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Clinical utility of *Shabda* and *Sparsha Pareeksha* in evaluation of *Prakruta* and *Vaikruta Garbhavastha*

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ABSTRACT

Garbha is a conglomeration of biological mass with different strata including consciousness, needs an innovative clinical tool to evaluate its well being, which proves safe, potent, cost-effective and non-invasive. The idea of taking up this study was to sensitively predict the *Prakrutavastha* or well being w.r.t *Garbha-pushti* and ongoing Fetal Pathology, *Vaikrutavastha* w.s.r *Garbhavyapads* for a sharp interference to get a possible best neonatal outcome. The objective of this study was to calculate the predictive accuracy of evaluation of *Garbhaspandanam* on external *Shabda* and *Sparsha Pareeksha*. A Prospective Clinical study of *Garbhaspandanam* (FHS and FM) with external *Shabda* and *Sparsha* stimulation on maternal abdomen, from 24th week onwards was conducted in a cohort of 30 Singleton Pregnant women at Dept. of Prasuti Tantra & Stri Roga, S.D.M.C.A. Hospital, Udupi. Among the 9 cases in abnormal category, 2 cases had gone for IUD and one case though placed in abnormal category had responded relatively well to *Shabda* and *Sparsha Pareeksha* which may be due to the proper antenatal care and intervention given along with the patient's *Vatakara Nidana Parivarjana*. Predictive Accuracy Rate on *Shabda* and *Sparsha Pareeksha* showed, FHS 70%, FM 76.7%; FHS 73.3%, FM 66.7% respectively. *Shabda* and *Sparshapareeksha* can be utilized as the *Garbha - chetana - dyodakalakshana* and can be performed as a routine antenatal bedside procedure, which can fairly detect the *Prakruta* and *Vaikrutavastha* of *Garbha* w.r.t *Pushti*. However larger prospective studies are required.

Key words: *Garbhaspandanam*, *Garbha*, *Chetana*, Tactile and Acoustic Stimulation.

INTRODUCTION

The *Garbha* has different strata like body, senses, mind, emotion and consciousness which is already present in it right from the conception, but in a subtle form in the beginning and attains *Pravyaktata* in its

due course, becoming eligible for treatment (*Chikitsyapurusha*)^[1]. So a proper diagnostic protocol from Ayurvedic texts should be highlighted to evaluate its *Prakruta* and *Vaikruta* conditions in regard with *Gabhapushti* and *Garbhavyapads* respectively, a window through which the *Chetanashakti* can be predicted apart from *Nadi* etc. *Ashtasthanapareeksha*, which proves safe, potent, cost-effective and non-invasive. Since the *Garbha* structured with *Indriyas* is capable for *Indriya-Vishaya Abhigrahana* from inside the mother's womb, this *Indriya-Vishaya-Abhigrahana-Shakti* of *Garbha* was open for experimentation to assess the well-being of *Garbha*. *Acharya Kashyapa's* description about '*Praspandanam*'^[2] (fetal heart sound and fetal movement) described in *Masanumasika Garbhavidhi* was taken as a milestone for normal

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growth (*Prakruta*) and its variations as an indicator of abnormal fetal conditions (*Vaikrutavastha*)

Prakruta Garbha

The *Garbha* that fulfills the requirements as said in the *Masanumasika Garbhavruddi* is considered as *Prakrutagarbha*, which will have regular *Garbhaspandanam* (FHS and FM), Proper *Indriya* – *Arthasannikarsha* (*Shabda* and *Sparsha*) from 24th week onwards and attains proper *Kukshivruddhi* (fundal height) according to different gestational age.

Basic Understanding of Indriya- PraptaKaryata^[3] (Shabda and Sparsha Pareeksha) of Prakruta Garbha in-Utero.

The mechanism involved in the *Indriya-Arthasannikarsha* of *Shabda* and *Sparsha* in *Prakruta Garbhavastha* can be understood on the basis of the theory of *Tulyayonitwa*.^[4]

From 24th week onwards after the evolvement of *Buddhi*, When the external stimuli applied in the form of *Shabda* and *Sparsha* which are the properties of *Akasha* and *Vayu Mahabhutas* (the properties which are already inherent in the form of *Shabda-Tanmatra* and *Sparshatanmatra*) will be perceived by the respective faculties in *Garbha*, *Srotrendriya* and *Sparshanendriya* due to *Tulyayonitwa*, and the concerned *Akasha-bhuta* and *Vayu-bhuta* derived actions^[5] or response can be observed in *Garbha*, which evokes the auditory and somato-sensory reflex by *Prerana Karma*, resulting in *Cheshta* (motor activity) *Sarvashareera Spandanam* (involuntary movements including FHR), consequently *Dhatusamvyuhana* (grouping or accumulation of tissues) and *Viviktata* (differentiation) are appreciated, indicating proper functioning of *Vata* (*Akasha + Vayu*) signifying Normal growth and development of *Garbha*.

Vaikruta Garbha

All the *Garbhavyapads* mainly manifest due to *Vata* vitiation. So the pathophysiologic mechanism involved in the impaired *Indriya-Arthasannikarsha* of *Shabda* and *Sparsha* in *Vaikrutagarbha* can be explained on the basis of *Vata* vitiation.

Basic Understanding of the Pathophysiology of Vaikruta Garbha In-Utero leading to Garbhaspandana Vikruti

Due to *Vatakara Ahara Vihara* of *Garbhini* → *Vata Dosh* (constituting *Akasha + Vayu*) *Prakopa* occurs → The increase in *Ruksha* and *Khara Guna* of *Vata* → Produces *Samkocha* of *Rasavahinis* (feto-placental vessels) → Leading to *Rasawahasrotodushti*, having origin in *Garbha Hrudayam* → Leading to *Garbha-Pranavahini-Dushti* and *Ojovahasrotodushti* (both *Srotas* having same origin, *Moolam - Hrudayam*) → Causing *Ojo - Visramsa*^[6] and affects *Garbha-Chetana* → Resulting in *Kriyasannirodha* (impairment in activities) → and the corresponding decrease in *Ojas*^[7] leading to *Vyathitendriya* (impairment of sense organs) → Leads to inability / incompetency of *Garbha Srotrendriya* and *Sparshanendriya* to perceive their corresponding *Indriyarthas*, that is *Shabda* and *Sparsha*, applied in the form of external stimuli, causing *Impaired Prerana* (incompetent to evoke auditory reflex and somatosensory reflex) and which leads to *Impaired Cheshta* (motor activity) *Impaired Sarvashareeraspandanam* (involuntary movements including FHR), consequently *Impaired Dhatusamvyuhana* (grouping or accumulation of tissues) and *Impaired Viviktata* (differentiation) are appreciated indicating impaired functioning of *Vata* (*Akasha + Vayu*) signifying Growth Restriction and Impaired Development of *Garbha*.

The pathophysiology involving *Rasawahasrotodushti* and *Pranawahasrotodushti* leads to Nutritional deficiency and Oxygen deficiency which are the basic pathological states that can be observed in *Garbha-Vyapads* related with growth and development like *Garbha-Sosha*, *Upavishtaka*, *Nagodara* and *Leenagarbha* where *Vaikruta Garbhaspandanam* is observed like, *Mandaspandanam*,^[8] *Chiraat Kinjit Spandanam*,^[9] *Aspandanam*^[10] etc.

AIM AND OBJECTIVE

To calculate the predictive accuracy of evaluation of *Garbhaspandanam* on external *Shabda* and *Sparsha Pareeksha* to evaluate *Prakruta Garbhavastha* w.s.r

Garbhapushti and Vaikruta Garbhavastha w.s.r to Garbhavyapads.

MATERIALS AND METHODS

A Prospective cohort of 30 singleton pregnant women with gestational age from 24 week onwards was selected on the basis of inclusion and exclusion criteria attending the OPD of Prasooti Tantra and Stree Roga Department, S.D.M.C.A. Hospital, Udupi. The study was approved by Institution Ethics Committee.

An additional no. of 7 patients were recruited for the study on account of lack of 2 patients who lost follow-up around 30-34 weeks, 2 cases who had fetal distress during labour and 3 cases were instrumental delivery which followed exclusion criteria for their neonatal outcome analysis and completed the study population of 30 pregnant women within inclusion criteria.

Inclusion criteria

1. Pregnant women irrespective of age, religion and socio-economic status.
2. Pregnant women of gestational age of 24 weeks onwards.
3. Both Primigravida and multigravida
4. Pregnancy with maternal infections
5. Pregnancy with Oligohydramnios.
6. Pregnancy induced hypertension.
7. Pregnancy irrespective of maternal systemic diseases.
8. Irrespective of Mode of delivery (for neonatal assessment)

Exclusion criteria

1. Multiple gestation
2. Polyhydramnios
3. Any congenital anomalies

4. Antepartum haemorrhage
5. Obstructed labour
6. Fetal distress induced by medications and induction of labour (for neonatal assessment)

Procedure of Antenatal Assessment

Participants underwent routine antenatal investigations were examined from the Observation room near to Labour Theatre, equipped with hospital bed for privacy. The test apparatus and protocol were explained to them and then examinations were conducted on a fortnight basis.

The participant pregnant women were allowed to lay on the bed in recumbent position and examination of maternal abdomen done for a maximum period of 20 min. First the FM & FHR before stimulation were checked and documented

Examination With Stimulation

With Shabda: An external acoustic stimulus was applied with a buzzer placed approximately 30 cm from maternal abdomen for 5 seconds. The immediate response to stimulus within 15 sec or the reactivity in the form of FM & FHR acceleration were noted and documented in grades.

With Sparsha: An external cold stimulus with a cold ice gel pack of standard size 260 x 125 mm refrigerated for 20 min was applied onto maternal abdomen for about 15 seconds. The immediate response to stimulus within 15 sec or the reactivity in the form of FM & FHR acceleration were noted and documented in grades.

Neonatal Outcome: Assessed based on Birth weight in kg.

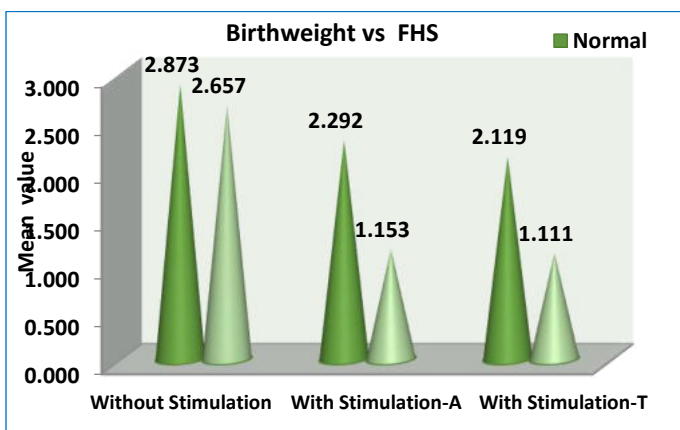
Final Assessment: The neonates were categorized into normal and abnormal groups based on Birth weight. Statistical tests used were Student- t Test, Fisher's Exact Test and Diagnostic Test. Finally predictive accuracy rate of *Garbhaspandam* (FHS and FM) on neonatal outcome w.r.t. birth weight was calculated.

OBSERVATIONS AND RESULTS

Table 1: Showing comparison between normal and abnormal birth weight with regard to FHS and FM

Group	Class	No	FHS			FM		
			X	SD	t	X	SD	t
Without Stim	Normal	21	2.873	.203	2.148	1.496	.145	2.569
	Abnormal	09	2.657	.248	p=0.019 sig	1.259	.367	p=0.016 sig
With Stim-A	Normal	21	2.292	.396	5.316	2.036	.345	5.281
	Abnormal	09	1.153	.788	p<.001 vhs	1.194	.512	p<.001 vhs
With Stim-T	Normal	21	2.119	.361	5.495	1.946	.258	5.380
	Abnormal	09	1.111	.645	p<.001 vhs	1.167	.545	p<.001 vhs

Graph 1: Showing comparison between normal and abnormal birth weight with regard to FHS



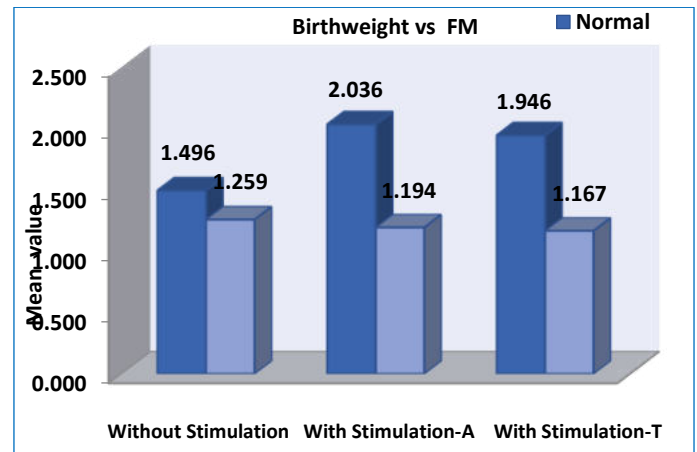
Calculation of predictive accuracy

With regard to FHS in prediction of birth weight, With stimulation-A, sensitivity of 88.9%, specificity of 61.9%, accuracy rate of 70%. With stimulation-T, sensitivity of 88.9%, specificity of 61.9, accuracy rate of 70%.

With regard to FM in prediction of birth weight, With stimulation-A, sensitivity of 100%, specificity of 66.7%,

accuracy rate of 76.7%. With stimulation-T, sensitivity of 100%, specificity of 52.4%, accuracy rate of 66.7%.

Graph 2: Showing comparison between normal and abnormal birth weight with regard to FM



DISCUSSION

Our *Acharyas* have given vast importance to the prenatal life (*Garbhavastha*) and its relevance in the genesis of different diseases in adulthood. There are growing evidence that the intrauterine environment can programme adult disease susceptibility by altering the epigenetic state of the fetal genome. The concept fetal origin of adult disease (FOAD)^[11] which holds that events during early development have a profound impact on one’s risk for development of future adult disease. Low birth weight, a surrogate marker of poor fetal growth and nutrition, is linked to coronary artery disease, hypertension, obesity and insulin resistance. So it is very important to understand the normal and abnormal states of prenatal life. The task of an Ayurvedic obstetrician is not limited to a normal prescription of *Garbhini Paricharya* but also to give the maximum facilities and stimulation for the inner baby (by music etc.) as it is also associated with *Chetana*.

Shabda and Garbha-Srotrendriya

The timing of formation of ears during fetal development as mentioned in *Garbha Upanishad* is by sixth month.^[12] The contemporary fetal study reveals that the major structures of the medulla oblongata are completely matured by 6- 7 months of gestation.

In addition to its many subnuclei, the medulla gives rise to a variety of descending spinal motor tracts which reflexively trigger limb and body movements and also hosts the five cranial nerves (VIII – XII), which exert tremendous influences on gross body movements, heart rate, respiration and the head turning.^[13] The External acoustic meatus gets canalized and ear will structurally get complete by 6 months. It is also the time of onset of myelination which coincides with the onset of acousticomotor reflexes and brainstem auditory evoked responses, and this was the rationale behind our study to initiate the acoustic stimulation test (*Shabdapareeksha*) by 24 weeks of gestational age.

Sparsha and Garbha-Sparshanendriya

The manifestation of *Twak* occurs in sixth month of fetal development.^[14] The specific sensory receptors, Meissner and Paccini bodies are well developed by the 24th week of gestation. Thalamocortical pathways, important for the perception of sensory impulses, reach the somatosensory cortex around the 23rd week, correlating with the development of synapses in the cortical plate.^[15] And this added to the rationality of our study to initiate the tactile stimulation test (*Sparshapareeksha*) by 24 weeks of gestational age.

Praspandanam Vs FM

Praspandanam is one among the milestones described by *Acharya Kashyapa* in the normal development of fetus at 3rd month. He describes it as *Shareerasya-Chalanam*, i.e. the movement of body. Fetal movement signifies the muscular activity in fetus. The *Vayu* associated with *Ushma (Pitta)* canalizes the *Srotases (Akasha)*, entering the *Mamsa* (flesh), divides it into *Peshis* (muscles).^[16] The *Vyanavayu* situated in *Hridaya* and said to be involved in locomotory activities will be entering into those *Peshis* and will embark the development of motor activity in the fetus. It is between 6 and 8 weeks of gestation, muscle fibers are formed by fusion of myoblasts, efferent and afferent neuromuscular connections are developed and spontaneous neural activity causes motility to begin.^[17] This clearly depicts

the action of *Vyanavayu*. The involvement of *Prana-Vata* and *Ojas* in motor activity is also remarkable. The essence of *Rasadhatu* of fetus gets localized in the *Garbha-Hridaya* and from there, it circulates to all body parts via the concerned *Srotas* and helps in maintenance of fetal activities. It is in the fourth month, there will be *Mamsa-Upachaya*, weight of fetus increase considerably; quickening occurs, thus the movements of fetus start to be perceived by the mother.

Praspandanam Vs Fetal Heart Sound

Cardiogenesis^[18] begins on the 18th day of life at the time of the cardiogenic plate formation and it is said that beating of heart is the first motor activity that can be observed in an embryo. Though the heart motion sets in by about 6 weeks of gestation, it is clear that heart becomes functionally active and coordinated by 9 weeks or in the month of third, which can be considered under *Praspandanam*. This was the rationale behind the selection of study of fetal heart sound also along with the Fetal Movement under *Garbhaspandanam*.

Indriya-Artha-Sannikarsha Vs Stimulation

The presence of *Manas* is needed for the perception of knowledge or the *Indriya-Artha-Sannikarsha*. The establishment of thalamocortical connections in the third trimester is the prerequisite for cortical analysis of sensory inputs. The view of *Acharyas* regarding the manifestation and development of mind with perception of consciousness and evolution of *Buddhi* comes in par with the modern view. During the third trimester, neuronal differentiation and synaptogenesis flourish in the cortical plate with afferent projections from the thalamus migrating deeper into the cortical layer increasing the probability that movement will be generated and modified in response to stimulation. Maturation and formation of additional sensorimotor connections in the cortex may create detectable changes in fetal movement as a product of improved sensory feedback.^[19]

Significance of stimulation of the Sensory Organs

The concept of *Utthapana*, commented by *Acharya Chakrapani* as "*Utthapanae Pushtijanane*", limiting the term for '*Pushti*' to '*Dhatupushti*' is not justifiable. The term may be indicating "awakening" process to stimulate both growth and development with special reference to neurological maturation and psychological tuning. With each sensory system, the initial stimulation is internal or endogenous, but at a critical or sensitive point in development, outside stimulation and experience are needed for further development. Prenatal activation of sensory systems may contribute to the normal development of peripheral structures and central connectivity, as well as to uphold their anatomic and functional integrity during prenatal maturation. It is also said that afferent input is necessary to establish and maintain a correct functioning of the sensory system. Thus the incoming sensory stimulation may play a crucial role during this period.

Birth Weight Vs Evaluation of *Garbhaspandanam*

When a stimulus was given to sensory system in a well-developed mature CNS, because of its interconnections with different motor-neuronal tracts, exhibits response through muscles and it shows the compactness. It shows good specificity for the percentage of fetus who gave good reactivity to stimulation - *Shabda* and *Sparsha*, which is well evident by recording of birth weight. The predictive value of normal and abnormal birth weight shows the fetal nutritional status which is equally important for brain development; so if the fetus is associated with reduced nutritional reserve as in cases of IUGR, it will reduce its motor activity and gives a less reactivity towards the external stimuli-A&T. In cases of fetal compromise, chronic oxygen deprivation due to different causes – placental insufficiency, anaemia, hypertension, GDM, the senses and CNS will not be upto the score to give a response towards external stimuli-A &T.

The very good start of quickening which was seen early in whomever, was found to have an impact on

maternal-fetal attachment, having good interaction in the form of good sucking reflex.

CONCLUSION

Antenatal clinical examination of *Garbhaspandanam* 'without stimulation' followed by *Shabda* and *Sparsha Pareeksha*, i.e. 'with external acoustic and tactile stimuli' can be performed as a routine antenatal bedside procedure, which can fairly detect the *Prakruta Garbhavastha* w.s.r. *Garbhapushti* and *Vaikruta Garbhavastha* w.s.r to *Garbhavyapads*. The *Shabda* and *Sparshapareeksha* can be utilized as the windows to predict the *Garbhachetana*. However larger prospective studies can be done for a better understanding of their diagnostic value.

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