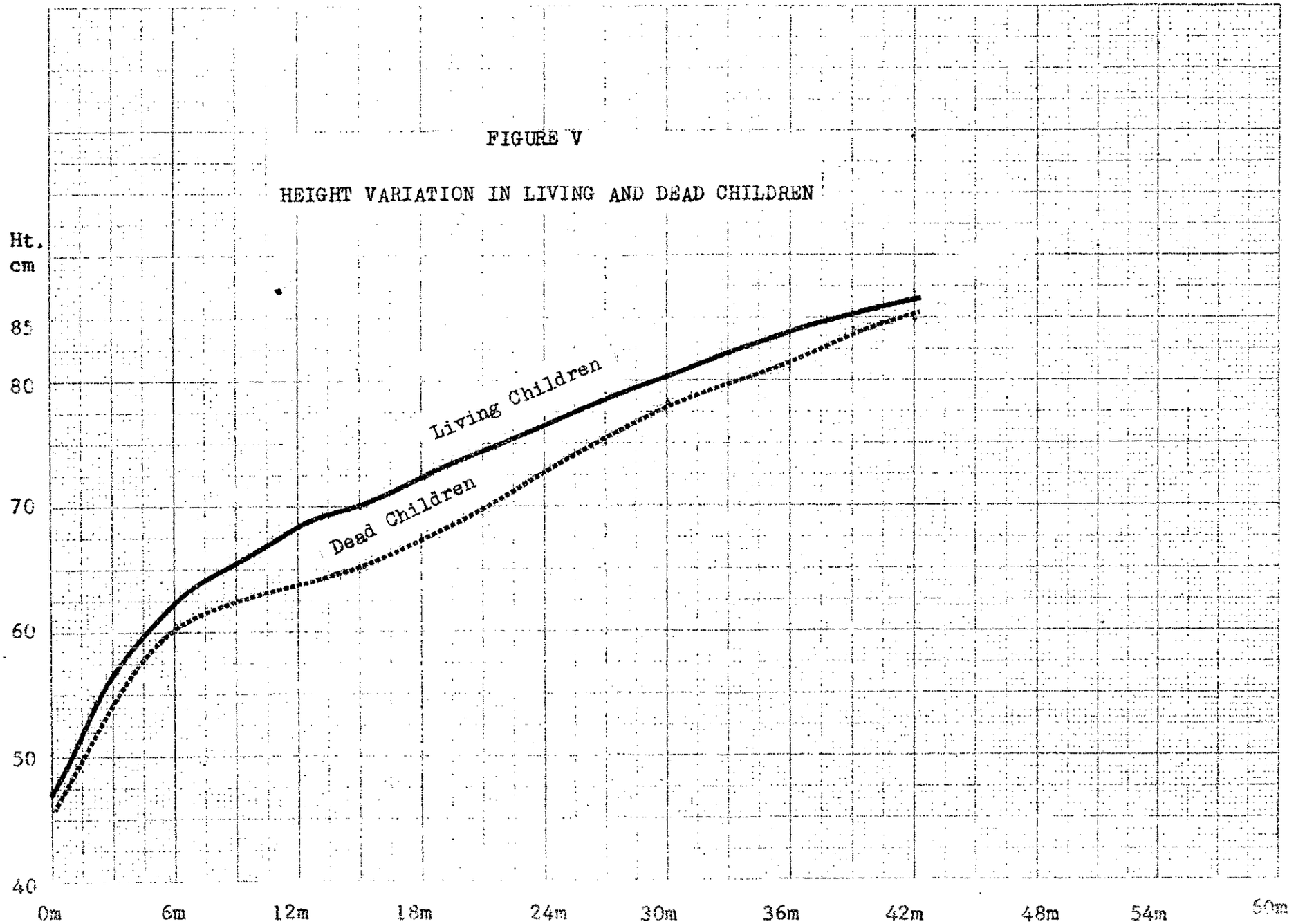


FIGURE 6

Mean weight of children born with low and high birth weight by age

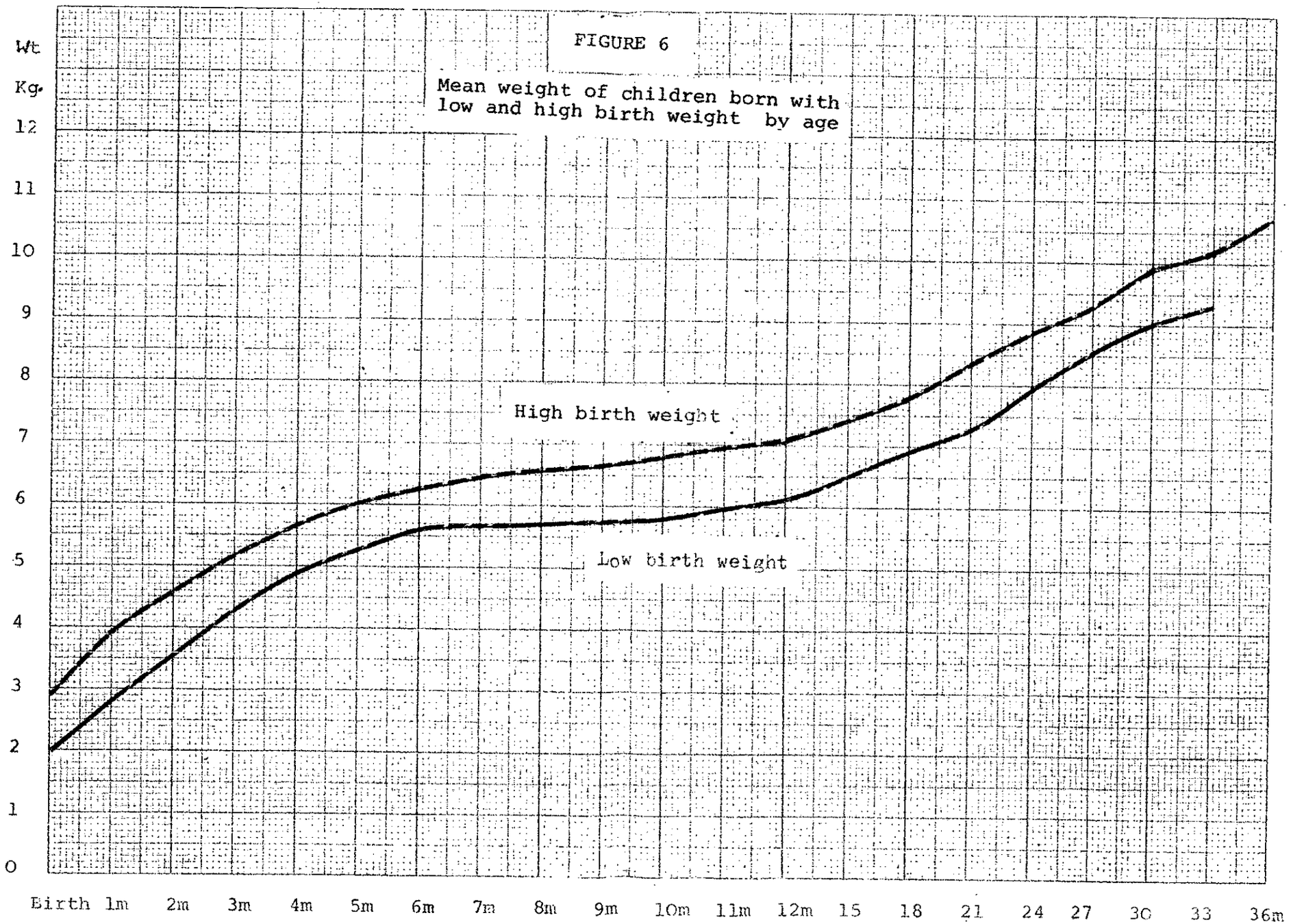
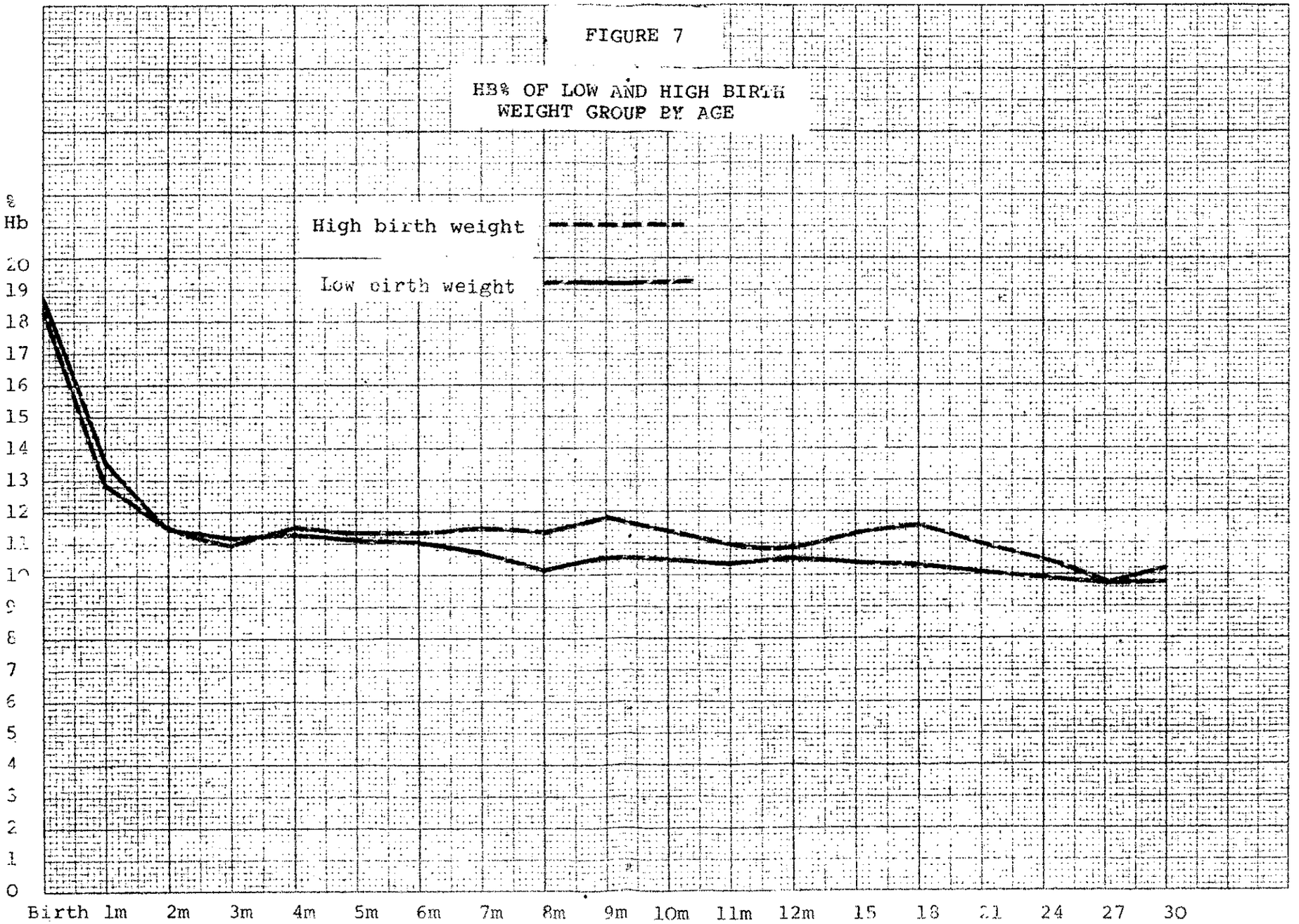


FIGURE 7

HB% OF LOW AND HIGH BIRTH WEIGHT GROUP BY AGE



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REFERENCES

1. Cholera Research Laboratory: Population census of Matlab, 1974

2. From Studies of Child Health and Development, Department of Maternal and Child Health, Harvard School of Public Health. Cited in: Nelson's Text book of pediatrics. Philadelphia, Saunders, 1975: 40-45

3. Martorell R, Habicht JP, Yarbrough C, Lechtig A, Klein RE, Western KA: Acute morbidity and physical growth in rural Guatemalan children. Am J Dis child. 129(11):1296-1301, Nov 75

4. Mata J, et al: Infection and infectious diseases in a malnourished population: a long term prospective field study. XIII Symposium Sweden Nutrition Foundation.

5. Dacca University. Institute of Nutrition and Food Science: Nutrition survey of rural Bangladesh, 1975-76. Dacca, 1977:102, 110

6. Yarbrough C, Habicht JP, Klein RE, et al: Determining the biological age of the preschool child from hand-wrist radiograph. Invest Radio. 8(4):233-243, Jul-Aug 73

7. Delgado H, Habicht JP, Yarbrough C, Lechtig A, Martorell R, Malina RM, Klein RE: Nutritional status and the timing of deciduous tooth eruption. Am J Clin Nutr. 28(3):216-224, Mar 75

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