

LONGITUDINAL STUDY ON HEAD CIRCUMFERENCE OF PAKISTANI INFANTS IN DIFFERENT SOCIOECONOMIC GROUPS

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SUMMARY

Head circumference of Pakistani infants from different socioeconomic groups, was measured during the entire period of infancy. Growth curves for head circumference of local infants remained below the 25th percentile of the Harvard standard throughout the first year. However, divergence from the standard increased as their age advanced. Head circumference was found to vary directly with socioeconomic status. It was concluded that smaller head circumference of the local infants was part of the overall growth depression caused by inadequate supplementary feeding and late introduction of solids to the infants' diet.

INTRODUCTION

Physical anthropometry is considered a valuable tool for the indirect assessment of nutritional status of a community.

In earlier communications we have discussed the influence of socioeconomic status (SES) on body weight (1) and length (2) of Pakistani infants. Measurement of the head circumference (HC) is valuable for the period of infancy and makes it possible to assess the volume of the brain and its development as reflected by the gradual increase in the HC (3). When used in combination with other anthropometric data, this parameter is especially useful to assess the nutritional status of the infants. The study herein presented is the first of its kind carried out in Pakistan and it is the object of this paper to present the growth pattern of HC of local infants in different socioeconomic groups, and to suggest local standards for HC for the first year of life.

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MATERIALS AND METHODS

A total of 916 infants born in various hospitals of Faisalabad, Pakistan, having no congenital abnormality, were randomly selected for this study. Head circumference was measured by the method recommended by Jelliffe (4) within 24 hours of birth and every 30 ± 2 days thereafter in a longitudinal fashion throughout the first year of life. After birth all the observations were recorded by visiting the family at its residence.

Data thus obtained were classified into three SES i.e. high, medium and low according to the method adopted by Nagra *et al.* (1). Analysis of variance (5) and Duncan's multiple range test (6) were used to determine significant differences. Various percentiles (7) were worked out for comparison with the standard.³

RESULTS

Average values for HC of the infants, from birth to 12 months of age are given sexwise in Table 1. Details of the average HC of infants belonging to various SES are presented in Table 2.

TABLE 1

AVERAGE MONTHLY HEAD CIRCUMFERENCE OF INFANTS
IRRESPECTIVE OF SOCIOECONOMIC STATUS (cm)

Age	Male		Female	
	Local	Standard	Local	Standard
At birth	34.1 \pm 1.2a(488)	35.3	33.5 \pm 1.3a(388)	34.7
1	36.4 \pm 1.2b(379)		35.6 \pm 1.2b(284)	
2	38.2 \pm 1.1c(355)		37.2 \pm 1.3c(243)	
3	39.3 \pm 1.5d(322)	40.9	38.3 \pm 1.3d(238)	40.0
4	40.4 \pm 1.2e(278)		39.2 \pm 1.2e(210)	
5	41.3 \pm 1.2f(279)		40.2 \pm 1.3f(210)	
6	42.0 \pm 1.3g(255)	43.9	40.9 \pm 1.3g(202)	42.8
7	42.6 \pm 1.2h(264)		41.7 \pm 1.3h(205)	
8	43.1 \pm 1.2i(256)		42.3 \pm 1.1i(188)	
9	43.6 \pm 1.2j(255)	46.0	42.8 \pm 1.3j(201)	44.6
10	44.0 \pm 1.1k(276)		43.2 \pm 1.3k(231)	
11	44.4 \pm 1.2l(280)		43.5 \pm 1.2l(255)	
12	44.7 \pm 0.9m(296)	47.3	43.7 \pm 1.1m(229)	45.8

Values are mean \pm SD, and the figures in parentheses represent the number of samples. Means within a column followed by different letters are significantly different at the $P < 0.01$ level.

³ Harvard standard; Start & Stevenson (1959).

TABLE 2
 AVERAGE MONTHLY HEAD CIRCUMFERENCE OF INFANTS BELONGING TO DIFFERENT SOCIOECONOMIC GROUPS
 (cm)

Age	Socioeconomic group					
	High		Medium		Low	
	Male	Female	Male	Female	Male	Female
At birth	34.3 ± 1.2(90)	33.8 ± 1.2(69)	34.2 ± 1.4(224)	33.6 ± 1.3(195)	33.8 ± 1.3(174)	33.1 ± 1.3(124)
1	36.8 ± 1.0(73)	36.0 ± 1.1(56)	36.5 ± 1.2(171)	35.7 ± 1.3(143)	36.0 ± 1.4(135)	35.2 ± 1.3(85)
2	38.6 ± 0.9(70)	37.4 ± 1.2(47)	38.2 ± 1.2(165)	37.3 ± 1.3(124)	37.7 ± 1.4(120)	36.8 ± 1.4(72)
3	39.4 ± 1.5(62)	38.6 ± 1.2(51)	39.6 ± 1.5(148)	38.4 ± 1.2(122)	38.8 ± 1.4(112)	38.0 ± 1.5(65)
4	40.8 ± 1.1(59)	39.6 ± 1.1(48)	40.6 ± 1.2(127)	39.3 ± 1.2(109)	39.9 ± 1.2(92)	38.8 ± 1.4(53)
5	41.8 ± 1.0(55)	40.5 ± 1.3(42)	41.2 ± 1.1(127)	40.2 ± 1.5(118)	40.8 ± 1.3(97)	39.8 ± 1.4(50)
6	42.4 ± 1.2(52)	41.4 ± 1.2(48)	42.1 ± 1.2(113)	40.9 ± 1.3(100)	41.4 ± 1.3(90)	40.5 ± 1.3(54)
7	43.0 ± 1.2(51)	42.3 ± 1.3(41)	42.7 ± 1.1(117)	41.6 ± 1.6(105)	42.1 ± 1.3(96)	41.2 ± 1.1(59)
8	43.5 ± 1.3(58)	42.7 ± 1.1(43)	43.3 ± 1.2(114)	42.3 ± 1.3(95)	42.6 ± 1.2(84)	41.8 ± 1.0(50)
9	43.9 ± 1.2(52)	43.1 ± 1.3(47)	43.8 ± 1.1(109)	42.8 ± 1.3(97)	43.0 ± 1.3(94)	42.4 ± 1.4(57)
10	44.4 ± 1.0(54)	43.5 ± 1.2(47)	44.2 ± 1.0(122)	43.2 ± 1.3(120)	43.5 ± 1.2(100)	42.8 ± 1.4(64)
11	44.8 ± 1.3(60)	43.9 ± 1.1(50)	44.6 ± 0.9(119)	43.6 ± 1.2(115)	43.8 ± 1.3(101)	43.0 ± 1.3(60)
12	45.1 ± 0.8(62)	44.0 ± 1.0(49)	44.9 ± 0.9(124)	43.8 ± 1.0(121)	44.2 ± 1.4(105)	43.4 ± 1.2(59)

Values are mean ± SD, and figures in parantheses represent the number of samples.

Average HC of male infants was 34.1 ± 1.2 cm at birth and increments in the first and second six months of life were 7.9 and 2.7 cm, respectively, as compared with standard values of 35.3 cm at birth and an increment of 8.6 cm for the first and 3.4 cm for the second six months of life. Average HC of female infants was 33.5 ± 1.3 cm at birth with an increment of 7.4 cm in the first six months, and 2.8 cm for the second six months as compared with the standard value of 34.7 cm at birth and an increase in HC of 8.1 cm for the first semester and 3.0 cm for the second semester.

Infants of either sex showed lesser HC values than that of the standard throughout the first year. Nevertheless, the difference was more pronounced in the second six months of life. Male infants had greater HC than females at all ages. Statistical analysis of the data revealed that the infants of either sex belonging to high SES had a significantly ($p < 0.01$) greater HC than infants from medium or low SES, and infants belonging to medium SES had a significantly ($p < 0.01$) greater HC than infants from low SES.

DISCUSSION

The influence of SES on HC of infants is evident (Table 2). Like weight (1) and length (2) high SES appeared to be associated with larger HC (8). During first year of life infants belonging to high SES had an increment of 11.0 and 11.1 cm for the male and female infants, respectively. This figure, on an average, was 1.0 cm less than the infants standard for either sex. A comparison of HC values obtained in the present study with those reported by Grantham-McGregor and Desai (9) revealed that the HC of Jamaican infants belonging to a low SES was greater than the local infants belonging to the high SES. It may be concluded that in Pakistan, even the high-income segment of population has not yet improved its living standard to the extent that it affects the physical growth and development of the newborn. However, values for HC of local infants at birth were comparable with those reported by Brzozowska (10) and Palti and Adler (11).

Growth curves for HC of local infants belonging to different SES (Figures 1 and 2) remained below the 25th percentile of the standard throughout the first year and divergence from the standard increased with advancing age. A similar trend had been observed in the growth curves of local infants in regard to weight (1) and height (2). This may be due to inadequate supplementary feeding and late introduction of solids to the infants' diet, which result in overall growth depression (12).

It is suggested that the HC of local infants belonging to the high SES, be adopted as local standard.

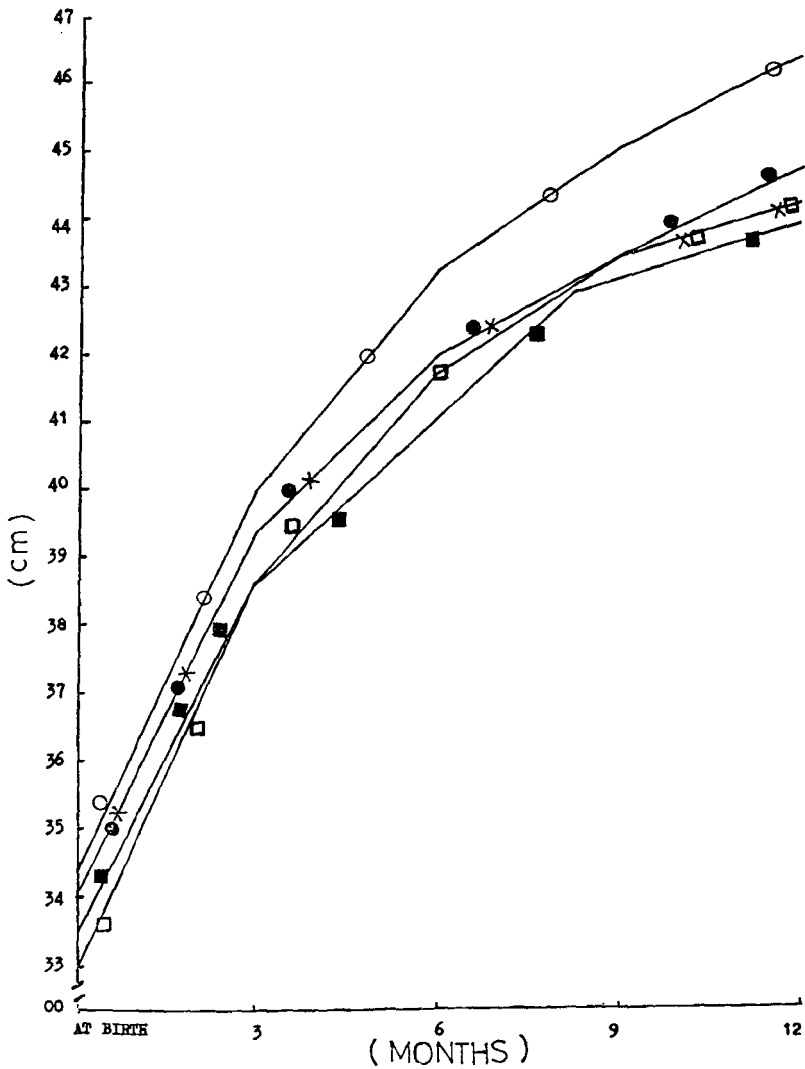


FIGURE 1

Head circumference-for-age of male infants belonging to different socioeconomic groups, compared with the Harvard standard. Within the graph, symbols \circ and \square represent 25th and 3rd percentile of the Harvard standard, respectively, and \bullet , \times and \blacksquare represent 50th percentile of local infants belonging to high, medium, and low socioeconomic groups, respectively.

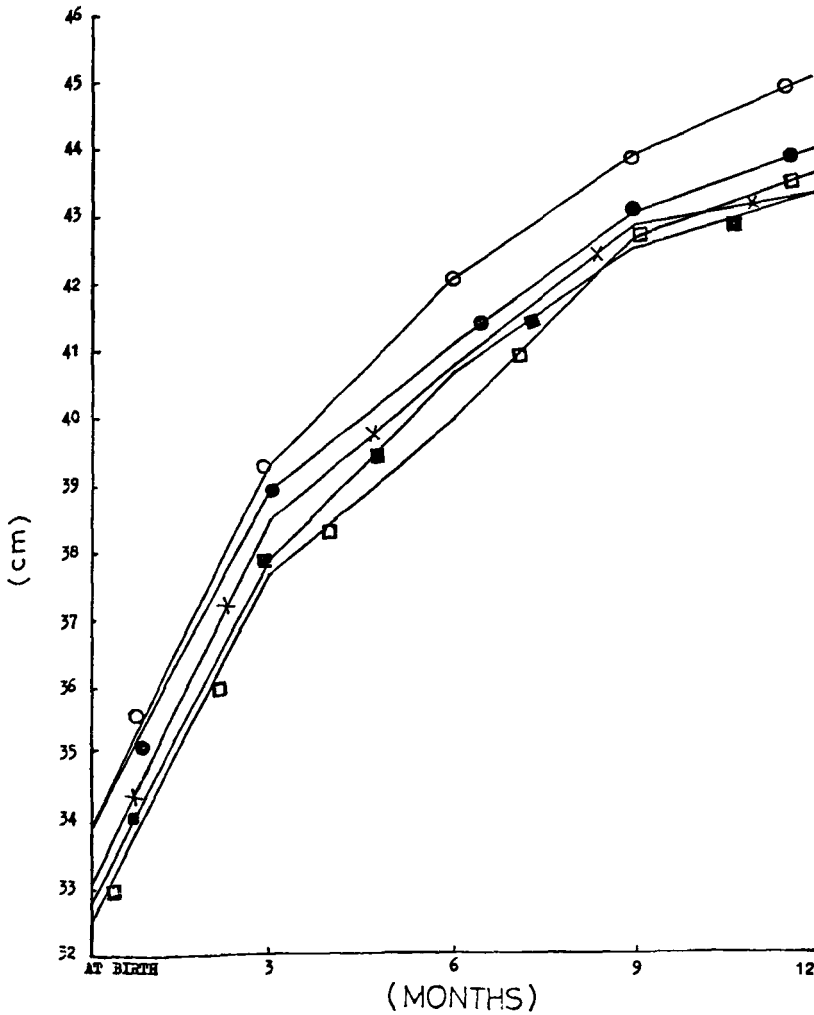


FIGURE 2

Head circumference-for-age of female infants belonging to different socioeconomic groups, compared with the Harvard standard. Within the graph, symbols \circ and \square represent 25th and 3rd percentile of the Harvard standard, respectively, and \bullet , \times and \blacksquare represent 50th percentile of local infants belonging to high, medium, and low socioeconomic groups, respectively.

RESUMEN

**ESTUDIO LONGITUDINAL DE LA CIRCUNFERENCIA CRANEANA
DE NIÑOS LACTANTES DE PAQUISTAN DE GRUPOS
SOCIOECONOMICOS DIFERENTES**

Se midió la circunferencia craneana de niños lactantes de Paquistán procedentes de grupos socioeconómicos diferentes, durante el período total de la infancia. Se determinó que las curvas de crecimiento de la circunferencia craneana de los niños locales permanecía por debajo del 25 percentilo del estándar de Harvard a través del primer año de vida. La diferencia del estándar, sin embargo, aumentaba a medida que los niños avanzaban en edad. Según se encontró, la circunferencia craneana varía directamente con el status socioeconómico. Se llegó a la conclusión de que la menor circunferencia craneana de los niños locales era parte del retardo en el crecimiento causado por una alimentación suplementaria inadecuada y una tardía introducción de sólidos a la dieta del pequeño.

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