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EXTERNAL PHYSICAL CHARACTERISTICS IN ASSESSING GESTATIONAL AGE IN SUDANESE NEWBORNS

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Abstract External physical characteristics were studied in assessing gestational age in Sudanese newborns. Various combinations gave reasonably high predictive values (correlation coefficients). Regression formula containing breast size, ear firmness and skin texture exhibited a curvilinear relationship with gestational age.

Key words Infant newborn; Sudan; Gestational age; Physical examination.

INTRODUCTION

Infants of the same birth weight but different gestational ages tend to have different morbidity and mortality rates. The recognition of infants born with birth weights disproportionate for gestational age, either too large or too small, is therefore important in paediatrics[1]. To do this it is essential to know the gestational age as well as the birth weight[2]. Moreover, gestational age assessment can be used as an efficient feed-back by the obstetricians to evaluate their prenatal assessment.

In the Sudan assessment of gestational age by the last menstrual period poses difficulties. Many women do not know precisely the date of the last menstrual period and even when they do, lactational amenorrhoea, irregular cycles, postconceptional bleeding, contraceptive pills, etc make this method inaccurate[3].

A perfect method for assessment of gestational age must be accurate, not dependent on nutrition of the baby and not distorted by the baby being ill. It should also be simple, reliable, learnt easily and not take much time or be disturbing to the baby.

The shortage of doctors in the Sudan makes elaborate methods for assessment of gestational age impractical. Therefore, this study was conducted in order to evaluate a simple method for assessment.

MATERIAL AND METHODS

The neonatal wards of Khartoum Teaching Hospital were visited regularly twice a week and all babies whose age was less than 72 hours were assessed by the method of external physical characteristics as described by Farr et al[4]. The date of the last menstrual period was not known to the observer at the time of assessment but was recorded after the examination. Two hundred cases were collected after excluding those babies whose mothers were not sure of the last date of the cycle and those babies whose skin colour was so dark that it could not be allotted any of the scores described for the criterion, and those babies whose mothers were on the pill during the last five months before conception.

The correlation coefficients with gestational age (predictive values) of each characteristic was determined. Multiple regression analyses were then performed to study the relative value of the various combinations.

RESULTS

Altogether there were 105 females and 95 males whose birth weights ranged from 1 - 4.88 kg with a mean of 2.910 ± 0.640 kg. Gestational age ranged from 178 - 319 days with a mean of 269 ± 21 days.

The distribution of the number of cases at various gestational ages is shown in Table I. Most of the babies fell in the 34 - 42 weeks range.

Table I.
Distribution of cases over various gestational ages

Gestational age (weeks)	Number of cases
< 28	3
> 28 - 30	3
> 30 - 32	5
> 32 - 34	2
> 34 - 36	10
> 36 - 38	45
> 38 - 40	84
> 40 - 42	38
42	10
Total	200

The correlation coefficients for the various characteristics with gestational age are shown in Table II. Skin texture, nipple formation, breast size and ear firmness had the highest predictive values while skin colour, skin opacity, lanugo and plantar creases had very low predictive values.

Table II.
Predictive values of characteristics with gestational age

Characteristics	Correlation coefficient with gestational age
Oedema	0.290
Skin texture	0.392
Skin colour	0.294
Skin opacity	0.272
Lanugo	0.251
Plantar creases	0.317
Nipple formation	0.473
Breast size	0.606
Ear form	0.381
Ear firmness	0.452
Genitalia	0.365

The relationship between the total score (x) and gestational age (y) is expressed by the formula y = a+bX where a and b are constants.

The multiple regression analyses resulted in regression forlulae containing various variables, the best using different numbers of variables being:

1) The one containing breast size alone as
   Y = 241.4 + 13.48 x (breast size)
   r = 0.6058
2) That containing two characteristics:
   Y = 216.5 + 11.6 (breast size + ear firmness)
   r 0 0.6559
3) That containing three characteristics:
   Y = 210.9 + 8.91 x (breast size + ear firmness + skin texture)
   r = 0.6331.
4) The one containing four variables:
   Y = 208.1 + 7.13 x (breast size + ear form + ear firmness + genitalia)
   r = 0.6721
5) The one containing five variables:
   Y = 207.7 + 5.79 x (breast size + nipple formation + ear form + ear firmness + genitalia)
   r = 0.6773.

The regression formula for the eleven characteristics was found to be expressed by the formula Y = 196.85 + 2.92 x total score. This had a low predictive value.

It will be observed that equations 1-5 mentioned above have more or less the same predictive values. The first equation depends on only one characteristic. Equation 4 and equation 5 gave the best predictive values but they depend on 4 and 5 characteristeics respectively and included genitalia which itself has a low predictive values. Therefore, it seems that the most reasonable one to use is the third equation which depends on only three characteristics.

Table III and the graph (Fig. 1) show the mean gestational ages derived from the total scores of the three characteristics together with the standard devi-

Table III.
Mean and standard deviations of scores derived from the best three characteristics

Score	No of cases	Sum G.A. (days)	Mean	S.D. ±
1	1	187	187	-
2	5	1074	214.8	30
3	8	1789	223.6	19
4	6	1492	248.7	30
5	12	3134	261.2	18.8
6	36	9679	268.9	13.9
7	68	18735	275.5	10.9
8	54	14934	276.5	18.3
9	8	2231	278.9	11.0
10	2	540	270	

ations. The relationship is clearly nonlinear. 95% of babies assigned any particular score will have gestational ages that fall within the limits shown by the black bars.

DISCUSSION

In the Sudan, the number of doctors usually available in health units is small. This necessitates that any method used for assessment of gestational age of babies in such units must be simple and quick.

The distribution of gestational ages of the sample seems to conform with that of Parkin's[5]. The three best characteristics in this study are among the four characteristics suggested by Parkin[5]. The babies were of different ethnic groups. Some were black African Sudanese, others were immigrant Nigerians. Some were Sudanese of Arab origin while others were of Egyptian or Turkish descent. In general, the correlation coefficients obtained were lower than those of previous studies. This is probably due to the non-homogeneous population of Khartoum, unlike Brueton et al[6] in Nigeria who performed the assessment within a few hours of birth, skin colour was not found to be useful. The non-homogeneous population may account for this.

The regression formula containing breast size, skin texture and ear firmness exhibited a curvilinear relationship with gestational age like that obtained by Parkin[5] and Peonides et al[7]. However, the 95% confidence limits at certain scores were wide. This is probably because some women who claimed to be sure of the last date of the cycle were not actually so. It may also be due to the fact that the sample contained more babies of higher gestational ages.

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