

**THE DEVELOPMENT OF STATURE, WEIGHT AND PONDERAL  
INDEX IN CHILDREN IN THREE DEFFERENT ENVIRONMENTS  
IN EGYPT**

*Key words* : Growth. Children. Egypt

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**نمو الأطفال في القامة والوزن ومعامل بوندلر  
في ثلاث بيئات متباينة في مصر**

جمع الباحث قياسات عن ارتفاع القامة ووزن الجسم لعدد ٢٤٠ حالة من الذكور والإناث لأطفال من مدينة القاهرة ومن بندر شربين ومن قرية كلابشة الجديدة ، واستخرج منها معامل بنية الجسم بطريقة بوندلر .  
وصنف المادة المجمعة طبقا للنوع ولفئات السن . ثم أجرى عليها بعض عمليات التحليل الإحصائي حيث اتضح قلة التباين بين المجموعات الثلاث وان كانت مجموعة بندر شربين تتفوق على المجموعتين الأخرين بدرجة قليلة ، ويرجع هذا غالبا إلى تأثير التغذية والبيئة أكثر مما يرجع إلى الفروق الأنثروبولوجية .

**فاروق عبد الجواد شويقة**

**Introduction**

The present paper elaborates the changes of stature and body weight according to age in three different environments in Egypt. The first one is Cairo city, the second is Sherbin town in mideast Delta and the third one is the new Nubia's homeland at Kom Ombo in upper Egypt.

The collected material was elaborated in three series. The first is represented by sex (boys and girls) from Cairo City. This series is represented by the group aged  $II \pm 0.5 - 16 \pm 0.5$  years.

The three presented series come from different environments so it seems more appropriate to elaborate them separately in order to comprehend any possible differences between them.

### Material and Methods

School age boys and girls, 240 in number, varying in age from  $II.0 \pm 0.5$  years were randomly selected and equally distributed from the three mentioned environments in Egypt (figure I). The data were collected by the author himself in 1973 by the way especially the data of the Konouz during the research work of the PH.D. dissertation at the New Nubia in Kom Ombo. Some of series ages limited to single individuals.

The measurements were taken by : Anthropometer and Weight Beam Scale and from their results the Ponderal Index was taken.

TABLE I

The number of cases and percentage according to sex and location

	Tatal		Cairo		Shenbin		Konouz	
	N	%	N	%	N	%	N	%
mal ♂	125	100.00	37	29.60	55	44.00	33	26.40
femal ♀	115	100.00	22	19.13	74	64.35	19	16.52
♂ + ♀	240	100.00	59	24.58	129	53.75	52	21.67

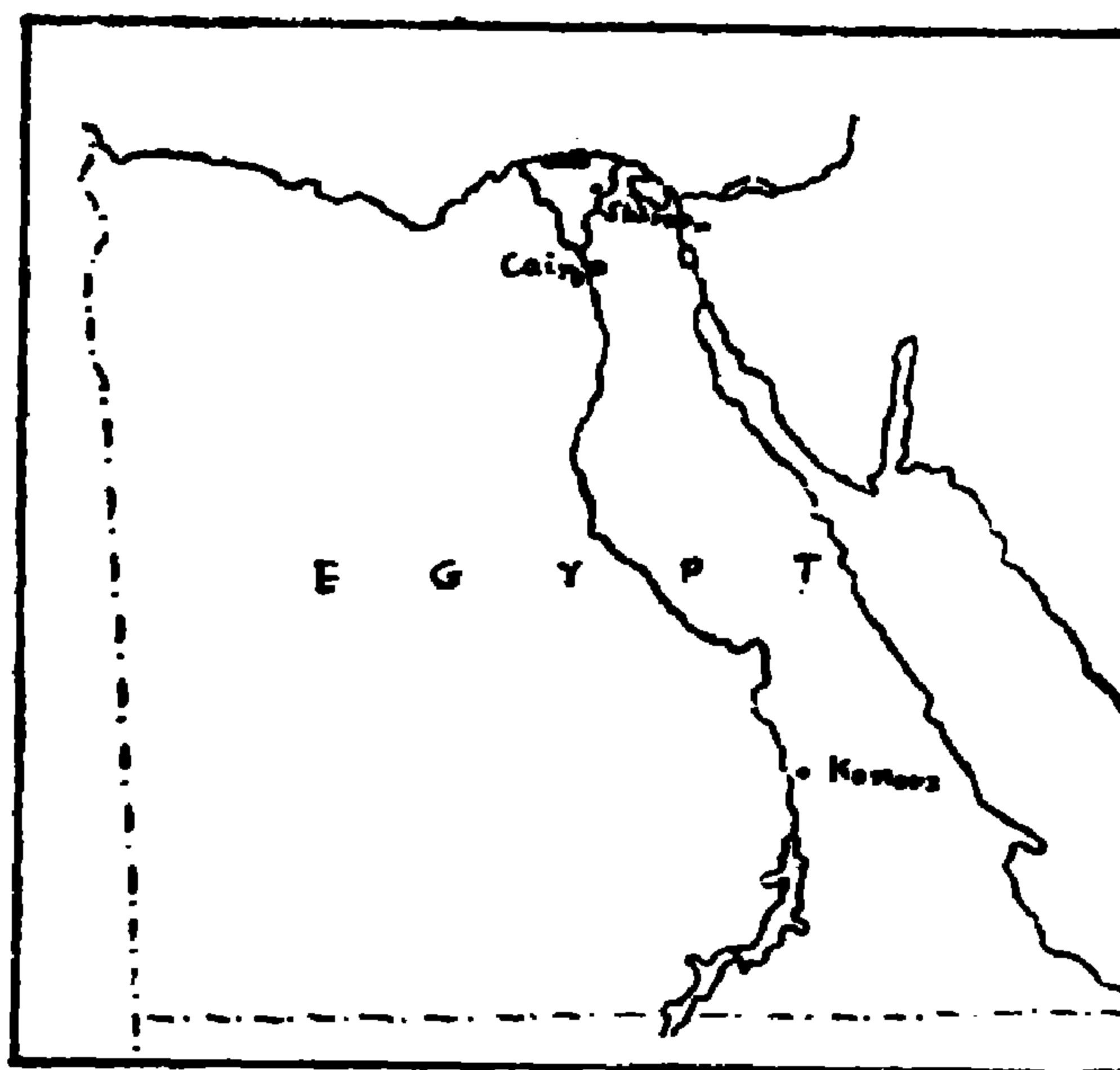


Fig. 1— Location Map

The following formula is thus used :

$$\text{Ponderal Index} = \frac{100 \times \sqrt[3]{\text{weight}}}{\text{Stature}}$$

Calculation of statistical analysis was done according to the formula :

$$\bar{X} = \frac{F}{n}$$

$$\sigma = S = \sqrt{\frac{\sum (X - \bar{X})^2}{(n-1)}}$$

$$SE_{\bar{X}} = \frac{\sigma}{\sqrt{sn}}$$

$$SE_{\sigma} = \frac{\sigma}{\sqrt{2n}}$$

These statistical analyses were made on the amount of : height, weight and Ponderal Index.

### Results

Stature : The statistical data necessary for a characterization of height development in boys and girls from each of Cairo, Sherbin and Konouz are presented in table 2 and 3, and also in figures 2 and 3,

The arithmetic means of the groups compared show that boys and girls from Cairo are taller in general than children of the same age in Sherbin town and of the Konouz group.

It is difficult to judge height difference among children in Konouz during the initial stage of maturity on account of lack of material. It might only be remarked that height average of girls at the ages of  $12.0 \pm 0.5$  and  $13.0 \pm 0.5$  is greater than that of boys.

The absolute measurement and rate of change in relation to age may be shown by comparing the height differences in the age groups  $11.0 \pm 0.5$  and  $16.0 \pm 0.6$  as well as these in any other age, these differences may show the average increase.

The appropriate data are given in table 4.

It follows from this table that arithmetic means of height at the age 13.0 in this particular series investigated increase by the following amounts :

	Cairo	Sherbin	Konouz
Boys	5.24	11.56	0.80
Girls	9.00	8.07	3.37

The boys and girls of Sherbin show an increase which is larger than that of those of Cairo.

Weight : The statistical characterization of the weight is shown in tables 5 and 6, and figures 4 and 5.

With reference to weight the picture which emerges is similar to that relating to stature. Children from Konouz are lighter in weight than those from Sherbin and Cairo, especially the first. These relations of the mean weight are quite understandable when referred to the mean heights.

Smallest children are at the same time the lightest in weight.

Table 2— Stature of Boys from: Cairo, Sherbin and Konouz of Kom Ombo

Age	Cairo			Sherbin			Konouz		
	N	$\bar{X}$	S	N	$\bar{X}$	S	N	$\bar{X}$	S
11.0±0.5	5	139.4±2.69	6.02 ± 1.90	3	128.9±2.90	5.03 ± 2.05	7	137.3±2.11	5.59±1.49
12.0±0.5	21	140.5±1.25	5.75 ± 0.89	9	143.8±2.45	7.34 ± 1.73	24	137.7±1.56	7.66±1.11
13.0±0.5	9	146.7±4.71	14.14±3.33	22	144.3±2.19	10.27±1.55	1	138.4	
14.0±0.5	2	157.1±2.60	3.68 ± 1.84	8	144.4±4.57	12.93±3.23	1	138.9	
15.0±0.5				13	155.8±3.25	11.73±2.30			
16.0±0.5									

Table 3— Stature of Girls from: Cairo, Sherbin and Konouz of Kom Ombo

Age	Cairo			Sherbin			Konouz		
	N	$\bar{X}$	S	N	$\bar{X}$	S	N	$\bar{X}$	S
11.0±0.5	2	134.4±1.48	2.09±1.05	12	137.6±1.43	4.96±1.01	2	139.4±2.14	3.02±1.51
12.0±0.5	14	144.2±1.67	6.26±1.18	12	137.6±1.43	4.96±1.01	12	141.7±1.85	6.41±1.31
13.0±0.5	3	146.5±2.42	4.19±1.71	15	148.7±1.66	6.43±1.17	5	144.1±0.75	1.68±0.53
14.0±0.5				15	151.9±1.79	6.92±1.26			
15.0±0.5	2	156.4±4.98	7.04±3.52	23	154.0±4.80	4.44±0.65			
16.0±0.5	1	157.5		9	154.9±3.29	9.88±2.33			

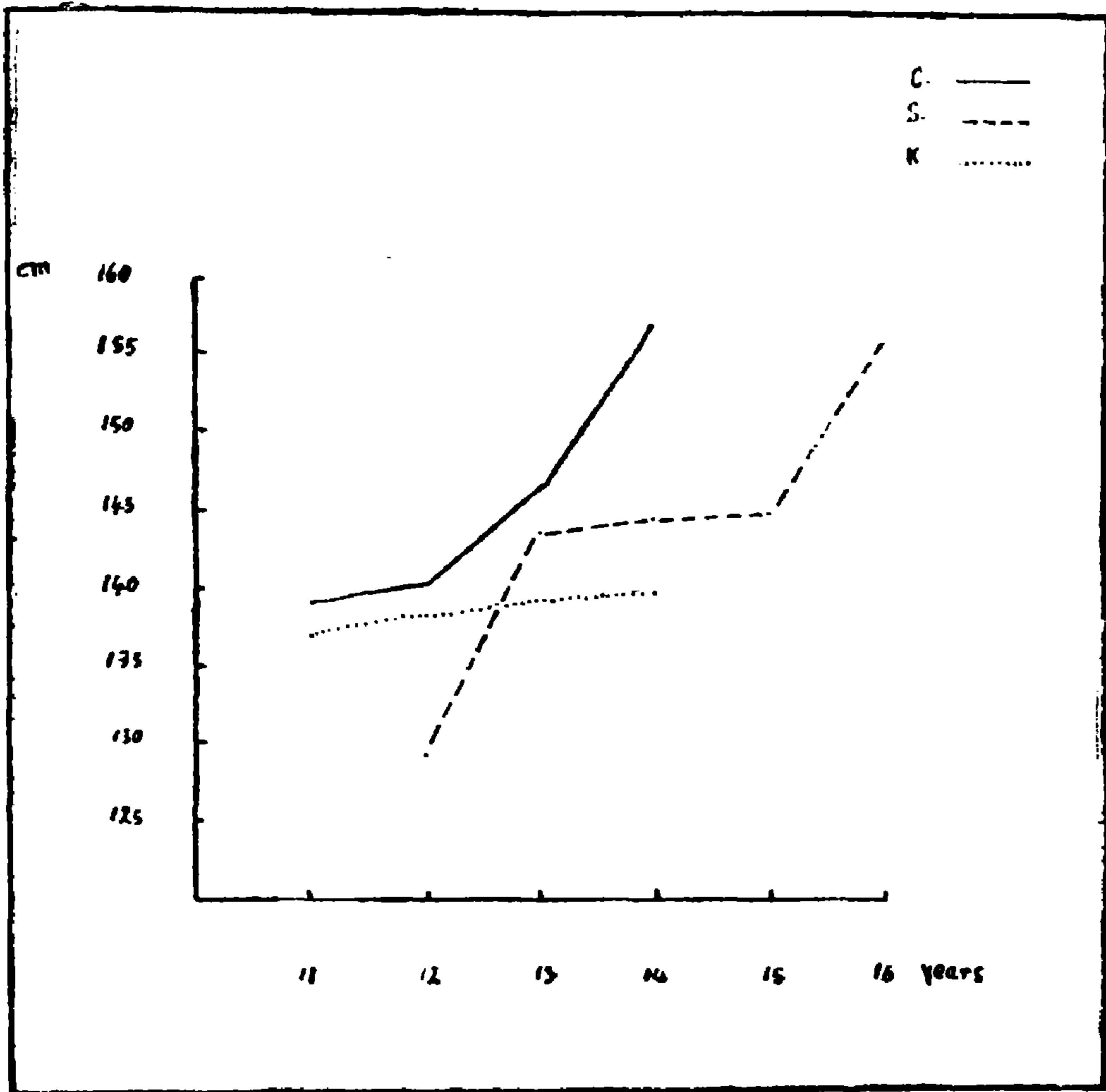


Fig. 2—Stature of Boys

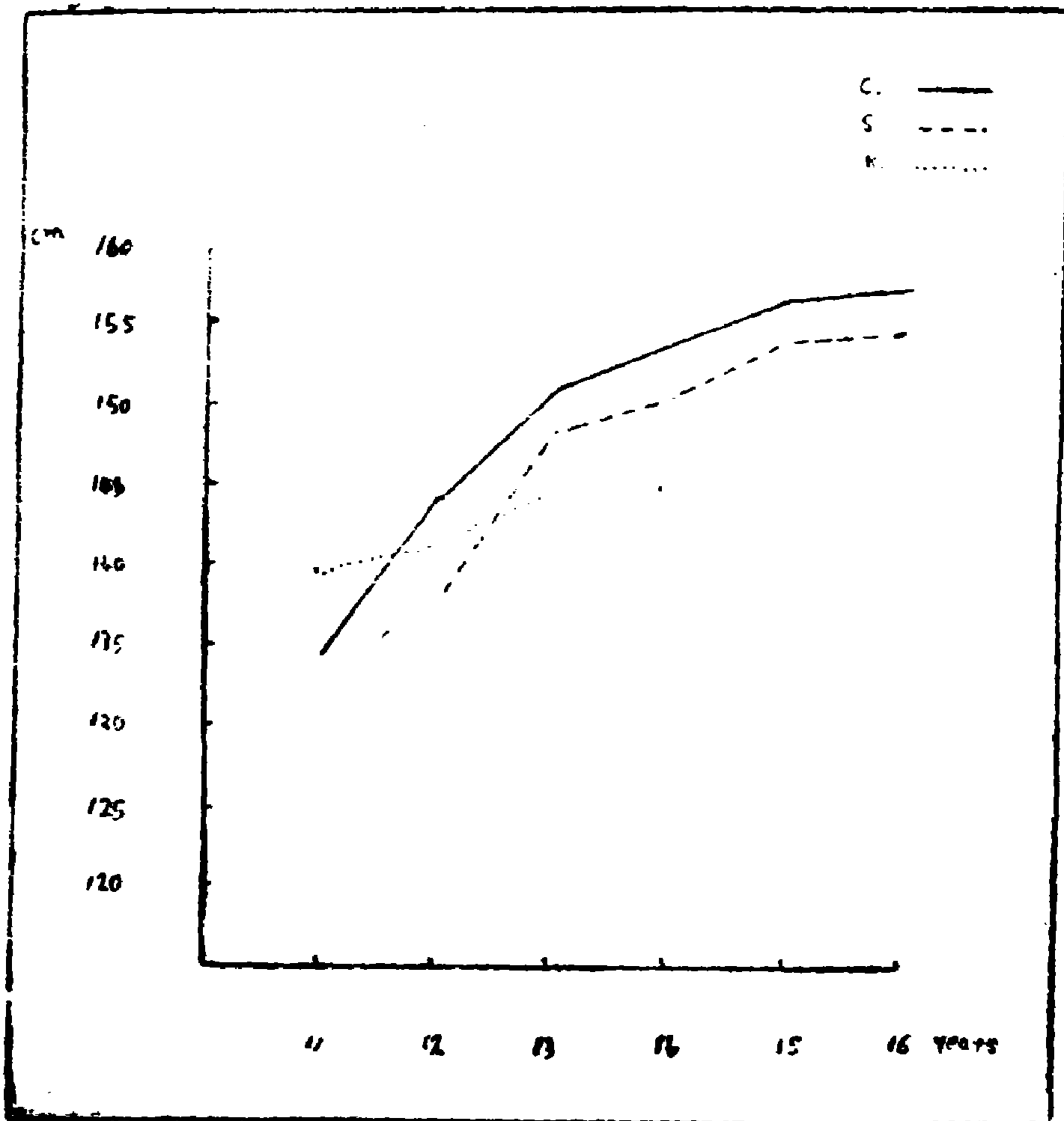


Fig. 3—Stature of Girls



Table 4— Stature of Children from: Cairo, Sherbin  
and Konouz of Kom Ombo in Percentage of thier height at the age of  $11.0 \pm 0.5$

Age	Boys						Girls					
	Cairo		Sherbin		Konouz		Cairo		Sherbin		Konouz	
	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
$11.0 \pm 0.5$	5	100.00	—	—	7	100.00	2	100.00	—	—	2	100.00
$12.0 \pm 0.5$	21	100.79	3	100.00	24	100.29	14	107.29	—	—	12	101.65
$13.0 \pm 0.5$	9	105.24	9	111.65	1	100.80	3	109.00	15	108.07	5	103.37
$14.0 \pm 0.5$	2	112.69	22	111.95	1	101.17	—	—	15	110.39	—	—
$15.0 \pm 0.5$	—	—	8	112.02	—	—	2	116.37	23	111.92	—	—
$16.0 \pm 0.5$	—	—	13	120.87	—	—	1	117.19	9	112.57	—	—

Data of the percentage differences between weight at the ages of  $11.0 \pm 0.5$  and  $13.0 \pm 0.5$  are given in the following table.

	Cairo	Sherbin	Konouz
Boys	16.48	16.96	2.99
Girls	31.15	21.36	31.43

Changes in the means of weight are to some extent similar to the means of height, which is of course quite comprehensible.

Ponderal Index : Statistical data and analyses of body characterization are shown in the tables 8 and 9, and figures 6 and 7.

The arithmetic means of the groups compared show that children (boys and girls) of Cairo are bigger in general than those of Konouz and Sherbin.

It follows from this table that the arithmetic means of ponderal Index at the age of  $13.0 \pm 0.5$  in the particular investigated series increase by the following amounts :

	Cairo	Sherbin	Konouz
Boys	3.02	0.89	0.88
Girls	0.86	0.44	5.00

Boys from Sherbin show a small increase in Ponderal Index than those of Cairo which shows a larger increase. In this period the girls from Konouz show a larger increase.

### Conclusion

This paper deals with the constitution and the development of children in Egypt. The author chose three different environments to obtain the measurements and compare their results with each other.

The comparison shows an increase in children of Sherbin (boys and girls) in each of the three categories : stature, weight and Ponderal Index ; especially boys and in stature and weight.

These differences may lie both in the individual measurements and their mutual proportions as conceived from the Ponderal Index and the rate of growth and its changes with age. They may be caused on the one hand by the modifying action of the external environment in the widest sense of this word, especially the nutrition effect, more than the anthropological differences of the groups compared.

Table 5— Weight of boys from: Cairo, Sherbin and konouz of Kom Ombo

Age	Cairo			Sherbin			Konouz		
	N	$\bar{X}$	S	N	$\bar{X}$	S	N	$\bar{X}$	S
11.0±0.5	5	35.2±3.93	8.78 ± 2.78				7	30.1±0.60	1.58±0.42
12.0±0.5	21	36.5±1.04	4.79 ± 0.74	3	28.3±1.20	2.08±0.85	24	30.5±1.03	5.04±0.73
13.0±0.5	9	41.0±4.19	12.56±2.96	9	33.1±3.09	9.27±2.18	1	31.0	
14.0±0.5	2	43.5±2.50	3.54 ± 1.77	22	37.7±2.23	10.44±1.57	1	32.0	
15.0±0.5				8	42.4±3.41	9.64±2.41			
16.0±0.5				13	48.9±2.24	8.06±1.58			

Table 6— Weight of Girls from: Cairo, Sherbin and Konouz of Kom Ombo

Age	Cairo			Sherbin			Konouz		
	N	$\bar{X}$	S	N	X	S	N	X	S
11.0±0.5	2	30.5±1.50	2.12±1.06	12	32.3±0.54	1.88±0.38	2	28.0±2.00	2.83±1.48
12.0±0.5	14	39.4±1.98	7.42±1.40	15	39.2±1.66	6.41±1.17	12	33.3±2.09	7.23±1.84
13.0±0.3	3	40.0±2.31	4.0 ±1.63	15	45.1±0.78	3.02±0.55	5	36.8±1.39	3.11±0.98
14.0±0.5				23	49.3±1.90	9.09±1.34			
15.0±0.5	2	46.0±7.50	10.61±5.31	9	49.6±2.75	8.24±1.94			
16.0±0.5	1	48.0							

**Table 7 — Weight of Children from Cairo Sherbin  
and Konouz of Kom Ombo in Percentage of their weight at the age  $11.0 \pm 0.5$**

Age	Boys						Girls					
	Cairo		Sherbin		Konouz		Cairo		Sherbin		Konouz	
	N	%	N	%	N	%	N	%	N	%	N	%
$11.0 \pm 0.5$	5	100.00	—	—	7	100.00	2	100.00	—	—	2	100.00
$12.0 \pm 0.5$	21	103.69	3	100.00	24	101.33	14	129.18	12	100.00	12	118.93
$13.0 \pm 0.5$	9	116.48	9	116.96	1	102.99	3	131.15	15	121.36	5	131.43
$14.0 \pm 0.5$	2	123.58	22	133.22	1	106.31			15	139.63		
$15.0 \pm 0.5$			8	149.82			2	150.82	23	152.63		
$16.0 \pm 0.5$			13	172.79			1	157.38	9	153.56		

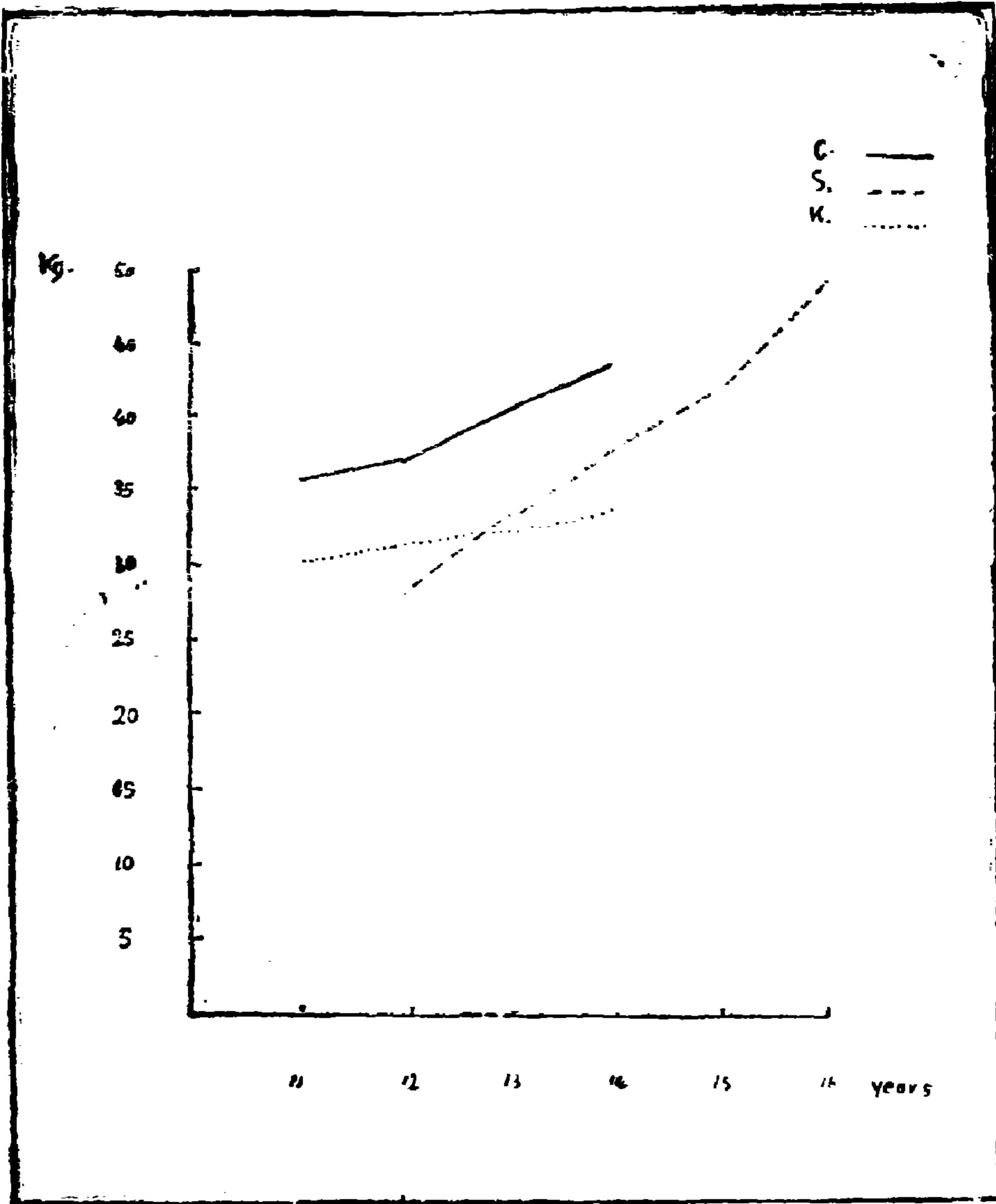


Fig. 4—Weight of Boys

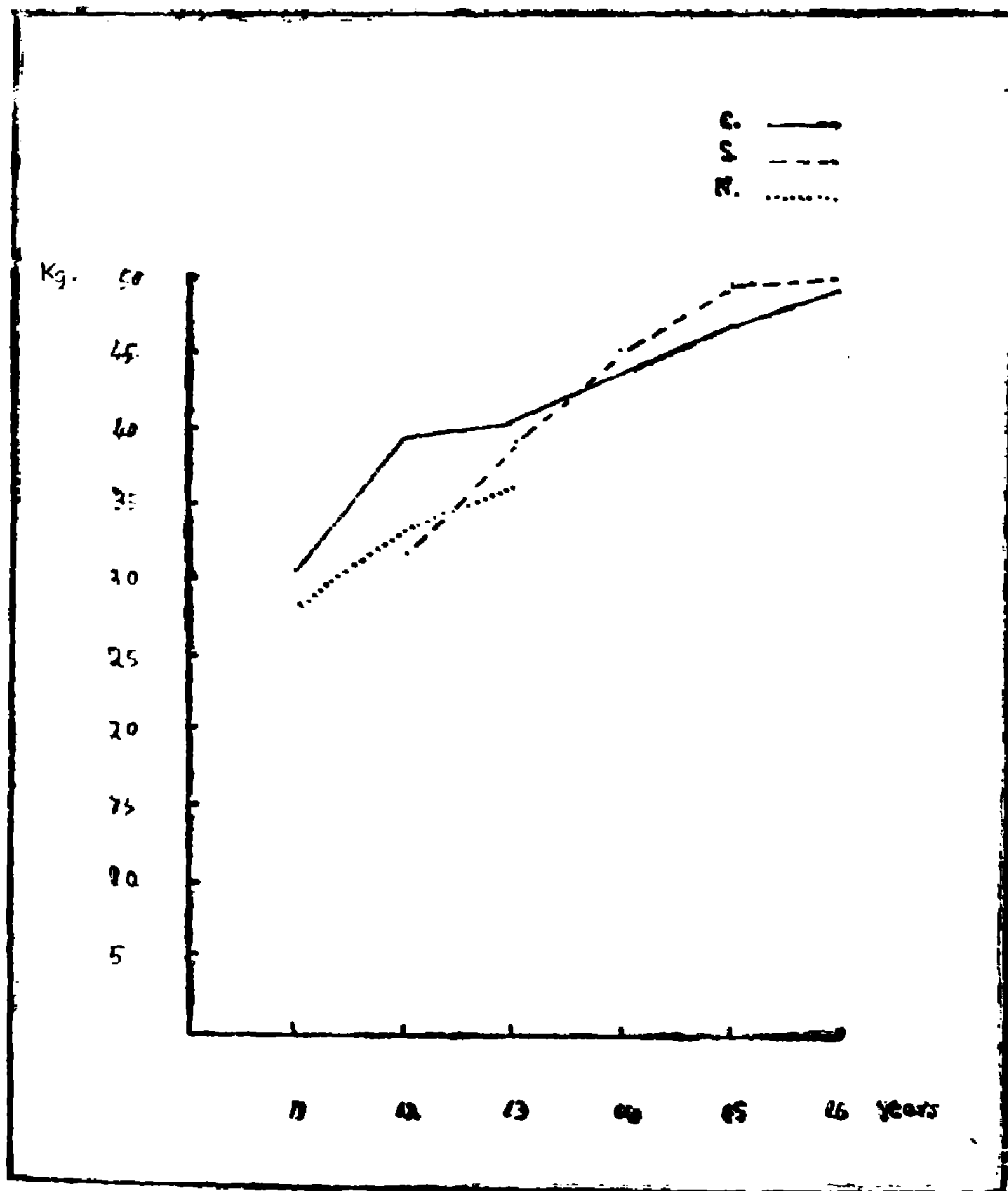


Fig. 5— Weight of Girls

**Table 8— Ponderal Index (Levis's Index) of Boys from:  
Cairo, Sherbin and Konouz of Kom Ombo**

Age	Cairo			Sherbin			Konouz		
	N	X	S	N	X	S	N	X	S
11.0±0.5	5	2.32±0.05	0.11±0.03				7	2.26±0.05	0.14±0.02
12.0±0.5	21	2.34±0.02	0.10±0.02	3	2.24±0.07	0.12±0.05	24	2.27±0.02	0.09±0.01
13.0±0.5	9	2.39±0.10	0.30±0.07	9	2.26±0.34	1.01±0.24	1	2.28	
14.0±0.5	2	2.40±0.15	0.21±0.11	22	2.27±0.02	0.09±0.01	1	2.29	
15.0±0.5				8	2.29±0.36	1.02±0.26			
16.0±0.5				13	2.30±0.02	0.08±0.02			



Table 9 — Ponderal Index (Levis 's Index) of Girls from:  
Cairo, Sherbin and Konouz of Kom Ombo

Age	Cairo			Sherbin			Konouz		
	N	$\bar{X}$	S	N	$\bar{X}$	S	N	$\bar{X}$	S
11.0±0.5	2	2.32±0.13	0.18±0.09				2	2.20±0.04	0.06±0.03
10.0±0.5	14	2.33±0.02	0.09±0.02	12	2.25±0.03	0.10±0.02	12	2.26±0.03	0.10±0.02
13.0±0.5	3	2.34±0.03	0.06±0.02	15	2.26±0.03	0.11±0.02	5	2.31±0.04	0.09±0.02
14.0±0.5				15	2.28±0.02	0.07±0.01			
15.0±0.5	2	2.37±0.02	0.03±0.02	23	2.30±0.01	0.06±0.01			
16.0±0.5	1	2.40		9	2.31±0.01	0.05±0.01			

Table 10 — Ponderal Index (Levis 's Index) of Children from:  
Cairo, Sherbin and Konouz of Kom Ombo in Percentage of thier index at age  $11.0 \pm 0.5$

Age	Boys						Girls					
	Cairo		Sherbin		Konouz		Cairo		Sherbin		Kouzon	
	N	%	N	%	N	%	N	%	N	%	N	%
$11.0 \pm 0.5$	5	100.00			7	100.00	2	100.00	—	—	2	100.00
$12.0 \pm 0.5$	21	100.86	3	100.00	24	100.44	14	100.43	12	100.00	12	102.73
$13.0 \pm 0.5$	9	103.02	9	100.89	1	100.88	3	100.86	15	100.44	5	105.00
$14.0 \pm 0.5$	2	103.45	22	101.34	1	101.33			15	101.33		
$15.0 \pm 0.5$			8	102.23			2	102.16	23	102.22		
$16.0 \pm 0.5$			13	102.68			1	103.45	9	102.66		

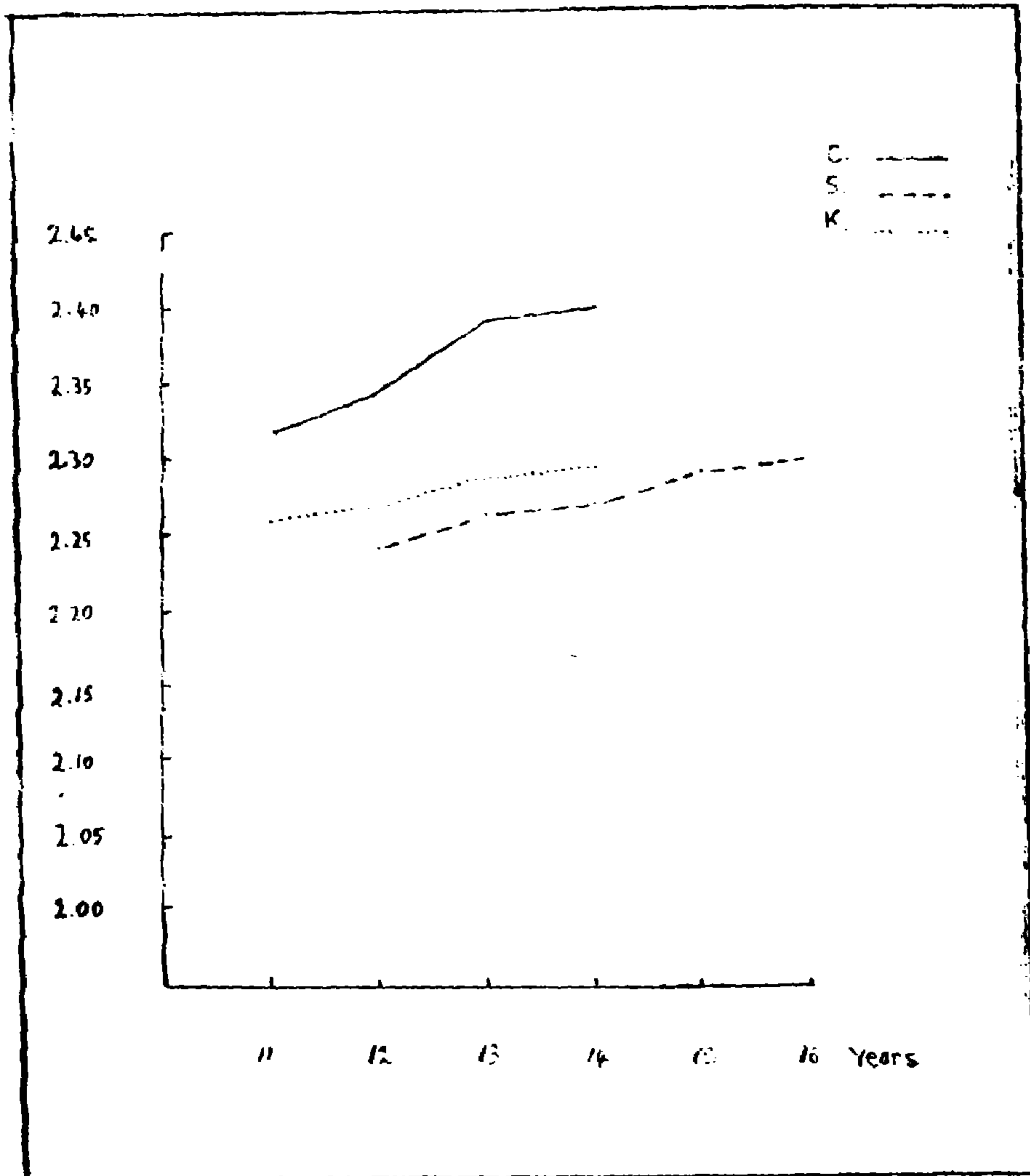


Fig. 6— Ponderal Index Boys

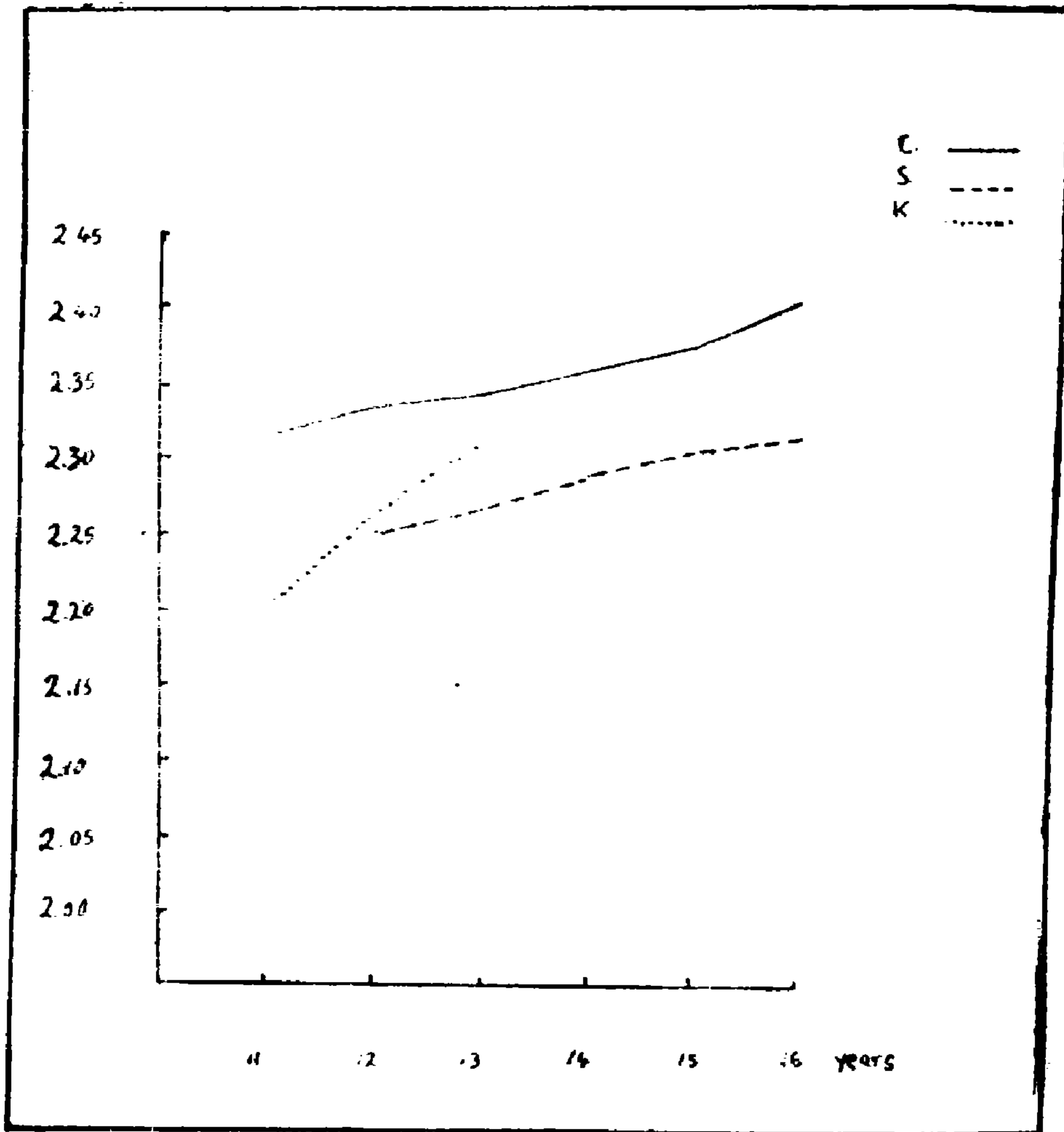


Fig. 7— Ponderal Index Girls

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