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Critical Evaluation of Concept of Genetics in Ayurveda WSR to Eight Undesired Body Types (*Ashta Nindit*)

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Abstract

Ayurveda is an ancient medical science of India. The roots of many concepts of modern medicine are deep seated in Ayurveda. Genetics is one such concept which has its roots in Ayurveda. The word 'Gene' probably have developed from the word 'Genesis' which in turn might have evolved from the Sanskrit word 'Janana' which literally means to produce medicine. Ayurveda also says that as per the maternal and paternal genetic influence during embryogenesis, organs with maternal and paternal make up shapes up. Ayurveda is of the view that during this process of embryogenesis, if any part of the Beeja (zygote) gets affected, then the genetic abnormality of that part is noticed in later life. Prakriti (Typical body types) is one such concept which is genetically determined during the process of embryogenesis. In Ayurveda, hereditary disorders are referred to as "Adibala Pravrutta Vikara". The eight undesired body types, mentioned in Ayurveda such as Ati Deergha (Long stature), Ati Hrasva (Short stature), Ati Sthula (Hereditary obesity), Ati Krusha (Hereditary leanness), Ati Gaura (Hereditary Albinism), Ati Krushna (Hereditary Hypermelanosis), Ati Loma (Hereditary Hypertrichosis), A Loma (Hereditary Hypotrichosis) may be categorized under Adibala Pravrutta Vikaras. (Hereditary Diseases). The present study aims to study the concept of eight undesired body types with respect to their genetic inheritance in the light of modern medical advances in genetics. It is observed and concluded that the concept of genetics is very well mentioned in Ayurveda and the eight undesired body types have genetic predisposition.

Keywords: Genetics; *Sahaj; Prakriti; Ashta Nindit*

Introduction

As per Ayurveda the smallest unit of the body is the *Parmanu (atom)* which refers to the modern concept of cell. As per Ayurveda, after sexual intercourse, the *parmanu swarupa (atomic) Shukra Beeja (sperm)* and Stree Beeja (ovum) unite to give rise to the Sanyukta Beeja which is referred as zygote in modern science. As per Ayurveda, during the process of embryogenesis, if any part of the Beeja (zygote) gets affected, then the genetic abnormality of that part is noticed in later life. According to Ayurveda, individual body constitution is genetically determined. As per Ayurveda, body power (Sahaj Bala) and natural immunity (Sahaj Vyadhikshamatva) is also genetically determined. In Ayurveda, hereditary disorders are referred as "Adibala Pravrutta Vikara or Sahaj Vikara". The list of genetic diseases given in Ayurveda includes Sahaj Prameha (Hereditary Diabetes), Hereditary obesity (Sahaj Sthaulya), Sahaj Arsha (Piles), Sahaj Klaibya (Impotency), Sahaj Kushtha (leukoderma), (Garbha Prastravati (Hereditary tendency for habitual abortion), Ati Hrasva (Dwarfism), Ati Deergha (Giantism), *Ati Sthula* (Hereditary obesity), Ati Krusha (Hereditary leanness), Ati Gaura (Hereditary Albinism), Ati Loma (Hereditary Hypertrichosis), A Loma (Hereditary Hypotrichosis). The association of eight undesired body types mentioned in Ayurveda and modern genetic disorders is traced and studied critically in present study.

Materials and Methods

Literary descriptive method of research is adopted in the present study. Critical study of Ayurvedic literature is done to come to logical conclusions.

Review of Literature

Hereditary/Genetic Disorders

In Ayurveda

In Ayurveda, hereditary disorders are referred to as "Adibala Pravrutta Vikara or *Sahaj Vikara*" (Diseases passed down from

gametes of parents). And are mentioned as follows:

Causes of Hereditary Disorders as Per Ayurveda [1]

- *Shukra Doshanwaya*: Spermatic genetic defects
- *Shonit Doshanwaya:* Ovular genetic defects

Classification of Heriditary Disorders as Per Ayurveda [2]

- *Matruja*: Maternal / X linked
- *Pitruja*: Paternal / Y linked

Eight Undesired Body Types in Ayurveda [3]

- *Ati Hrasva (*Hereditary Dwarfism)
- *Ati Deergha* (Hereditary Giantism)
- *Ati Sthula*(Hereditary obesity)
- *Ati Krusha* (Hereditary leanness)
- *Ati Gaura*(Hereditary Albinism)
- *Ati Loma*(Hereditary Hypertrichosis)
- *A Loma* (Hereditary Hypotrichosis)
- *Ati Krishna* (Hereditary Hypermelanosis)

Ati Sthula (Hereditary obesity)

It can be classified as monogenic, polygenic, or syndromic

Monogenetic Obesity: It is due to mutations in the leptin signalling pathways causing suppression of anorexigenic pathways and activation of orexigenic pathways. It may be autosomal recessive or dominant.

Polygenic Obesity: 60% of the inherited obesity is polygenic. It is associated with the mutations in the gene CYP27A1, TFAP2B, PARK2, IFNGR1, UCP 2 & 3 which codes for uncoupling of proteins in brown adipose tissue.

Syndromic obesity: It may be caused by chromosomal rearrangements like Prader Willi Syndrome, WAGR Syndrome, Bardet Biedl Syndrome, or mutation syndrome like Alstrom syndrome, Carpenter Syndrome, Cohen Syndrome. Ati Krisha (Hereditary Leanness) Genes called FTO, IRS1 and SPRY2 were associated with hereditary leanness. Variation in IRS1 gene was also found to be associated with heart diseases.

Ati Deergha (Giagantism & Acromegaly)

It is characterized by excessive growth and height above average. The height may exceed 7 to 9 feet. It results from overproduction of growth hormones before the fusion of the growth plates. Pre pubertal excessive production of growth hormones leads to gigantism while post pubertal excessive production of growth hormones leads to acromegaly [4].

Causes

Adenomas of Pituitary gland causing secretion of growth hormone releasing hormone (GHRH). Marfan Syndrome

Diagnosis

a. **For Acromegaly:** Increase in Growth Hormone level > 20 ng/ml is diagnostic.

b. **For Marfan Syndrome:** Clinical and genetic testing

Marfan Syndrome is an autosomal dominant multi systemic genetic disorder caused by mutation in FBN1 gene that makes fibrillin resulting in connective tissue disorder. In 75% cases, it is inherited from the parent with the condition whereas in 25% cases, it is a new mutation. Individuals with Marfan Syndrome are usually tall and slender. They have elongated fingers and toes (arachnodactyly), loose joints and arms that exceed their body height. They have long and narrow faces, abnormal curvature of the spine, sunken or protruding chest. They have exceptional flexible joints. They have risk of developing mitral prolapse and aortic aneurysm. This syndrome varies in onset and rate of progression.

Ati Hrasva (Dwarfism / short Stature)

In humans height less than 147 cm (4 ft 10 in) regardless of sex is considered as short stature. Types:

a. **Disproportionate dwarfism**: It is characterized with either short limbs or short torso

b. **Proportionate dwarfism:** It is characterized by short limbs and short torsos. However, their intelligence and lifespan are normal.

Causes

- **Achondroplasia (in 70% cases)**: It is the mutation in the fibroblast growth factor receptor 3. The mutation causes inhibition of bone growth. It is a defect from the paternal side.
- **Growth Hormone deficiency**: It may be due to damage to pituitary gland, poor nutrition, or stress.
- **Other causes**: They may include Turner's syndrome (only girls affected), congenital dysplasia, hypothyroidism, hypogonadism, and malnutrition.

Diagnosis

- Measurement (Praman Pariksha)
- Family history
- **Genetic Test**: Chromosome 4 analysis for Achondroplasia. In the case of Turner's syndrome, X chromosome is extracted from blood cells for study.
- **Hormonal test**: For growth hormone evaluation, Biochemistry, pituitary evaluation thyroid and testosterone

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levels.

- **Imaging:** Bone X-rays for diagnosing specific skeletal dysplasia

Ati Loma (Hypertrichosis) Hypertrichosis

It is an abnormal amount of growth hair over the body. Types:

a. **Generalized**: Growth of hair all over the body.

b. **Localized**: Growth of hair localized to some part of the body.

Causes:

- **Congenital:** It is caused by genetic mutation and present by birth.
- **Acquired:** Minoxidil treatment for hypertension, anticonvulsant phenytoin, antibiotic streptomycin, diuretic acetazolamide etc.
- **Hirsutism:** It is the type of hypertrichosis where excessive growth of body hairs occurs in women and children on parts of the body where hair is normally absent or minimal. It is also congenital and acquired. It is due to the excessive secretion of male hormone called Androgen in females. It is characterized by a masculine body, deepening voice, moustache, irregular menses etc.

Causes

- Congenital
- Acquired - Androgen secreting adrenal or Ovarian tumour, Adrenal hyperplasia

Diagnosis

- Hormonal evaluation - Androgen level

A-Loma (Hypotrichosis)

a. This can exist in following types:

b. **Male pattern hair loss**: In this pattern hair loss occurs at temples and crown. Genetic and hormonal (testosterone) causes are responsible.

c. **Female pattern hair loss**: In this pattern hair loss occurs at frontal and parietal area. The cause is not clear.

d. **Alopecia areata**: In this pattern hair loss occurs at eyebrows, backside of the head. It is autoimmune.

e. **Telogen effluvium**: It is due to psychological stressful event. It is common after pregnancy.

f. **Other causes of hair loss**: Fungal infection, drugs (chemotherapy), trauma, pregnancy.

Ati Gaur (Albinism)

A defect in one or several genes that produce melanin leads to albinism. The defect may result in absence or reduced production of melanin. The defective gene passes from both the parents. Children of parents affected with albinism are at increased risk of suffering from it. People with albinism have absence of colour in their skin and hair and eyes. Many at times it is associated with ocular problems like strabismus, photophobia, nystagmus, astigmatism, or impaired vision.

Ati Krishna (Hypermelanosis/ Hyperpigmentation)

Congenital diffuse hyperpigmentation may be inherited as autosomal dominant pattern. Alterations in genes controlling the pigmentation may occur in such individuals. Pigmentation of the skin normally varies as per racial origin and the amount of sun exposure. The melanocytes of the dark-skinned peoples produce more melanin than those of people with light skin. The melaninization process in dark skin is protective against the sun but it is less protective in white skin peoples. Some races like Africans have dark pigmented skin due to hot tropical region. In India also regional differences are seen in colour variation. Northern Indian are little fair whereas southern are mostly dark pigmented. Generalized hyperpigmentation may rarely arise from excessive circulating melanocyte stimulating hormone (MSH).

Applied Aspect of Ashtanindita as Per Ayurveda

As per Ayurveda, the disproportionate person is devoid of physical strength, luster, happiness. Life expectancy is also low in such individuals [5].

Discussion

As per Ayurveda, the individual body constitution (Prakriti) is genetically determined as per the intermixing of genetic material of sperm and ovum. The undesired body types may be inherited in some individuals. Ayurveda had described eight such undesired body types such as Ati Deergha (Long Stature), Ati Hrasva (Short stature), Ati Sthula (Hereditary obesity), Ati Krusha (Hereditary leanness), Ati Gaura (Hereditary Albinism), Ati Krushna (Hereditary Hypermelanosis), Ati Loma (Hereditary Hypertrichosis), A Loma (Hereditary Hypotrichosis). Although the genetic predilection of only Obesity is mentioned in Ayurveda, the genetic basis of the other seven conditions can very well be understood from modern studies. Although these conditions have secondary causes also but here their genetic basis of inheritance will be discussed. In Hereditary obesity (Ati Sthula), Monogenetic Obesity results due to mutations in the leptin signalling pathways. Polygenic Obesity is associated with the mutations in the gene CYP27A1, TFAP2B, PARK2, IFNGR1, UCP 2 & 3.

Syndromic obesity may be caused by chromosomal rearrangements. Hereditary leanness (Ati Krusha) may result from genes called FTO, IRS1 and SPRY2. Long stature (Ati Deergha) may occur in Marfan Syndrome which is an autosomal dominant multi systemic genetic disorder caused by mutation in FBN1 gene that makes fibrillin resulting in connective tissue disorder.

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In 75% cases, it is inherited from the parent with the condition whereas in 25% cases, it is a new mutation. Achondroplasia is the cause for short stature (Ati Hrasva) in 70% cases. It is the mutation in the fibroblast growth factor receptor 3. The mutation causes inhibition of bone growth. It is a defect from paternal side. Congenital hypertrichosis (Ati loma) is caused by genetic mutation and present by birth. For male pattern hypotrichosis (A loma), genetic and hormonal (testosterone) causes are responsible. In this pattern hair loss occurs at temples and crowns. A defect in one or several genes that produce melanin leads to albinism (Ati Gaura). The defective gene passes from both the parents. Congenital diffuse hyperpigmentation (Ati Krishna) may be inherited as autosomal dominant pattern.

Conclusion

Eight undesired body types (*Ashta Nindita*) mentioned in Ayurveda, have genetic basis of inheritance. They may be categorized under Hereditary Diseases (*Adibala Pravrutta Vikaras*). The concept of genetics and genetic disorders is very well documented in Ayurveda.

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