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STUDY OF CRANIOFACIAL ANTHROPOMETRY IN NORMAL INFANT IN A POPULATION OF KOLKATA

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ABSTRACT

Objective: Anthropometry is the systemic collection and correlation of measurements of human body and its different parts. In this study I took measurement of different craniofacial parameters of normal healthy infants (1-6m) of both sexes. This study will provide a reference data set for normal infant population as well as it will be helpful to establish any statistically significant sexual differences if any. There is no published literature about the standard craniofacial parameters and types of head and face shapes of infant population in West Bengal. This data is also deficient in various parts of world especially in developing countries. **Methods:** Total 150 infants meeting inclusion criteria are taken for hospital based observational cross sectional study conducted in Department of General Surgery, Medical College & Hospital, Kolkata. Around 150 infants based on inclusion and exclusion criteria are selected and various defined parameters are calculated on each infant using Spreading Callipers, Measuring tape without elasticity, Ruler , etc. Using various reference pointscephalic index is calculated along with head length (HC), head width (HW), head circumference (HC), inter cantonal distance (ICD), oral commissural distance (OCD), and ear length (EL). **Results:** There is no statistically significant sexual dimorphism in craniofacial parameters among normal birth weight male and female infant. In case of low birth weight infant my study shows no evidence of sexual dimorphism regarding the following parameters i.e HL, HW, HC, ICD & OCD. But shows evidence of sexual dimorphism in case of ear length .In my study it has been seen that the mean EL of male infant (LBW) is significantly more (p=0.024) than that of female LBW infant. There is statistically significant higher values of HL, HW, HC in male infant with normal birth weight than those of low birth weight male infant. There is no statistically significant difference is noted in ICD, EL, & OCD in normal birth weight male & low birth weight male infant. The normal birth weight female shows statistically significant higher values in HL, HW, HC& EL than the low birth weight female infant. The average cephalic index of male & female infant of west Bengal are 83.72% & 84.12% respectively. The predominant head shapesinWestBengal is hyper brachycephalic (44%)followed by brachycephalic (37.33%). Percentage of low set ear is very low in normal birth weight male & female infant. No cases seen low birth weight infant group. So from this study we can say that the ear is normally situated in almost all infants irrespective of their sex and birth weight.

Conclusion: no significant sexual dimorphism in craniofacial parameter is seen among male and female infant but significant difference in craniofacial anthropometry is seen among low birth weight infant and normal weight infant. The predominant head shapesin West Bengal is hyper brachycephalic followed by brachycephalic. Percentage of low set ear is very low in normal birth weight male & female infant.

KEYWORDS

Craniofacial, Anthropometry, Kolkata, Normal infant.

Introduction:
Anthropometric dimensions are the basis for evaluation of health of infants. Further, with knowledge of standard facial traits, an individual can be provided with optimum facial attractiveness2. Anthropometric measurements provide quantitative values for qualitative descriptions, thus playing an important role in the evaluation of individuals with dysmorphic features for the identification of patterns of dysmorphism. Nowadays plastic surgeons, forensic experts & geneticists are emphasising on craniofacial anthropometry in many dysmorphogenic syndrome development of face is an important factor. As face is a complete anatomic unit, it is best to evaluate each distinct region of face separately taking into consideration the various parts and its relation with the whole of the face.Normative standard values and curves are needed for the meaningful interpretation of individual measurements.

Material and Methods: It was an institutional based observational study conducted in Department of General Surgery, Medical College & Hospital, Kolkata.

Sample Size: Total 150 infants were included in this study.

Inclusion Criteria:
[1] The full term (37-40 weeks of gestation), healthy babies born by any mode of delivery and having normal birth history.
[2] The age should be within 1-6 month
[3] The infants devoid of any gross congenital anomalies
[4] Infants without any history of birth asphyxia, any form of distress or illness
[5] Infants without maternal history of Diabetes Mellitus, Hypertension, cardiac and renal diseases.

Exclusion Criteria:
[1] Preterm babies.
[2] Babies with any gross congenital anomalies.
[3] Babies with history of birth asphyxia or any other illness/distress

Study Design : Observational, hospital based study, a cross sectional study

Study Tools: Spreading callipers, Measuring tape without elasticity, Paper, Pen, Ruler, Liquid Hand wash, Electronic hand drier, Disposable gloves, Cap and mask Rubber slipper, Antiseptic solution, Sterilised cotton balls, Calculator, Computer.

Study Technique:
(1) Identification of the baby - Relevant information like date and time of birth, pro-forma birth weight , sex of infant, brief perinatal history were collected from the hospital discharge certificate of the corresponding babies and the pro-forma was duly filled.
(2) Reference points-

Ophyron-It is actually defined as the point on the midline of the forehead just above the glabella.
Opisthocranium - It is the most prominent posterior point on the occiput. Glabella - It is the most significant point in the median sagittal plane between the supraorbital ridges.
Euryon - It is the most lateral point on the head.
Endocanthion - It is the inner comer of the eye fissure where the eyelids meet. Superorale - It is the uppermost point on the auricle.
Suborale - It is the lowermost point on the auricle.
Cheilion - The lateral most point at the angle of the lips.

Statical analysis:
The obtained data was subjected to extensive statistical analysis using Microsoft excel and SPSS software. Following analysis used in the study-

Results:
Total 150 infants were taken for my study. Among them the no of normal birth weight male, normal birth weight female infant, low birth weight female infant & low birth weight male infant were 66,49,13,22 respectively. The average birth weight of normal birth weight male and female infants are 2.94 and 2.82 respectively. Whereas, in case of low birth weight male and female infants the average weight is 2.23 &2.2 kg respectively.

The study shows that the average values of HL, HW, HC, ICD, EL, OCD in male infant with normal birth weight are 12.66±0.617 cm,10.609± 0.586 cm, 38.515±1.561cm, 1.929±0.384cm, 3.771±0.371cm, 3.059±0.415cm respectively. Whereas the values in case of female infant with normal birth weight are 12.496±0.661cm, 10.602±0.533cm, 38.03±1.515cm, 1.935±0.494 cm, 3.704±0.354cm, 2.995±0.418 cm respectively.

Study shows that the average values of HL, HW, HC, ICD, EL, OCD in male infant with low birth weight are 12.169±0.413 cm, 10.138±0.919cm, 36.73±1.69cm,1.953±0.442cm, 3.815±0.393cm, 2.892±0.579cm respectively. Whereas the average values of HL,HW,HC,ICD,EL,OCD in female infant with low birth weight are 12.163±0.551 cm, 10.068±0.811 cm, 36.409±1.736 cm, 1.781±0.355 cm, 3.459±0.45 cm, 2.9±0.407 cm respectively.

Discussion:
Anthropometry comprises a series of noninvasive, inexpensive and easy to perform methods for estimating body measurements. However, they are operator dependant and to be useful clinically, must be performed in a precise, stanzdardized and reproducible manner. The study revealed that the average HW&HCof NBW male infant(1-6m) in West Bengal are 10.61±0.586 cm 38.52±1.561 cm, respectively. Whereas these values are 8.804±0.632 cm & 34.998±1.485 cm respectively in Turkmen male newborn in Iran.[12] So the values of craniofacial parameters of infant of west Bengal are slightly higher than that of Iran.

In my study the average head length (HL)of normal birth weight male infant (1-6m) is 12.6±0.617 cm which is comparable to average HL of Turk-man & Far male newborn in Iran where the values are 11.44±0.529 cm& 11.453 cm respectively.

In a study on newborn of Maduiguri Metropolis, the average HW,HC of male and female newborns shows slightly lower values than the infants of my study group in West Bengal But the average head length of male and female infants of my study are 12.66±0.677 cm, 12.5±0.66 cm respectively, which is comparable with the study in Maduiguri.

In the same study he cephalic index of male and female newborn (Kannuri) were 70.03% & 77.15% respectively.Whereas in my study the average cephalic index of male & female infant(1-6m) are 83.72% & 84.12% respectively in West Bengal. Our study supports the fact that "there are great range of cranial indices and shapes in racial groups however sexual differences are minimal"

In a study on head circumference among Turkish infant it has been seen that at 6 month the head circumference of breast fed boy infant & girl infants are 43.7±0.1 cm & 42.9±0.1 cm respectively& at the age of 1 month it is 38.3±0.1 cm &37.9±0.1 cm for boys and girls respectively [44].In my study the average HC of NBW male & female are 38.52±1.56 cm&38.03±1.52 cm respectively. Whereas in case of LBW male & female infant it is 36.73±1.69 cm & 36.42±1.74 cm respectively .So the HCof infant of west Bengal are more or less similar to the Turkish infant.

A study conducted by sociological research unit , ISH, Kolkata showed that in tropical zones, head form is longer(dolicocephalic) but in temperate zone head form is more round (mesocephalic or brachycephalic)specially among SC & ST than other caste.42 The present study finding show that predominant head shapes here is brachycephalic(37.33%) & hyperbrachycephalic (44%) followed by mesocephalic(16%).

In my research work cephalic indices were 83.719±4.957 cm in male infant & in female it is 84.109±4.567 cm, which is slightly higher than the study conducted in Iran–Gorgan where it was 77±5.211 cm & 77.97±5.347 cm in Turkman & Far races respectively.

The cephalic indices of this study were very much similar to Jordon study inSouth Africa. 45(80.29±0.89)(Jordon,1976) & slightly lower than India (87.5±6.4) (Rajlakshmi et al, 2001).They resembled to Imami"s study in Quzvin-North west in Iran (87.5±6.4) (Mibodi& Frahani,1996).

In the present study, the mean cephalic index for male infant =83.72±4.96 &for female it is 84.12±4.57.This value is very similar to the study conducted on the medical students at Gujarat ,where mean cephalic index for both sex is 80.81, ranging from 71.1 to 89.77 & according to Stewart"s classification (1935) Gujarati subjects can be called mesaticephalic. Our study also establishes that Bengali subjects are predominantly Brachycephalic & hyperbrachycephalic followed by mesocephalic. Comparing previous records of cephalic indices with recent work it proves tendency toward „brachycephalisation"In a study conducted by Niemitz C et al showed that the greatest ear length in females were 52 mm(SD ± 4.3 mm)at birth.43 In our study the highest ear length of female infant in West Bengal is considerably lower and it is 43 mm(±3.54 mm).

In a study by cho,byungchae et al ,the average OCD was 2.68 cm 22 among newborns of both sexes. In our study the value is 3.059 cm & 2.995 cm in NBW male & female respectively and 2.892cm & 2.9 cm in LBW male & female respectively.

Both the study of ours and that of Agnihotri et al. show no statistically significant sexual dimorphism in case of OCD.

Conclusion:
In brief the results obtained from my study are following-

1. There is no statistically significant sexual dimorphism in craniofacial parameters among normal birth weight male and female infant.
2. In case of low birth weight infant my study shows no evidence of sexual dimorphism regarding the following parameters i.e HL, HW, HC, ICD & OCD. But shows evidence of sexual dimorphism in case of ear length .In my study it has been seen that the mean EL of male infant (LBW) is significantly more (p=0.024) than that of female LBW infant.
3. There is statistically significant higher values of HL, HW, HC in male infant with normal birth weight than those of low birth weight male infant.
4. There is no statistically significant difference is noted in ICD, EL, & OCD in normal birth weight male & low birth weight male infant.
5. The normal birth weight female shows statistically significant higher values in HL, HW, HC& EL than the low birth weight female infant.
6. The average cephalic index of male & female infant of west Bengal are 83.72% & 84.12% respectively.
7. The predominant head shapes in West Bengal is hyperbrac hycephalic (44%) followed by brachycephalic (37.33%).
8. Percentage of low set ear is very low in normal birth weight male & female infant. No cases seen low birth weight infant group. So from this study we can say that the ear is normally situated in almost all infants irrespective of their sex and birth weight.

Tables:

Type Of Comparison Used	Test	Significant Level
1.Comparisons of parameter between male and female infant of normal birth weight	Students t-test	P<0.05
2.comparisons of parameters between male and female infant of low birth	do	P<0.05
3.comparisons of parameters between male infants of normal and low birth	do	P<0.05
4.comparisons of parameters between female infants of normal and low birth	do	P<0.05

Table-1: Showing statistical comparison of parameters among male and female infants of normal birth weight.

Parameters	t-value	p-value	comments
Head length	1.385	0.169	Not significant
Head width	0.066	0.947	Not significant

Head circumference	1.666	0.098	Not significant
Intercanthal distance	-0.072	0.943	Not significant
Ear length	0.978	0.33	Not significant
Oral commissural distance	0.804	0.423	Not significant

It is evident from the above table that there is no statistically significant difference between various craniofacial parameters between male and female infant of normal birth weight in my study group.

Table-2: Showing statistical comparison of parameters among male and female infants of low birth weight

Parameters	t-value	p-value	comments
Head length	0.032	0.975	Not significant
Head width	0.236	0.815	Not significant
Head circumference	0.535	0.596	Not significant
Intercanthal distance	1.263	0.216	Not significant
Ear length	2.367	0.024	Significant
Oral commissural distance	-0.046	0.964	Not significant

It is clear from the above table that there is no statistically significant difference in HL, HW, HC, ICD, OCD between low birth weight male and low birth weight female infant. Only ear length of male in low birth weight infants is significantly more(p=0.024) than that of female low birth weight infant. So my study shows no evidence of sexual dimorphism regarding HL, HW, HC, ICD, OCD in the infants of west Bengal.

Table-3: Statistical comparison of parameters among male infants of normal birth weight and low birth weight.

Parameters	Parameters	p-value	comments
Head length	-2.753	0.007	significant
Head width	-2.388	0.019	significant
Head circumference	-3.716	0	significant
Intercanthal distance	0.210	0.834	Not significant
Ear length	0.388	0.699	Not significant
Oral commissural distance	-1.236	0.220	Not significant

While comparing the values among normal birth weight and low birth weight male infants ,statistically significant differences have been observed in values of HL, HW, HC. That is, mean HL, HW, HC in normal birth weight males are significantly more than those of low birth weight male infants.But the values of EL, ICD, OCD does not shows any statistically significant difference between the two groups. So the null hypothesis stands correct here.

Table-4: Statistical comparison of parameters among female infants of normal birth weight and low birth weight.

Parameters	Parameters	p-value	comments
Head length	-2.055	0.044	Significant
Head width	-3.296	0.002	significant
Head circumference	-3.984	0	significant
Intercanthal distance	-1.304	0.197	Not significant
Ear length	-2.474	0.016	significant
Oral commissural distance	-0.900	0.371	Not significant

Above table shows that the mean values of HL, HW, HC& EL are significantly more in normal birth weight female infant than those of low birth weight female infant. But the values of ICD,OCD show no statistically significant difference among the two groups.

Table-5: Showing distribution of low set ears.

Group of infant	Low set ears
1.Male with normal birth weight	1.52%
2.Female with normal birth weight	2.04%
3.Male with low birth weight	0%
4.Female with low birth weight	0%

The above table shows that the distribution of ear among NBW male, NBW female, LBW male, LBW female are 1.52%, 2.04%, 0%, 0% respectively.

Table-6: Showing values of cephalic index

Sex of infant	Mean cephalic index(mean ±Sd)
Male	83.719± 4.957
Female	84.109± 4.567

Table-7: Showing distribution of head shapes among infants

Head shapes	Findings (%)
Dolicocephalic	**2.66**
Mesocephalic	**16**
Brachycephalic	**37.33**
Hyperbrachycephalic	**44**

The above table shows that 2.66% dolicocephalic, 16% mesocephalic, 37.33% brachycephalic, 44% hyperbrachycephalic head shapes were observed among infants of west Bengal.

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