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A Study on Fetal Biometry in Third Trimester in Relation to *Maternal Prakruti*

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ABSTRACT

Fetal biometry refers to the various measurements obtained from sonography which denotes the development of the fetus in a particular period of growth. These measurements describe normal growth of fetal structures and are used to estimate the age and to monitor fetal growth. The biometric measurements attain an optimum value in the third trimester and any abnormality in the range of the values in this particular period can predict fetal anomalies as well.[1] *Prakruti* (constitution) is the inborn character reflected on the individual which forms the basis of one's personality.[2] It is a group of characters inherited by an individual depending on the predominance of *Dosha* (humor) prevailing at the time of conception and which remains with him or her throughout life.[3] Out of the many factors which influence the growth and development of fetus, *Prakruti* has an important role to play. Hence an effort has been made to know the influence of maternal *Prakruti* on fetal biometry in the third trimester of pregnancy.

Key words: *Fetal Biometry, Prakruti, Third Trimester, Dosha.*

INTRODUCTION

Fetal biometry is the measurement of the fetus and various segments of the fetal anatomy. Fetal biometry with the help of ultrasound scanning provides the most reliable and important information about the fetal growth and wellbeing.[4] This is useful in the estimation of gestational age and is helpful in detection of growth aberration in later stages of pregnancy. In addition, fetal biometry distinguishes the normal from abnormal fetal structures. The ultimate goal of fetal biometry is to enable the user to predict information concerning a fetus and to verify how closely the fetus confirms to the prediction. The purpose of this approach is to evaluate body proportion and symmetry of growth of different organ systems in the hope of elucidating subtle patterns which might be recognized as abnormal in very early stages when some form of prenatal management might improve reproductive outcome. Biometry is therefore an integral and valuable element of obstetrical practice. The real-time ultrasound scanners have given a number of ultrasonic biometric parameters. Although many embryonic and fetal structures can be measured, only a few measurements are easy and repeatable enough for widespread use. The most common are the following:

1. **Crown Rump Length (CRL) -** It denotes the longest axis of the fetus and is highly accurate for estimation of fetal age between 7 - 13 weeks of gestation. It is the distance between crown of head and breech which is equivalent to the sitting height of an individual.

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2. **Bi-Parietal Diameter (BPD) -** It is accurate between 12 - 18 weeks and can be used till term. It is the transverse width of the head at its widest and is measured along a standard axial plane passing through the widest portion of the skull, with both thalmi and septum pellucidum in midline.
3. **Head Circumference (HC) -** It is an important measurement of neonatal head growth and has gained much importance in in-utero ultrasound because it is independent of shape of head. It is the measurement around the perimeter of the skull including the bone but not fetal hair and scalp.
4. **Abdominal Circumference (AC) -** It is measured in a location that estimates liver size and can be determined sonographically as the position where the right and left portal veins are continuous with one another. It gives an estimate of weight and size of fetus and aids in monitoring fetal growth for detecting intra uterine growth retardation as well as for dating fetus.
5. **Femur Length (FL) -** This is an additional and slightly more accurate method for predicting age than BPD. FL is measured along the long axis of the diaphysis disregarding the curvature of medial border of femur and non ossified epiphyseal cartilages. Femur is generally preferred over other long bones owing to its size, visibility and ease of measurement.

The secondary biometric parameters include Head Perimeter, Occipito-Frontal Diameter, Ocular Diameter, Inter ocular Distance, Binocular Distance, Thoracic Perimeter, Gestational Sac Volumes, Cephalic Index etc.[5]

Ayurveda describes *Prakruti* as the innate character, physical constitution or disposition of a person. This *Prakruti* forms the foundation on which both physical and mental characters are built upon. In fact the behaviour, the individuality etc. which are unique to each and every person is ultimately dependant on *Prakruti*. Although environment, society, tradition and culture have great impact on one's character it is indeed a solid fact that the basic character or the basic constitution never changes but remains the same.[6] In other words, it is the cluster of both somatic and psychic characters of an individual customary from birth till death, which is formed by the *Dosha* predominant during conception.[7] The predominance of these *Doshas* in *Sukra* (sperm) and *Shonita* (ovum) at the time of fertilization is responsible for the formation of *Prakruti.*[8] The *Doshas* which constitute the *Prakruti* neither afflicts the person just as *Visha* (poison) present in *Visha Krimi* (poisonous creatures) nor gets altered due to the influence of any external or internal factors. Thus *Prakruti* once formed never changes.[9]

Objectives

- Assessment of *Prakruti* of pregnant ladies of third trimester.
- To analyse the relation between Fetal biometry from USG report in third trimester and *Prakruti* of pregnant lady.

Materials and Methods

Apparently healthy pregnant ladies belonging to the third trimester of pregnancy were selected randomly from the OPD and IPD of Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan and their *Prakruti* was assessed. These ladies were grouped chiefly into three categories - *Vata, Pitta* and *Kapha* dominant *Prakruti* (three types of body humors) (*Vata, Pitta* and *Kapha*) depending on the predominance of the *Dosha* characteristics attributed for each *Prakruti.* Each of these dominant *Prakruti* groups was further subdivided into two subgroups taking into consideration the concept of *Dwidoshaja Prakruti* (constitution with two humors). Thus the subgroups were named as VP *(Vata Pitta)* and VK *(Vata Kapha)*; PV *(Pitta Vata)* and PK *(Pitta Kapha)*; KV *(Kapha Vata)* and KP *(Kapha Pitta)*. If the lady satisfied about 60% of the criteria of a *Prakruti*, then it was considered as the dominant *Prakruti* with the next highest score of *Prakruti* as *Anubandha* (less predominant). A proforma was prepared to analyze the *Prakruti* of the pregnant ladies which consisted of *Prakruti* characters that were divided based on

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anatomical and physiological features under physical and psychological characters.

Investigation adopted was Ultrasonography. Four important fetal biometric parameters were included in the study such as Biparietal Diameter, Head Circumference, Abdominal Circumference and Femur Length and these were analyzed in relation with the *Prakruti* of pregnant lady.

Assessment Criteria

Healthy pregnant ladies of third trimester of different *Prakruti* were assessed by the *Lakshsanas* (characters) mentioned in the classics and fetal biometry obtained from USG was studied in relation with the *Prakruti*.

Inclusion Criteria

Healthy pregnant ladies of age group between 20 to 35 yrs were considered for the study.

Exclusion Criteria

Pregnant ladies with systemic disorders like gestational diabetes mellitus, hypertension; those with history of miscarriages, abortions, fetal anomalies, IUGR; elderly primigravidae, malnourished and anaemic women were excluded from the study.

METHODOLOGY

The study was conducted in 122 pregnant ladies of third trimester who belonged to the age group 20 - 35yrs. First their *Prakruti* was assessed using the proforma. USG reports were collected and fetal biometry was studied mainly in relation with the three dominant *Prakrutis* as well as the six *Dwidoshaja Prakruti*. Whether the measurements were the same for all the *Prakruti* or varied according to *Prakruti* was analysed and studied.

OBSERVATIONS AND RESULTS

122 cases were categorized based on their respective *Prakruti* as follows.

Table 1: Frequency of *Ekadoshaja Prakruti*

Group	Frequency	Percentage
Vata	30	24.6
Pitta	63	51.6
Kapha	29	23.8

Table 2: Frequency of *Dwidoshaja Prakruti*

Group	Frequency	Percentage
VK	2	1.6
VP	28	23
PK	28	23
PV	35	28.7
KP	27	22.7
KV	2	1.6

Chart 1: Age wise distribution of pregnant ladies

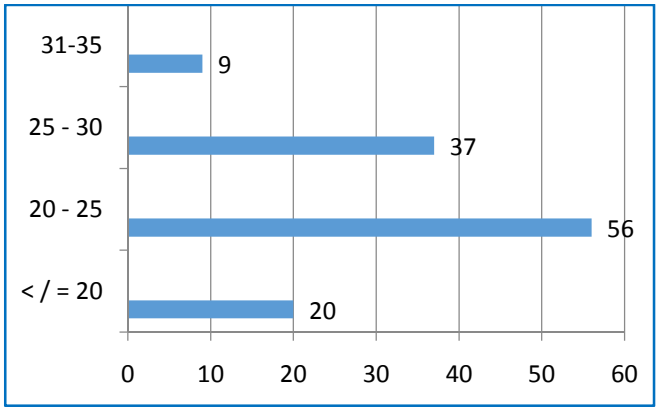

Table 3: Range, Mean & Standard Deviation of Fetal Biometry

	N	Range	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
VAR00001 (BPD)	2	11.00	79.00	90.00	84.5000	5.50000	7.77817
VAR00002	2	42.9	286.	329.0	307.	21.4	30.3

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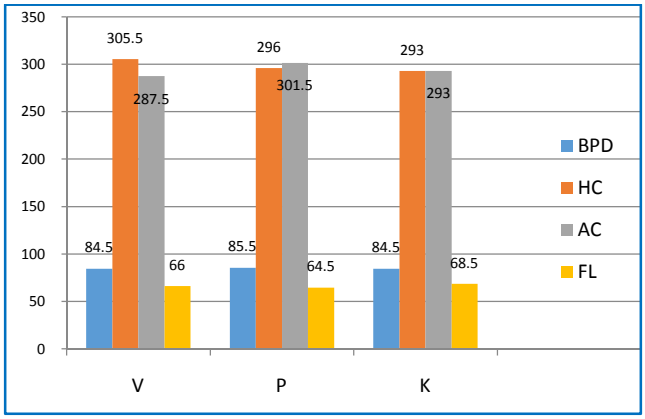
(HC)		0	10	0	5500	5000	3488
VAR00003 (AC)	2	90.00	248.00	338.00	293.0000	45.00000	63.63961
VAR00004 (FL)	2	19.00	59.00	78.00	68.5000	9.50000	13.43503

Chart 2: Mean values of biometry in the three *Ekadoshaja Prakruti*



All fetal biometric measurements obtained from the study fall within the normal range. Hence it satisfies the criteria that only healthy pregnant ladies without any fetal anomalies have been taken for the study.

The fetal biometric parameters and the three dominant Prakruti groups were subjected to Chi square test to find out the relation between the two.

Table 4: Chi Square test

		Pearson Chi-Square	Likelihood Ratio	Linear-by-Linear Association
BPD	Value	83.021[a]	95.683	1.292
	Df	64	64	1
	Asymp. Sig. (2-sided)	0.05	0.006	0.256
HC	Value	136.022[a]	150.137	0.735
	Df	98	98	1
	Asymp. Sig. (2-sided)	0.007	0.001	0.391
AC	Value	157.311[a]	172.572	0.49
	Df	122	122	1
	Asymp. Sig. (2-sided)	0.017	0.002	0.484
FL	Value	53.320[a]	60.688	0.229
	Df	58	58	1
	Asymp. Sig. (2-sided)	0.65	0.379	0.632

Since P < / =0.05 there is significant relation between BPD, HC, AC and *Prakruti*. Since there is significant relation between the characteristics, it can be concluded that there exists a relation between BPD, HC, AC and *Prakruti*. But FL did not reveal much significance may be due to the least difference in values between the groups. Hence it has been proved statistically that there is association between *Prakruti* & Fetal Biometry.

The dominant *Prakruti* groups were subjected to ANOVA test to compare between the groups.

Table 5: ANOVA Test

		Sum of Squares	Df	Mean Square	F	Sig.
BPD	Between Groups	34.925	2	17.463	1.186	.309
	Within Groups	1752.462	119	14.727		
	Total	1787.387	121			
HC	Between Groups	260.005	2	130.002	.841	.434

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	Within Groups	18399.642	119	154.619		
	Total	18659.647	121			
AC	Between Groups	608.044	2	304.022	.800	.452
	Within Groups	45215.391	119	379.961		
	Total	45823.435	121			
FL	Between Groups	28.962	2	14.481	1.198	.305
	Within Groups	1438.257	119	12.086		
	Total	1467.219	121			

The result was not satisfactory may be due to the large difference in sample size between the groups

Paired t test was administered for comparison between individual dominant *Prakruti* groups.

Table 6: Paired Samples Test

		Paired Differences				t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1	BPDV – BPDP	1.953	5.741	-.190	4.097	1.863	29	0.073
Pair 2	BPDV – BPDK	1.337	5.679	-.822	3.498	1.269	28	0.215
Pair 3	BPDP – BPDK	-.779	2.949	-1.901	0.342	-1.42	28	0.166
Pair 4	HCV – HCP	3.530	14.965	-2.058	9.118	1.292	29	.207
Pair 5	HCV – HCK	3.041	19.184	-4.255	10.338	.854	28	.400
Pair 6	HCP – HCK	-.920	11.550	-5.314	3.472	-.429	28	.671
Pair 7	ACV – ACP	3.926	25.433	-5.570	13.423	.846	29	.405
Pair 8	ACV – ACK	-4.151	30.766	-15.854	7.551	-.727	28	.473
Pair 9	ACP – ACK	-7.489	19.061	-14.740	-.239	-2.116	28	.043
Pair 10	FLV – FLP	1.820	5.210	-1.065	4.705	1.353	14	.198
Pair 11	FLV – FLK	3.433	5.026	.649	6.217	2.645	14	.019
Pair 12	FLP – FLK	.613	3.505	-.719	1.947	.943	28	.354

Significant difference was found between *Pitta* predominant and *Kapha* predominant groups for AC; between *Vata* predominant and *Kapha* predominant groups for FL.

Discussion

On keen observation, it was noted that all the four fetal biometric measurements were within the normal range. Hence it can be inferred that only healthy pregnant ladies without any fetal anomalies and those who satisfied the criteria for the study alone were considered. Yet they could be categorized into three groups based on their dominant *Prakruti* whose fetal biometric measurements possessed particular range and mean for the respective *Prakruti*. Hence an index

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can be formed by which pregnant ladies can be grouped into three categories based on their predominant *Prakruti.*

It was found that in all the four parameters, the mean value of biometric measurements was the least in the *Vata* predominant *Prakruti* group for BPD and AC. *Kapha* dominant group had the highest mean for FL, where as *Pitta* predominant group occupied an intermediate position for HC.

While comparing between the groups, there was not much significant difference between the dominant groups. This might be due to least difference in measurements between the groups or due to smaller sample size. In larger sample size significant difference between all the groups is expected. Comparison between the *Dwidoshaja Prakruti* groups was not attempted as the difference in the sample size between the groups was too big to give a satisfactory result especially in the *Vata* and *Kapha* dominant groups.

The growth and development of the fetus can be assessed from fetal biometry. Ayurvedic classics do not reveal any method to determine the *Pramana* (measurement) of *Garbha* (embryo/fetus); yet *Garbhavridhi* (development of embryo/fetus) has been mentioned to have relation with *Maturaharviharas* (food and regimen of mother). Though the size and weight of the fetus can be determined from the biometric measurements, they are not sufficient to assess the *Garbhaprakruti* (constitution of embryo/fetus). *Prakruti* cannot be assessed unless the baby is born.

The *Prakruti* of *Garbha* is determined by various factors like *Sukra Sonita Prakruti* (constitution of sperm and ovum)*, Kala Garbhashaya Prakruti* (time of conception and status of uterus)*, Maturahara Vihara* and *Panchamahabhuta Vikara* (products of the five subtle elements). The predominant *Dosha* present in the *Sukra* and *Sonita* or at their *Samyoga* (union) is the deciding factor of *Garbha Prakruti*. Genes acquired from either father or mother is responsible for the expression of traits or characteristics of an individual. Kala refers to the time and period of conception which has influence on the *Garbhavridhi*. *Kala* provides the conditions essential for the operation of hereditary factors to constitute a particular *Prakruti*. *Garbhashaya Prakruti* is yet another determinant of importance influencing *Garbha Prakruti*. *Charakacharya* points out that defect of *Garbhashaya* (uterus) may result in malformations of *Garbha*. Hence the status of in-utero environment has a greater impact on the health of the fetus which in turn affects its proper growth and development.[10]

Acharya Kasyapa and *Charaka* have stressed on the importance of *Panchabhoutika Ahara Rasa* (essence of food made up of five subtle elements) of the mother in determining the constitution of *Garbha*.[11] Thus various types of food consumed by the mother have influence on the development of fetus and also on the constitution of *Garbha*. In the context of *Mudhagarbha* (dead fetus), *Acharyas* state the due to excessive usage of *Vatala Ahara Viharas* (food and regimen which vitiates vata) of mother, aggravation of *Vayu* occurs which results in *Mudhagarbha*. Thus it is evident that diet consumed by the mother has influence on the growth and development of the fetus.

Physical and mental characteristics of an individual are inherited from the parents at the time of fertilization. The genetic factors form the prime determinants of the physical frame, general development and identifying features of a person. The physical traits may be influenced by many factors like nutritional status of mother, her psychological status, influence of hormones, intra-uterine environment etc. This opinion seems to be similar to that in our classics which gives emphasis that the constitution is determined by the predominant *Dosha* at the time of fertilization along with maternal diet, *Kala, Garbhashaya* etc.

The *Viharas* include both the physical and mental activities of mother and have great impact on the development of *Garbha*. Modern science too accepts the fact that behavioural patterns and occupational factors of mother have great influence on the fetus.

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The various *Ahara Viharas* of mother have impact on *Garbhaposhana* (nutrition of *Garbha*) in different ways which accounts for the varying growth and development of *Garbha* which is reflected as the difference in fetal biometric measurements according to *Prakruti*. A pregnant lady of certain *Prakruti* possesses increased or decreased fetal biometric measurements within the limits which in turn is dependent on the constitution of the fetus. This point throws light on the relation between *Prakruti* of mother and fetal biometry.

The way of combination of *Pachamahabhutas* (subtle elements) at the time of conception is yet another factor involved in the formation of *Prakruti* of *Garbha*. The *Shadbhavas* (six factors) like *Matruja, Pitruja, Rasaja, Atmaja, Satwaja* and *Satmyaja Bhavas* (factors derived from the mother, father, nutrition, soul, psyche and wholesomeness) play an important role in the growth and development of *Garbha*.[12] Thus all the factors discussed above help in determining the constitution as well as growth and development of *Garbha.*

The *Pramana* of adult humans is related to *Prakruti*. According to *Prakruti*, the height and measurements of body parts vary. It is being dealt that *Kapha Prakruti* people possess *Suvibhakta Gatra* (well built physique), *Pralamba Bahu* (long arms); *Vata Prakruti* are said to be *Deerghakaya* (tall), *Apacita* (lean) and *Alpa Shareera* (emaciated). The *Prakruti* formed at the *Samyoga* of *Sukra* and *Sonita* remains unchanged.

If there was any parameter to assess the *Prakruti* of *Garbha*, this would have some relation with the fetal biometry since fetal biometry is the measurement of the physical constitution of the fetus. Since *Garbhaprakruti* could not be assessed, *Prakruti* of mother was taken into consideration. Further studies are needed regarding this by studying the child after birth. From the present study it is clear that a pregnant lady of certain *Prakruti* has more or less biometric measurements within the normal limits. These measurements correspond to the *Garbhaprakruti* and that which has a definite relation with the mother's *Prakruti*. This is reason elicited for the highest, moderate and least measurements of fetal biometry according to *Prakruti*.

Susruta explains that the *Dosha* predominant at the time of conception decides the *Prakruti* of *Garbha* which remains unchanged throughout life.[13] This *Garbha Shareera Prakruti* is influenced by many factors such as *Prakruti* of *Sukra, Sonita*, that of *Kala, Garbhashaya, Aharavihara* of mother and *Panchamahabhutavikaras.*[14]

Studies have proved that maternal and pregnancy characteristics have a significant influence on in-utero fetal biometry. The same fact has been quoted by *Acharyas* decades back. The primary relationship existing between a mother and her baby, which begins in the earlier stages of pregnancy, has an impact in the development of the baby's personality.

Prakruti of mother is one of the factors which influence the growth and development of fetus. Other factors like constitution of father, nutritional status of mother, uterine environment etc. also have to be considered to get a complete picture. It is not necessary that the fetus should inherit the same *Prakruti* as that of the mother, rather it is decided chiefly by the dominant *Dosha* at time of conception which is influenced by various factors.

CONCLUSION

The influence of *Prakruti* on Fetal biometry was the core concept of the present study. The characteristic features of each *Prakruti* assessed during the study conducted were found to have been in concurrence with those mentioned in Ayurvedic classics. It was observed that there exists a difference between the groups in all the fetal biometric parameters except for a few. Each biometric parameter showed maximum relevance for a single group in. Moreover the relation between the fetal biometry and *Prakruti* has been proved statistically too. Maternal *Prakruti* is one of the governing factors of fetal growth and development. Hence it can be concluded that fetal measurements depend on maternal *Prakruti* to a certain extend. Futher long term group studies throughout the whole period of pregnancy with larger

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sample size by considering all the factors which influence fetal growth and development along with secondary biometric parameters are recommended to gain a better understanding.

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