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CLINICO - ANATOMICAL CONSIDERATION OF BEEJA, BEEJABHAGA AND BEEJABHAGAAVYAVA

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ABSTRACT

Science of Genetics may appear a new topic but ancient *Ayurvedic* Acharyas like *Charaka* and *Sushruta* very well understood the principle of heredity and nature of traits or characters. They knew the fundamentals of Genetics i.e., the factors responsible for genetical defect in a child. They said it was not due to any defect in the mother or the father but in the ovum or sperm of the parents (an accepted fact today). Acharya *Sushruta* gives the concept of hereditary and congenital types of diseases such as; *Sthaulya, Klaibya, Prameha* and other diseases which occurs due to the defect in genetic component. Whereas Acharya *Charaka* has described the whole genetics in three genetic units in the form of *Beeja* (Gametes), *Beejbhaga* (Chromosome) and *Beejbhagavyava* (Gene). He also explained that due to *Vikriti* of *Beeja, Beejbhaga* and *Beejbhagavyava* of the couple, there will be *Vikriti* or *Vyapada* in the offspring. While considering the statistics of genetic disorders it was found that, if all congenital anomalies are considered as part of the genetic load, then greater than or equal to 79/1,000 live-born individuals have been identified as having one or other genetic disorder before approximately age 25 years. After having this much higher prevalence rate and unavailability of the matter at a single place in texts necessitates the work. Thus, an effort

has been made to collect, compile and understand the concept and clinical relevance of *Beeja, Beejbhaga* and *Beejbhagavyava.*

KEYWORDS:– Genetics, *Beeja, Beejbhaga, Beejbhagavyava*.

INTRODUCTION

Genetics plays a role, to a greater or lesser extent, in all diseases. Variations in our DNA and differences in how that DNA functions (Alone or in combinations), alongside the environmental factor (Which encompasses lifestyle), contribute to disease processes. The literature of Ayurveda encompasses description of genetics. For the formation of Garbha *Sukra* (Sperm) and *Shonita* (Ovum) are primary requisites.[1] If there occur any vitiation in the healthy *Sukra* (Sperm) and *Shonita* (Ovum) then either the conception does not occur or there may be some deformity in the fetus. The other contributing factors responsible for the procreation of foetus or human being derived from the following sources i.e., *Matrijabhav, Pitrijabhav, Atmaja*, *Satmaja, Rasaja* and *Satmaja.*[2]

In *Sushruta Samhita* the seven-fold of disease consider on the Trividha dukha. Among these *Adibala pravritta vyadhi* indicates the diseases which are congenital in origin and genetically determined like Dusta *Arsha, Prameha*, *kustha* etc. and are manifested due to the vitiation of Shukra and Shonita of father and mother. *Acharya Charak* explained this concept at the level of *Beeja, Beejabhaga* and *Beejabhagavyava*.

Modern concept of development of fetus[3]

According to modern science the 23 chromosomes of the female Pronucleus and 23 of the male Pronucleus get mixed up and form 23 pairs. These 46 Chromosomes undergo changes like those in a typical mitotic division leading to the formation of an embryo having two cells. After cleavage, division of the zygote, formation of Morula, Blastocyst and its implantation, differentiation of Trophoblast and Chorion, appearance of Bilaminar and Trilaminar Germ Disc takes place accordingly. After that it gets characterised by the changes of the shape and external appearance of the embryo. After the formation of three germinal layers, each of the three germ layers undergoes individual differentiation and most of the tissue and organs of the body are formed.

Concept of beeja, Beejbhaga and Beejbhagavyava[4]

***"Manusya beejam hi pratyangabijabhaga samudayatamkam swadrisham pratyanga samudayarupa purushjankam"* – Chakrapani**

Means the *Beeja* of humans is the samudaya of *Beejbhaga* forming the body parts and these *Beejbhaga* have the power to generate the similar species. So, whenever there occurs any vitiation in Beejbhaga there occurs vitiation of body parts.

In context of congenital developmental defect associated with female and male *Beeja*, Acharya has again described them at more subtle level and gave the concept of *Beejabhaga* and *Beejabhagavyava*.

Bija

Bija refers to *Sukra* and *Shonit*. Acharya *Chakrapani*[5] has clearly stated that the smallest unit found in *Shukra* (Sperm) & *Shonita* (Ovum) can be considered as *Beeja* of male and female respectively, which may compare with the male and female gametes i.e., sperm and ovum. These two, carry complete set of instructions on how the body is supposed to be built. This genetically coded instructions are the Genetic constitution of an organism which determines different traits of an individual such as Eye colour, Haircolour, Height, Weight, skin colour etc.

Bijabhaga

"Bijasya angapratyanganirvartkobhagahbijabhag,"

Beejbhaga may be compared to a chromosome. The genomes are the set of chromosomal complements which are passed on as units from generation to generation one from each of the parents. These carry the hereditary information in the form of genes. Thus, *Beejbhaga* is held responsible for the expression of different characteristics of individual and origin of different organs and tissues of the body.[6]

Bijabhagavyava

"Avayavashabden garbhashayasyartavasyaekdeshuchhyate"

Beejbhagavyava is the most fundamental entity which can be grossly compared to a gene. It is the basic physical and functional unit of heredity which are mainly responsible for expression of a particular trait in an individual that are transmitted from one generation to another. These are specific sequences that encode instructions on how to make proteins which in turn are responsible for the expression of a trait.[7]

Gene – it is the most basic physical and functional unit of genetic material that lies on chromosomes which encodes information of making proteins which in turn is responsible for expression of a particular trait.

	Characteristic	**Outcome**
Beeja	Smallest unit of Shukra & Shonita considered as gametes	Responsible for conception
Beejbhaga	Component of Beeja (chromosomes)	Responsible for development of body organs and tissues.
Beejbhagavyava	Subtle stage of Beejbhaga (Gene)	Carry hereditary characters and responsible for particular manifestation in an individual.

Theory of Chromosomal and Genetic disorders

- **Chromosomal disorder:-** The normal fertilized egg cell contains 23 chromosomes from the mother and 23 from the father. Thus, there are normally 23 pairs of chromosomes in the fertilized egg. These include two sex chromosomes: XX for girls and XY for boys. Some chromosomal abnormalities occur when there is an extra chromosome. While others occur when a section of a chromosome is deleted or duplicated. Examples of chromosomal abnormalities include Down syndrome, Trisomy 18, Trisomy 13, Klinefelter syndrome, XYY syndrome, Turner syndrome, triple X syndrome, Cri-du-chat syndrome, Angelman syndrome, Prader-Willi syndrome, Fragile X syndrome etc.
- **Genetic disorder:-** A genetic disorder is a disease caused in whole or in part by a change in the DNA sequence away from the normal sequence. Genetic disorders can be caused by a mutation in one gene (Monogenic disorder), by mutations in multiple genes (multifactorial inheritance disorder), by a combination of gene mutations and environmental factors, or by damage to chromosomes (Changes in the number or structure of entire chromosomes, the structures that carry genes). eg- Huntington's disease, Sickle cell diseases (SCDs), muscular dystrophies, asthma, heart disease, diabetes, certain cancers, schizophrenia, Alzheimer's disease, multiple sclerosis etc.

Concept of *vikrit garbha* (Fetal anomalies/Applied aspect)

***"Manusya beejam hi pratyangabijabhaga samudayatamkam swadrisham pratyanga samudayarupa purushjankam"* – Chakrapani**

Means the *Beeja* of humans is the samudaya of *Beejbhaga* forming the body parts and these *Beejbhaga* have the power to generate the similar species. So, whenever there occurs any vitiation in Beejbhaga there occurs vitiation of body parts.[8]

***"Yasya yasya hi anga avayavasya bije bijbhagauptapo bhavati tasya tasya angaavayavasyaviktirupjsyte, naupjayte chaanuptapat"* – C.Sh 3/17**

Whichever part of *Beeja, Beejbhaga* is vitiated by the Doshas, the concerned part of the body presents with disease. Acarya *Charaka* has explained further that teratologic abnormalities depend upon the condition of *Beeja*, not on the physical status of the couple. In other words, what so ever part of *Beeja* is defective, the body part developing from that portion of *Beeja* will be abnormal. E.g., If the portion of a *Beeja* of a Kushthi man responsible for formation of skin is defective then the only born child will have *kushtha*. However, if that part is not abnormal then the child will be healthy.[9]

Acharya *Charak* has mentioned in *Mehatigarbhavkranti Sharir Adhayaya* that when a woman uses aggravating factors, the *Doshas* gets vitiated and in course of spreading reach the *Shonita* (ovum) and *Garbhashaya* (uterus) but do not affect them entirely, thus yet women conceives but there occur *Vikriti* of one or more among *Matrijabhav* or *Pitrijabhav*. The factors derived from mother i.e *Matrijabhav* - most of the soft organs like skin, blood, flesh, fat, heart, liver, kidney, stomach. The factors derived from father i.e *Pitrijabhav* - scalp, hair, nail, teeth, bones, veins, ligaments, arteries etc. All the main organs & systems in human body are related with *Matrijabhav*a like heart, liver, kidney etc. whereas the hard supporting structure are of *Pitrij* origin like teeth, skin, bones etc. Thus, deformity in any of the above organ/system is the resultant of *Vikriti* in *Beeja, Beejabhaga* and *Beejabhagavyava* (certain congenital developmental anomalies in the fetus).

Acharya *charak* gives brief description of - Vitiation in the *Beeja* of female leads to *Vandhya*(infertility) in the foetus, vitiation in the *Beejbhaga* of female leads to *Putipraja* in the foetus and vitiation in the *Bheejbagavyava* of female leads to *Varta* in foetus. Vitiation in the *Beeja* of male leads to *Vandhy* in the foetus, vitiation in the *Beejbhaga* of male leads to *Putipraja* in the foetus and vitiation in the *Beejbhagavyava* of male leads to *Trunputrika* in foetus.[10]

The other Garbhaj Vikrities which were scattered in samhitas have been collected and compiled. Garbhaj Vikrtiya as mentioned by Charaka, Sushruta, Ashtang Sangrah & Ashtang Hriday

1. Yamala/Yamal
2. Shandha – impotent persons: - a. Aasekya b. Saugandhika c. Kumbhika d. Irshyaka e. Shandhaka/Vatiksandhak
3. Anasthi Garbha
4. Svapn me maithun se garbha /Garbha-Bhasa- (false Pregnancy, pseudocyesis)
5. Monster/abnormal Garbha Vikrita Garbha
6. Dvireta
7. Pavanedriya
8. Samskaravahya
9. Klib
10. Vakri
11. Garbhasrava(abortion)
12. Garabhapata(miscarriage)
13. Upavishtaka
14. Nagodara
15. Lina Garbha
16. Upshirshka
17. Anyanya
18. Jad
19. Janmaandha
20. Ama Garbhapat
21. Mudhagarbha (obstructed labour)
22. Jivit mudgarbha mrtagarbha (intrauterine death of fetus)
23. Mritagarbha (intrauterine death of fetus)
24. Bhuthata or Negameshhata
25. Mastuluangchya
26. Pangulya
27. Mukatva
28. Vamantva
29. Khandoshtha

30. Khandta

Viable aneuploidies[11]

Aneuploidy	Common name	Estimated incidence among life-births	Symptoms can include
Trisomy 13	Patau syndrome	Approximately 1:16000	Severe intellectual disability, heart defects, brain or spinal cord abnormalities, small or poorly developed eyes, extra fingers or toes, cleft lip and palate, weak muscle tone
Trisomy 18	Edwards syndrome	Approximately 1:5000	Intrauterine growth retardation, low birth weight, heart defects and abnormalities of other organs, small, abnormally shaped head, small jaw and mouth, clenched fists, severe intellectual disability
Trisomy 21	Down syndrome	Approximately 1:800	Mild to moderate intellectual disability, characteristic facial appearance, weak muscle tone, heart defects, digestive abnormalities, hypothyroidism, increased risk of hearing and vision problems, leukaemia, Alzheimer's disease
Trisomy X	Triple X syndrome	Approximately 1:1000	Increased height, increased risk of learning disabilities, delayed development of speech, language and motor skills, weak muscle tone, behavioural and emotional difficulties, seizures, kidney abnormalities
47, XYY		Approximately 1:1000	Increased height, increased risk of learning disabilities, delayed development of speech, language, and motor skills, weak muscle tone, hand tremors, seizures, asthma, scoliosis, behavioural and emotional difficulties
47, XXY	Klinefelter syndrome	1:500 to 1:1000	Small testes, low testosterone levels, delayed and incomplete puberty, breast enlargement, reduced facial and body hair, infertility, increased height, increased risk of breast cancer, learning disabilities, delayed speech and language development
48, XXXY		Approximately 1:18000 to 1:40000	Small testes, low testosterone levels, delayed and incomplete puberty, breast enlargement, reduced facial and body hair, infertility, increased height, tremors, dental problems, peripheral vascular disease, deep vein thrombosis, asthma, type 2 diabetes, seizures, heart defects, delayed speech and language development, learning disabilities

45, X	Turner syndrome	Approximately 1:2500	Short stature, early loss of ovarian function, infertility, absence of puberty, webbing of the neck, skeletal abnormalities, kidney problems, heart defects

Need for genetic knowledge

If all congenital anomalies are considered as part of the genetic load, then greater than or equal to 79/1,000 live-born individuals have been identified as having one or other genetic disorder before approximately age 25 years.[12] Thus, to understand the fundamental biological makeup of the organism, For better understanding of the disease process, For actual prevention of the disorder and for the effective disease treatment. Hence *Ayurveda* advised cleansing of the male and female body before planning to have a child and to take rejuvenation therapy to restore health which prevents the appearance of genetic disorder. Keeping *Ayurvedic* principles in view, the couple should be instructed beginning from the Vivaha, followed by *Garbhadhana* upto to the *Prasava*. Genetic counselling may aid at different levels of formation of *Prakriti. Atulyagotriya vivaha*, and appropriate age for marriage. Counselling to avoid Consanguineous marriage. Counselling to consume healthy diet *Shadrasa yukta Ahara* for the proper Growth of the foetus which will determine Maaturahara vihara prakruti. Following specific *Garbhini Charya* for each month for healthy growth and development of the foetus.

CONCLUSION

Ayurveda has the fundamental knowledge on genetics much before modern geneticists. Though *Ayurveda* does not implicate the pure and literary of genetics in much details but has taken up its applied aspect scientifically. Thus, the concept of *Beeja*, *Beejabhaga* and *Beejabhagavayava* is a highly evolved concept of genetics representing even the minutest entity of genetics of contemporary science. *Beejabhaga* and *Beejabhagavyava* is nothing but the genetic material found in the nucleus of cells in the form of chromosomes on which genes lie. *Beejabhaga* and *Beejabhagavyava Dusti* indicates the scientific knowledge of *Acharya* regarding genetic material and diseases arising due to them. They also know that the role of environmental and dietary factors in causing variation in genes i.e gene mutation.

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