



## **Ancient Overview of Modern Genetics as Per Ayurveda: A Review**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. 'All authors read and approved the final manuscript.*

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### **ABSTRACT**

The human genome studies reveal that most of the diseases have a genetic component. Genetic mutation occurs either randomly or due to an environmental factor. Genetic disorders may or may not be hereditary. WHO data illustrate that the congenital anomalies are the reason for 17%–43% of infant mortality. If parent's genetic configuration is vulnerable to some diseases, their children and grandchildren are more susceptible to such illness. This suggests that their genes or chromosomes possess aberrant changes and are carried over into next generation and results in congenital or hereditary diseases. Ancient ayurvedic acharyas had the idea that the genetic materials are transmitted from generation to generation. The expression of these can be understood with regard to prakriti. An individual's unique physical characteristics and psychic behaviors (phenotype) depends on the prakriti. Genetics emerged in mid to late 19th Century. But centuries before itself, ancient Ayurvedic literature documented the union of sukra and shonita, concept of beeja, beejabhaga and beejabhagavayava, inheritance, congenital anomalies, and genetic disorders. Ayurveda also gave importance to personalized or individualized concepts of understanding and treating diseases. Ayurvedic concepts like garbhasambhavasamagri (factors necessary for formation of garbha) and garbhotpadaka bhava (six procreating factors), dinacharya, ritucharya, sadvritha, dharaneeya, adharaneeyavega, ritumaticharya, & garbhinicharya assures the

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regulation of gene sequencing and gene expression and thus can-do wonders to the challenging issues.

**Keywords:** *Beeja; beejabhaga; beejabhagavayava; garbhasambhavasamagri; genetics; anuvamaki sidhantha; beejopataptata; garbhopaghatakarabhava.*

## 1. INTRODUCTION

Genomics, the emerging branch of medicine fetches a tremendous change in the concept of understanding and treatment of diseases. The genetic material is transferred from parent to next generation and these materials control and modify the cell function. Understanding the concept of the genome helps to apply this knowledge in a personalized approach from pre womb to tomb. So, the genome sequence promises early actionable interventions, individualized response, individualized treatment, minimal side effects, and maximal effectiveness. WHO global report on traditional and complementary medicine 2019 points out that; there are considerable opportunities in preventive and personalized health in traditional and complementary medicine [1].

Human genome studies reveal that most diseases have a genetic component. Some diseases are caused by acquired mutations in a gene or group of genes that happen in a life time, like working with radioactive elements etc. It also occurs as a result of tobacco smoking, alcohol consumption, environmental pollutants, and psychological stress. Mutations are the main cause of hereditary diseases and these hereditary disorders are transmitted to offspring from their parents through the genes. Congenital anomalies can be inherited or caused by a prenatal environmental factor. "According to the WHO data, 17%–43% of infant mortality was attributed to congenital anomalies". EUROCAT data (2005–2009) show terminations of pregnancy for congenital anomaly were almost three times more frequent than infant deaths and stillbirths with congenital anomaly combined. Similarly, findings from the Global Burden of Disease Study 2017 suggest that globally the total burdens of disability increased by 52% between 1990 & 2017.

## 2. INDIVIDUALITY OF AYURVEDA

Ancient ayurvedic acharyas focused on the diseases from a personalized aspect. Susrutacharya who is believed to live in the period between 1200 BC - 600 BC defined health as a state of equilibrium of tridosha (somatic

humor), agni and dhatu, well excretion of mala and the atma, indriya, manas being in a state of bliss. This definition itself is pointing to the personalized aspects of medicine. The unique concept of prakriti which is the phenotype of distinctive genetic codes further explains this concept. The prakriti decides the sahabala(natural immunity) which determines whether an individual is more prone to a disease or not.

Genetics emerged in Mid to Late 19th Century. But centuries before itself, the formation of garbha, role and transmission of inherited factors, different congenital anomalies, hereditary and genetic disorders are well acknowledged by ayurvedic acharya. Beeja, beejabhaga, and beejabhagavayava are the unique concepts through which the genetic materials are transmitted from generation to generation. Garbhotpadaka chaturbhava (which include ritu, kshetra, ambu and beeja) and shadbhava (six procreating factors) have a significant role in preventing birth defects and genetic disorders. Dinacharya(daily routine), ritucharya(seasonal regimens), sadvritha(code of conduct), dharaneeya and adharaneeyavega (suppressible& non suppressible urges), ritumatcharya (rituals which prepares a female physically and mentally for conception), and garbhincharya (antenatal care) help to keep the dosha in equilibrium and thereby regulate gene sequencing and gene expression.

## 3. THE CONCEPT OF BEEJA, BEEJABHAGA AND BEEJABHAGAVAYAVA

The set of functional units representing the structures and features of all angapratyanga (parts & subparts) of an individual is known as Beeja [2]. This functional unit is responsible for the transformation of characteristics from parents to offspring and is also responsible for the growth and development. Each species has its characteristic features. Hence human beings and other animals like elephants, horses etc have their distinguishing characteristics [3]. To sustain the uniqueness of a species it is important to have a definite number of chromosomes. So, the chromosome number of a species will be unique

and even the chromosome number of its zygote is also definite.

As per Vaisheshika philosophers, everything in the universe is made up of paramanu of panchamahabhoota and responsible for the formation of various angapratyanga. The samyogaa(union) of the panchamahabhoota by the help of vayu, karma and swabhava leads to the formation of various angapratyanga [4].

If we look into the history of the evaluation, we can understand that variation and heredity place an important role. Variation explains the uniqueness of an individual and heredity tells how these are transmitted to generation. Variation helps to adapt a person to present circumstances in a certain phase of time and is carried to the next generations. Hence, two kids of the same couple possess similarities as well as the uniqueness of character. This is due to three factors like beeja, beejabhaga, and beejabhagavayava possessing all the functional units signifying the structures and features of all the anapratyanga in the body. Through these, the characteristic of a parent is being transmitted to their offspring. This mechanism of transmission is known as Anuvamsaki.

Acharyas explained beeja, beejabhaga and beejabhagaavayava with the help of certain diseases. When beejabhaga in the ovum of the mother which is responsible for the production of garbhashaya excessively vitiated then she gives birth to a vandy (sterile child). When the beejabhagavayava available in the ovum of the mother is responsible for the production of uterus is excessively vitiated then she gives birth to puthipraja (who delivers a dead foetus). When the beejabhagavayava which is responsible for the production of garbhashaya and also the portion of beeja which is responsible for the production of organs that characterize a female in the ovum of the mother get excessively vitiated then she gives birth to a child who is not a complete female but only having feminine characteristics in abundance. This kind of child is known as Varta. Beejabhaga is vitiated in antarmukhi and Suchimukhi Yonivyapath and results in defects of garbhashaya of the foetus. As there is upataptavasta(vitiation) of beeja in Vamini yonivyapath, the product of conception is eliminated. In Putraghni yonivyapad, there will be repeated abortion. Shanti is a condition where there are upahataasaya due to garbhashayadosha. Napumsaka occurs due to

defects in beejabhaga and beejabhagavayava. Klaibya also occurs due to beejadosh.

The male and the female genital system develop from the mesonephric duct and paramesonephric duct respectively. Studies show 0.001 to 10% of prevalence of defect in the fusion of Mullerian duct. Average 8-10% of women with congenital uterine anomalies affect fertility and some other researches show that women can conceive but difficult to sustain normal pregnancy [5-6]. In 44 XY ambiguous woman - have external genitalia female but chromosomal constitution and reproductive organ of a male [7]. In the case of Turner's syndrome, sex chromosome X0 has female genitalia and Klinefelters syndrome with XXY with male genitalia, sex organs do not mature at puberty [8]. All these points towards the beejabhaga and beejabhagavayavadushti.

#### **4. KARMAJAVYADI (DISEASES BASED ON DEEDS) [9]**

Susrutacharya, has explained another classification of disease as karmajavyadhi. When the person indulges in wrong activities, the guilty or negative feeling may even influence the gametogenesis which may be carried into the next generation. So based on dharmadharma(good and bad deeds) we do, the genetic information is stored in the gamete. He also advised doing good deeds to reduce the effect of karmaphala (result of deeds).

Adibalapravritta diseases are groups of illnesses that attribute defects inherent in either the Shukra or Shonita. Prameha, arsha, sthaoulya, Ashtananditha purusha, jatyaandha and kushta may occur due to the vitiation of beeja, hence they are categorized under adibalapravritta vyadhi's [10]. The inauspicious action of a couple in their previous life is one of the major causes for foetal abnormalities [11]. Here comes the role of daivavyapasrayachikitsa which reduces the severity of karmaphala [12].

Different terms are used to denote genetic diseases in different treatises of Ayurveda. Vaghbata uses the term Sahaja/ Kulodbhava. Susruta uses Adibalapravritta and Charaka uses kulaja.

#### **5. FACTORS RESPONSIBLE FOR BEEJOPATAPTATA**

Doshaprakopa is the major reason for upatapta of beeja [13]. Indulging in apathyaharavihara will ultimately affect the doshas only.

Manasikavastha (mental status) of both parents at the time of conception is highlighted to get desired progeny. The negative behaviors decrease the release of neurotransmitters favoring the development. The negative emotions release neurochemicals that strain and damage organs [14].

Susrutacharya clearly says that the characteristics of an offspring can be understood from the thoughts and deeds of the mother during pregnancy. During pregnancy there will be certain physical, biochemical, hormonal, psychological changes expressed in terms of pregnancy longings or needs. The non-fulfillment of her longings leads to aggravation of vata, which may result in developmental anomalies like kubja(dwarf), kuni(distorted arm), pangu(lame/distorted legs), muka(dumb), minmina(nasal voice).

**Garbhopaghatakarabhava:** Ayurveda advise pregnant women to have some precautions concerning diet and activities. She is advised to avoid factors that produce physical and mental strain like excessive exercise, pungent materials, harsh or violent activities etc. Such physical strain may disfigure the placental formation and affect the nutritional flow through minute channels. The risk for Sudden Infant Death Syndrome (SIDS) increases due to prenatal exposure to smoking and alcohol [15].

## 6. FACTORS OVERCOMES THE BEEJOP-ATHAPHTATAHA

### 6.1 Ritumatcharya and Garbhinicharya

From the first day of the menstruation onwards a lady should follow do's and don'ts like avoiding sleeping at day etc. This helps to regulate the tridosha. Garbhinicharya ensures the non-exposure of toxins, chemicals, dosha provoking aharavihara and ensures proper growth and development of the foetus. The aggravated dosha can affect her reproductive system and oogenesis which in turn will affect the foetus when she is conceived.

### 6.2 Masanumasika Pathyakrama (month-wise dietary regimens)

Healthy diet should be taken in a proper time and manner. This keeps the tridosha in normalcy. Month-wise diets and regimens are explained for the pregnant ladies. Following such diets ensure proper nourishment, thereby avoiding IUGR.

### 6.3 Garbhastapana Drugs

Counteract the harmful effects of certain factors (garbhopaghatakara bhava) and maintain proper development of the foetus. It also prevents unwanted abortions.

In gametogenesis, there is the possibility of DNA damage. DNA repair is an additional quality of mammalian cells. It identifies the damaged DNA and corrects the DNA molecule encoding its genome. Formation of polar bodies acts as a natural mechanism to keep up the healthy chromosomes. So Acharyas highlighted ritumatcharya and pre-conceptual measures to accelerate

### 6.4 Proper Age

Acharyas told the proper age for conception. Studies reveal that advanced maternal age is the cause of the chromosomal abnormality. A higher frequency of gestational diabetes, chronic hypertension, oligohydramnios, polyhydramnios etc are observed in advanced maternal age [16]. In aging fathers Spermatozoa can also be more prone to chromosomal aneuploidy [17]. They are also prone to disorders like achondroplasia, autism [18], schizophrenia, and bipolar disorders.

### 6.5 Athulyagotriya

Charakacharya advice to avoid marriage from the same family. Studies show that marriage between sibling's results in congenital anomalies [19] and creates more risk for autosomal recessive disorders due to the inheritance of autosomal recessive gene mutations from a common ancestor [20].

## 7. EXPRESSION

The concept of beeja, beejabhaga and beejabhagavayava gives an idea of the genotype of an individual. Its expression (phenotype) can be understood from the Prakriti level. Prakriti remain unchangeable till death Ayurveda considers every individual as unique. This simply exposes the genetic components in an individual. As per genetics, every individual is created out of a unique set of genetic polymorphisms. He will be influenced by epigenetic factors. Prakriti can be considered as the phenotype which is determined by certain genotype. Thus, Ayurveda contributes to personalized aspects of medicine. Prakriti can get influenced by desa(place), vaya(age) etc. Researches show that several lifestyle factors diet, exercise, physical activity, environmental pollutants, psychological stress

etc can modify the expression of genes. Studies also observed a reasonable correlation between HLA gene type and Prakriti type [21].

Gene editing is a revolutionary method in which programmable RNA targets specific locations in the genome. In Ayurveda instead of gene editing, through the unique concepts of dinacharya, ritucharya, sadvrittha and maturaharavidhi, gene formation and gene expression can be controlled before and after birth respectively.

## 8. CONCLUSION

The factors which are explained as the causative factor for beejopataptata can be considered as epigenetic factors. Every cell in the human body will be having the same DNA. But the cell type and function will differ due to the expression and non-expression of certain genes (gene on and off mechanism) [22]. These epigenetic factors influence the expression of genes and thereby affect transcription, translation of genes. The epigenetic factors are modifiable. Those factors that vitiate the dosha in turn causes the uptaptavastha of Beeja Hence one should follow the hitahara vihara, avoid the pranjaparadha and indulge in good deeds. By following pre conceptive measures, garbhinicharya, garbhashtapakadravya one can attain a good progeny. If a couple follows proper dinacharya, ritucharya, pathyahasavihara, sadvrittha, ritumaticharya, proper age, athulyagotra and garbhotpadakachaturbhava in its optimum form, then definitely they will be able to produce supraja.

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## CONSENT

It's not applicable.

## ETHICAL APPROVAL

It's not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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