GESTATIONAL AGE ASSESSMENT;
ROLE OF CROWN HEEL LENGTH AND CROWN RUMP LENGTH OF TERM IN NEONATES IN PAKISTAN

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ABSTRACT... drmuhammadaziz@yahoo.com **Objectives:** to provide an addition to national standards regarding Crown Heel Length and Crown Rump Length appropriate for gestational age neonates in Pakistan **Design:** Prospective and comparative. **Setting:** Lahore and Quetta. **Material and Methods:** 1028 neonates from three hospitals of Lahore and one hospital of Quetta were measured. **Results:** Crown heel and crown rump length of the study was (Mean±S.D) was 50.6 ± 2.1 c.m and 34 ± 1.5 c.m respectively. Male neonates were significantly longer than female neonates. Neonates from multiparous mothers were also significantly longer than the neonates from primiparous. No significant effects of consanguinity, high altitude or socioeconomic status were noticed. Neonates of present study were longer significantly as compared to the neonates of other developing countries and were equal or slightly longer than those of British standards. **Conclusion:** Our neonates have got full potentials to grow during intra uterine life.

Key Words: Crown heel length, Crown rump length, consanguinity, Socioeconomic status.

INTRODUCTION

For the first time in history Count Phillibert de Monteilard measured his son from 1759 to 1777 i.e from birth to eighteen year of age after each six months. The results were published in Buffon's Histoir Naturalle[1].As research proceeded it was unveiled that there are many factors which affect height during pre and post natal life i.e. genetic, racial, diet disease and parity[2,3]

There is a secular trend towards increase in height amongst all people. This is partly due to improved health and nutrition but in addition, it is thought that genes for tall stature have a dominant effect. The children of Japanese who immigrated to United States tend to be taller than their parents. A similar effect may be occurring amongst Asian families in Britain. Neonates whose parents are small tend to be small at birth[4].

Length of new born babies differs from height not only in terminology but also in actual measurement. Height is taken in standing position while length is taken in supine position .Length is 1 c.m more than height. This is due to orthostatic compression of the

vertebral column in erect posture. Toxemia of pregnancy, anaemia, extreme of age and twin pregnancy lead to small neonates. Diabetes and multiparity results increase in size of new born babies[5].

A neonate may be appropriate for gestational age, small or large for gestational age. Appropriate for gestational age babies have no problem, while small or large for gestational age babies are usually associated with complications[6].

In developed countries, growth standards are made for their people, but in developing countries such standards are not yet available. In Pakistan national standards for length of new born babies are not available though few reports are published in literature[7, 8].

The present prospective study was carried out in Lahore and Quetta to provide basic statistical data regarding crown heel (CHL) and crown rump (CRL) length. Regarding CHL, CRL variations are present among different countries. This may be true in our country as well due to genetic, racial, climatic and dietary factors. Hence we need our own values. This study will provide basic anthropometric values of crown heel length and crown rump length. Length of the newborn babies will be helpful in estimation of growth rate during pre and post natal life and child hood as well as in medico legal cases.

MATERIALS & METHODS

In total 1028 newborn were measured from Sir Ganga Ram Hospital, Sheikh Zayed Hospital and Fatima Memorial Hospital Lahore and Sandeman Provincial Teaching Hospital Quetta. Babies selected for this purpose were mature single neonates of gestational age 38-42 weeks and birth weight 2500-3999 grams delivered by normal vaginal delivery.

New born babies of mothers suffering from gestational diabetes mellitus, pre-eclamptic toxemia, eclampsia, anaemia, hypertension, babies with abnormal presentation or lie and instrumental deliveries were not included in the study. In addition

to this, neonates suffering from anencephaly, erytheroblastosis foetalis, congenital dislocation of hip joint, talipes equino varus, talipes equino vulgus, genu equino varus, genu equino vulgus were not included in the study. Gestational age was calculated from first day of last menstrual period by taking menstrual history carefully and babies of those mothers were selected who were sure about their dates.

These mothers were not taking parenteral or oral contraceptive medicine for at least six months before conception and had regular menstrual cycle. When menstrual cycle is regular and menstrual history is accurate even then rare bleeding pervaginum during early months of pregnancy may be interpreted as menstrual bleeding, which is a common source of error in estimation of gestational age.

Majority of the mothers whose babies were selected for study were booked and they visited hospital regularly for antenatal check up. Non of them were smokers or used tobacco in any other form e.g betel.
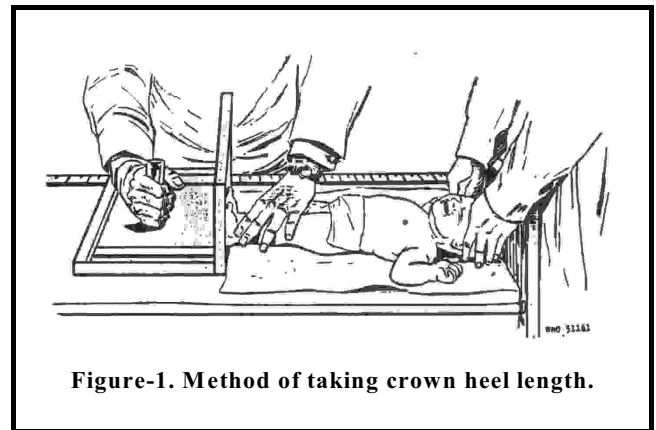

Figure-1. Method of taking crown heel length.

Crown heel and crown rump length were measured according to the method described by Jellife D.B. (The assessment of the nutritional status of the community WHO monograph No: 54 Geneva WHO 1966[9]). By means of an infantometer as shown in Figure-1. m easurements of length were taken with the help of an assistant, by putting the baby supine on the ruled board of an infantometer. The assistant held the head of baby against fixed end of ruled board so that baby's vertex touched it, moveable

piece was placed so that it was flat against the soles of the feet of baby and length was read from the side of the board to the last completed millimeter. This is crown heel length.

Crown rump length was taken by flexing the baby's legs at hip joint with left hand and foot piece was moved cranially so that it touched the breech of baby and length was read in similar way. Measurements were taken just after birth.

Level of significance between two means was calculated by the Z test by finding the value of P. For the calculation of percentiles following formula was applied.

$$P = L + C/f \ (Pn/100-F)$$

Where P is percentile, L is the lower class boundary, C is class interval, f is the frequency of observed values in the category or class. f is the cumulative frequency and n is the total number of observed values.

RESULTS

The mean CRL of neonates in present study (n =1028) was 50.6±2.1 c.m. and CRL was 34±1.5 c.m On average the CHL and CRL in male neonates (n = 504) was 50.9 ± 2.1 and 34.2±1.6 c.m. Female neonates (n=524) are 50.4±3.4 c.m. long from vertex to heel and 33.7±1.5 c.m crown rump length. Male neonates are significantly longer than female neonates regarding CHL (P<0.02) and CRL (P<0.001).

Regarding parity neonates of primipara (n= 334) mothers have mean crown heel length 50.1± 4 c.m, crown rump length 33.9±2.2 c.m Neonates of multiparous mothers(n= 694) are significantly longer than those of primiparous in crown heel length (P<0.01) as well as in crown rump length (P<0.001).

Considering the data of samples of neonates collected from Lahore and Quetta, the neonates born in Lahore (n=808) were50.6 ± 2 c.m long from vertex to heel as compared to neonates born in Quetta (n = 220) with CHL 50.7 ± 2.2 c.m with insignificant

difference. The difference is also insignificant regarding CRL which is 34 ± 1.5. m of neonates born in Lahore and 34.1±1.5 cm born in Quetta.

Table I Showing (Mean ± S. D) CHL, CRL of neonates of four hospital. No Significant difference was found in the CHL, CRL of neonates belonging to the hospitals included in present study.			
Hospitals	**N**	**CHL;(c.m) (± S.D)**	**CRL (c.m) (± S.D)**
Sir Ganga Ram Hosp	276	50.5(2.2)	34.0 (1.7)
Fatima Memorial Hosp	234	50.4(2.2)	34.2 (1.8)
Sheikh Zayed Hosp	298	50.6 (1.8)	34.1 (1.5)
Civil Hospital	220	50.7 (2.2)	34.1 (1.5)

Table II Showing (Mean ± SD) CHL, CRL of neonates regarding consanguinity.			
Parental Relationship	**N**	**CHL (c.m) (± S.D**	**CHL (c.m) (± S.D**
Unrelated	556	50.3 (3.1)	33.9 (1.5)
Related	120	50.6 (2.1)	34.0 (2.9)
First Cousin	352	50.3 (3.1)	33.9 (1.6)

Table-I shows the CHL and CRL of all the four hospitals and comparison among them. Regarding parental relationship there were three groups i.e. unrelated, related and first cousin as indicated by the table-II. The table also indicates that the CHL of unrelated and first cousin have same CHL regarding mean as well as standard deviation.

DISCUSSION

Results of present study have proved that the anthropometric data of neonates regarding CHL & CRL of our country differs significantly from other nations because of racial, environmental and dietetic factors. Table III shows the comparison between the results of present study and three ethnic groups living

in Singapore[10] Table IV indicates the comparison with developed countries like Britain, separately of male and female neonates. Neonates of present study are near to or slightly longer than the British Standards[11].

Table III Indicating both (Mean ± S.D) CHL, CRL of three ethnic groups and present study along with level of significance.

Measurements (c.m) (Mean ± S.D)	Chinese n=105	Malay n=51	Indians n= 51	Present Study n= 1028
Crown heel length	49.4 ± 3.6	49.6 ± 3.4	47.7 ± 2.7	50.6 ± 2.1
Crown Rump Length	29.5 ± 2.6	29.9 ± 2.8	29.7 ± 2.4	34 ± 1.5
COMPARISON. (CHL, CRL)				
This study vs Chinese				P> 0.001
This study vs Malay				P> 0.001
This study vs Indians				P> 0.001

Table No: IV Percentiles of CHL of both male and female neonates of British Standard and of this study.

MALE					
	3rd	10th	50th	90th	97th `
BRITISH STANDARD	46.4	48.0	50.2	52.8	54.8
PRESENT STUDY	46.9	48.4	51.2	53.9	55.3
FEMALE					
	3rd	10th	50th	90th	97th `
BRITISH STANDARD	47.2	48.5	50.4	52.5	53.8
PRESENT STUDY	46.9	48.2	50.2	53.1	54.6

Male neonates are significantly longer regarding both i.e. CHL and CRL than female neonates. This is due to genetically programmed higher levels of testosterone in males[12]. Neonates belonging to the multiparous mothers are longer regarding CHL & CRL significantly. This is due to the progressive enlargement of the uterine blood supply which improves the fetal growth[13].As indicated by the table III. There is no significant difference regarding the CHL and CRL of neonates of all the four hospitals.

It means length of the neonates are not affected by the socioeconomic status, unlike the birth weight. Neonates of Sheikh Zayed Hospital, belong to the mothers who are from upper or upper middle class. While the neonates of other three hospitals belong to poor / lower class families.

In present study it was also known that there is no significant difference regarding CHL and CRL of neonates whose parents are first cousin, related or unrelated to each other as indicated in table II. There is insignificant or negligible difference in length (CHL, CRL) of neonates born in Lahore and Quetta.

It means no effect of high altitude was noticed. It can be concluded that neonates of our country have got full potentials to grow during intrauterine life.

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