THE ARM CIRCUMFERENCE AT BIRTH AND ITS RELATIONS TO OTHER ANTHROPOMERIC PARAMETERS

M. Gueri, P. Jutsum, P. Knight and V. Hinds.

Caribbean Food and Nutrition Institute, Jamaica

SUMMARY

The weight, head, chest and arm circumference of four hundred and sixty-one infants in Jamaica were measured during the first twenty-four hours of birth. The purpose of this work was to draw attention to the arm circumference as a possible indicator of the stage of maturity at birth and correlate this parameter against the other three and against factors on the mother. The highest positive correlation was found between the weight and the chest circumference, followed by the weight and arm circumference. Attempt to produce an equation to estimate birth wight from arm and chest circumference was unsatisfactory.

INTRODUCTION

The mid upper arm circumference has been recognized as a very useful indicator of the nutritional status, particulary in young children (1). In general, most investigators use as reference the standards given by Wolanski and published by Juliffe (2) or figures derived from these. Perhaps the greatest value of the arm circumference is that it is relatively age independent. There is a marked increase in the circumference from one month to 12 months, approximately 5 cms. However, from 12 to 60 months the increase is only one centimeter.

There is considerable amount of data on the arm circumference from one month of life onwards but to our knowledge little has been done about this parameter at birth and its possible use. Indeed, we have been able to find only one report in which values for the arm circumference at birth are

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given, and these are obtained by extrapolation to 0 mont (3).

In this paper we want to draw attention towards the arm circumference at birth, its correlation with other anthropometric parameters and its possible use as an indicator of "Maturity" or "Nutritional Status" at birth.

MATERIAL AND METHODS

Four hundred and sixty-one children of both sexes born at the Spanish Town Hospital, Jamaica, during a period of 16 weeks in 1973, were examined within the first 24 hours of birth and the weight, head circumference, chest and arm circumferences measured, using well recognized anthropometric techniques (2). The weight of the mother was also measured at the same time.

Information was obtained on the duration of pregnancy, age of mother, number of pregnancies, number of live births and whether diabetes or hypertensión had been diagnosed during pregnancy. Those cases in which a surgical intervention had been performed were not included in this study.

RESULTS

The mean age of the mothers in our group was 23.8 years (Table 1) and their mean weight 60.48 kg, varying from 35.4 to 110.7 kg. The maximum number of pregnancies was 13 with an average of 3.6 pregnancies and 3.4 live births per woman.

TABLE 1: MOTHER'S CHARACTERISTICS

	Age (Years)	Weight (Kg.)	No. of Pregnancies	No. of Live Births
Mean	23.8	68.48	3.6	3.4
S.D.	±6.4	±10.70	±2.9	±2.6
Range	13-47	35.38-110.68	1-13	1-12

The mean, standard deviation and range of the four measurements taken in the infants are shown in Tables 2, 3, 4, and 5 for both boys and girls. The mean weight and head circumference are similar to the data presented by Roopnarinesingh (4) and Persaud (5) in children born at the University Hospital in Jamaica in 1970.

Table 6 shows the percentiles of the four parameters. Compared with well recognized international standards such as the Stuart and Stevenson(6) the upper 25th percentile in our group is close to their 50th and our 50th is more similar to their 25th percentile. We have not been able to find comparable standards for the arm circumference, but our 50th

TABLE 2: WEIGHT AT BIRTH

	Boys (Kg.)	Girls (Kg.)	Both Sexes (Kg.)
Mean	3.24	3.19	3.22
S.D.	±0.47	±0.48	±0.48
Range	2.04-4.8	1.76-5.10	1.76-5.10

TABLE 3: HEAD CIRCUMFERENCE

	Boys (Cms.)	Girls (Cms.)	Both Sexes (Cms.)
Mean	33.9	33.5	33.7
S.D.	±1.5	±1.3	±1.4
Range	28.5-38.0	29.5-37.0	28.5-38.0

TABLE 4: CHEST CIRCUMFERENCE

	Boys (Cms.)	Girls (Cms.)	Both Sexes (Cms.)
Mean	32.1	32.0	32.1
S.D.	±1.8	±1.9	±1.8
Range	26.5-36.0	27.5-39.5	26.5-39.5

percentile is smaller than that obtained by Burgess and Burgess by extrapolation.

Table 7 presents the correlation matrix among the different variables considered in our study. As it would be expected there is a good positive correlation among the age of the mothers, the number of pregnancies and the number of live births. Among the anthropometric variables in the children, the highest correlation is found between the weight and the chest circumference, followed by the weight and the arm circumference. This latter correlation coefficient is the same as that found by Robinow and Jeliiffe in older Ugandan children(7).

TABLE 5: ARM CIRCUMFERENCE

	Boys (Cms.)	Girls (Cms.)	Both Sexes (Cms.)
Mean	9.9	9.9	9.9
S.D.	±0.9	±0.8	±0.8
Range	7.5-14.5	7.0-12.5	7.0-14.5

TABLE 6: PERCENTILES OF THE DIFFERENT MEASUREMENTS

B O Y S Percentiles						G I R L S Percentiles				
10th	25th	50th	75th	90th		10th	25th	50th	75th	90th
2.61	2.95	3.29	3.51	3.8	Weight (Kg.)	2.61	2.83	3.17	3.51	3.86
32.0	33.0	34.0	35.0	35.5	Head Circumference (Cm.)	32.0	32.5	33.5	34.5	35.0
30.0	31.0	32.0	33.0	34.0	Chest Circumference (Cm.)	29.5	31.0	32.0	33.0	34.5
9.0	9.5	10.0	10.5	11.0	Arm Circumference (Cm.)	9.0	9.5	10.0	10.5	11.0

TABLE 7: CORRELATION MATRIX BETWEEN VARIABLES OBSERVED

	Mother's Age	No. Pregnancies	No. Live Births	Diabetes	Hypertension	Duration Pregnancy	Mother's Weight	Child's Sex	Twinning	Child's Weight	Child's H.C.	Child's C.C.	Child's A.C.
Mother's Age	1.00												
No. Pregnancies	0.80	1.00											
No. Live Births	0.79	0.97	1.00										
Diabetes	0.03	0.04	0.04	1.00									
Hypertension	0.16	0.17	0.13	0.17	1.00								
Duration Preg.	0.01	0.03	0.03	0.01	0.06	1.00							
Mother's Weight	0.35	0.30	0.30	0.02	0.10	0.01	1.00						
Child's Sex	0.02	0.01	0.02	0.05	0.04	0.01	0.08	1.00					
Twinning	0.00	0.01	0.09	0.01	0.07	0.01	0.04	0.01	1.00				
Child's Weight	0.23	0.18	0.17	0.12	0.06	0.13	0.34	0.09	0.16	1.00			
Child's H.C.	0.17	0.15	0.13	0.01	0.08	0.15	0.23	0.13	0.13	0.66	1.00		
Child's C.C.	0.20	0.17	0.14	0.03	0.09	0.11	0.27	0.06	[illegible]	0.82	0.70	1.00	
Child's A.C.	0.19	0.15	0.13	0.01	0.04	0.09	0.32	0.07	0.09	0.79	0.54	0.71	1.00

DISCUSSION

There are in the Caribbean, and in many other developing countries a considerable number of children delivered at home by midwives whose birth weight is not obtained because an

easily portable and accurate scale has yet to be invented. Yet, the birth weight is in itself an indicator of the risk of infant mortality. It is well known that mortality during the first year of life is higher among children weighin 2.5 kg or less(8).

Would it be possible then to substitute the weight at birth by another parameter more easily obtainable under field conditions which would alert the health worker that the child needs special care? To answer this question the data were analysed to find the best equation to estimate birth weight from arm and chest circumference measurements. The accuracy of estimation was not high, the standard error being about 190 g. In our sample, there were 39 births below 2.5 kg weight and 69% of these were identified as such by the equation. All those missed were 2.25 kg or more. However, 26 were wrongly estimated to be below 2.5 kg. Twenty of these cases were in fact below 3.0 kg.

This method is therefore not good in itself to estimate birth weight, but it suggests the possibility of identifying at-risk children by using alternative anthropometric parameters other than weight. We believe that more research in this field is desirable.

RESUMEN

La circunferencia del brazo en recién nacidos y su relación con otros parámetros antropométricos.

El peso, la circunferencia de la cabeza, del tórax y del brazo fueron medidos en 461 niños nacidos en Jamaica. Las medidas fueron tomadas durante las primeras 24 horas del nacimiento.

El propósito de este trabajo fue atraer atención sobre la circunferencia del brazo como un posible índice del estado de "madurez" al nacer y correlacionar este parámetro con los otros tres y con factores matérnos.

El coeficiente de correlación más alto se encontró entre peso y circunferencia del tórax, seguido por peso y circunferencia del brazo. Por este motivo se intentó hallar una ecuación que permitiera calcular el peso al nacer a partir de las circunferencias del tórax y del brazo. Sin embargo la exactitud de este cálculo fue baja (con un error standard de 190 gms.). Este método se consideró pues inadecuado para estimar el peso al nacer pero sugiere la posibilidad de identificar niños en peligro usando otros índices en vez de el peso.

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