IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ROOT OF GENETIC IN SAMHITA- A REVIEW

[1] Dr. Dinesh H. Dumadiya, [2]Dr. Darshna H. Pandya

[1] Ph.D. Scholar, [2] Associate Professor,
[1]Roga Nidana evam Vikriti Vigyana,
[1]Institute of Teaching and Research in Ayurveda, Jamnagar, India

Abstract: According to Ayurveda any substance which is not visible can be precepted through inference. The disease run in family is manifested in child and abnormal organ is developed that leads to develop concept of *Beeja, Beejabhaga* and *Beejabhaga Avayava* and root of genetics is implanted. *Brihatriya* and *Laghutriya* is searched critically for evidence of genetic in classic and help of latest book of contemptory science. *Acharya* suggested that one should avoid consanguineous marriage (*Atulya Gotriya*) for prevention of many recessive genetic disorders. As age is increased quality of uterine health decreases hence late marriage are not appreciated even today era late marriage leads to many chromosomal disorders like down syndrome. *Beeja, Beejabhaga and Beejabhaga Avayava* can be understood as nucleus of sperm/ovum, Chromosome and gene respectively. As an example of various Ayurvedic disease are given which can now correlated with chromosomal and genetic disorder. *Janma Prakruti* which cannot be changed and *Deha Prakriti* which is changed over a period of time can be correlated with genotype and phenotype respectively. Many diseases given with name of *Sahaj, Kulaj, Kulodbhava* are clear indication towards hereditary diseases. All above fact suggest that ancient Acharya was very much aware about gene, chromosome and hereditary disorder but as this disorder are incurable primary description only available and its prevention aspect are strongly recommended.

Index Terms - Genetic, *Sahaj Vikara*, Hereditary disease, *Beeja Dusti, Kulaj Vyadhi*

Introduction

According to science of life (ayurveda) visible is limited and which is not visible is more[i]. There are various reasons for its invisibility. subtleness (*Shaukshmya*) is one among those[ii]. Any substance which is not visible can be precepted with the help of inferences[iii]. Here nuclease, chromosome and gene are not directly visible because of its minuscule. So, their presence can be inferenced when disease being run in family is manifested in child or abnormal organ is developed. The concept of genetics was in existence since the time of ancient Aacharyas. They referred to *Kulaja*[iv], *Kulodbhva*[v], *Sahaj Vikara*[vi] while referring to hereditary disease. This can now be studied in light of genetic. So, root of genetic are already there in ayurveda and cited at various places in all classical text of Ayurveda.

The word genetics is derived from the Ancient Greek word meaning 'genitive', 'generative' or 'origin'.[vii] A gene is a discrete genomic region whose transcription is regulated by one or more promoters and distal regulatory elements that contains the information about synthesis of functional proteins or non-coding RNAs, related by the sharing of a portion of genetic information at the level of the ultimate products (proteins or RNAs).[viii] Each gene occupies a certain location on a chromosome. Genetics is the study of heredity. Genomics is defined as the study of genes and their functions, and related techniques[ix].

The difference between non-living and living entities is the absence or presence of deoxyribonucleic (DNA) respectively. In the living species, the difference between them is in the order of the bases (adenine–thymine, guanine–cytosine) in the DNA. All nucleated cells contain DNA. The combination of DNA creates genes. It is estimated that humans have approximately 20,000 genes. Approximately (~400) 2% of these are coded genes that express themselves and known as the genotype. The part of the genetic makeup that determines specific characteristics of an individual. It is stable and non-changing unless there is toxic damage. The genotype is responsible for the development of the phenotype of the individual. The phenotype refers to the physical properties of an individual appearance, development, and behaviour Whatever one does in own life

knowingly or unknowingly affects the phenotype and notable expression changes can affect next progeny called genetic disorder.[x]

For better understanding genetic diseases are classified in four types i.e. a) Chromosomal abnormality b) Single gene defect c) Multifactorial and d) Mitochondrial. Single gene defect is of two types 1) Dominant (Autosomal and x linked i.e., Huntington's disease and Marfan syndrome) and 2) recessive (Autosomal and x linked i.e., cystic fibrosis, sickle cell anaemia Thalassemia and haemophilia A).[xi]

On the basis of disease manifestation time these can again categorised as A) Presented at the time of birth e.g. Down syndrome and B) Act as predisposing factor and disease occur at its time with even little indulgence of causative factor like manifestation of type 2 DM with positive family history.

If one goes through classical Avurvedic texts and try to find about roots of genetic; some interesting concepts can be explored. These are I. Non-consanguine marriage (*Atulya Gotriya*). II. Maternal age and genetic disorder III. Phenotypes presentation of genomes (Constitution- *Prakriti*). IV. Description about *Beeja, Beejabhaga, Beejabhaga Avayava*. V. Hereditary disease (*Sahaja Vyadhi*).

I. Non-consanguine marriage

Out of total 8 chapter of 4th section of Charaka Samhita one separate chapter is given for non-consanguineous marriages. Since ancient time it was very strict and clear about one should not get married within same *Gotra* (Paternal lineage from common ancestor)

Single gene defect is of two types 1) Dominant (Autosomal and x linked) and 2) recessive (Autosomal and x linked). In dominant disease one faulty copy of gene either maternal or paternal side can produce genetic disease in progeny whereas in recessive genetic disorder produced when both the copy of gene either maternal and paternal are faulty then and only disease produced[xii]

Same *Gotra* (Paternal lineage from common ancestor) has very much high chance that single same gene defect is found in both maternal and paternal side and that leads to recessive (Autosomal and x linked) disorder in child.

Studies reveals that consanguineous marriages are associated with high risk for congenital malformations and autosomal recessive diseases, with increased postnatal mortality[xiii]

This shows the well knowledge and understanding of genetic disorder in ancient science.

Table 1 common gene proportion in relatives at different degree of relation[xiv]

Relationship type	Relation to each other	Proportion of gene they have in common
-	Identical twins	100%
First degree relatives	Brothers and sisters, non-identical twins,	50%
Second degree relatives	Uncles, Aunts, nephews, nieces and grand parents	25%
Third degree relatives	First cousins, half uncles and aunts, half nephews and nieces	12.5%

II. Maternal Age

Development of potential *Garbhasharir* (healthy child) depends on *Shukrashonita Prakriti* (nature and quantity of sperm and ovum), *Kaalgarbhashaya Prakriti* (the time of conception and status of health of uterus), *Matrujaaharvihar Prakriti* (during pregnancy diet and lifestyle of mother), *Mahabhootvikar Prakriti* (interaction of *Mahabhuta*)[xv]

Consanguineous marriage, age of marriage and conception will determine nature of sperm and ovum. Importance of non-consanguineous marriage is already given in above section.

The ideal age for marriage & child production is 16 years and 25 years for female and male respectively[xvi].

Age should neither less nor much more excess, spontaneous abortion and chromosomal anomaly is related to excess age of paternal. If any of parents is overage then chance of improper development, abortion are high and if it survives by chance then it may suffer with disease. In both conditions progeny will be genetically abnormal.

Modern genetic shows the correlation of advance maternal age and pre deposition of genetic syndromes, especially Down's Syndrome[xvii]

III. *Janma Prakriti* & *Deha Prakriti* (Genotype and Phenotype)

Prakriti is a set of characteristics that an individual develops from the embryological stage as a result of the effect of physiologically normal *Dosha*, which then persists and appears as behaviour throughout one's life. The constitution (*Prakriti*) associated with foetus (*Garbha*) is determined by *Prakriti* of sperm and ovum at the time of conception and status of health of uterus, diet and lifestyle of mother (during pregnancy) and interaction of *Mahabhuta*. Body humors (*Dosha*), one or more predominates in these factors gets attached to the foetus which is called physical or *Doshika* constitution (*Dosha Prakriti*) of human beings which is emerged from the initial stage of foetus.[xviii].

Also, there are three types of *Bala* (Biological strength/ immunity) *Sahja, Kalaja* and *Yuktikrut*[xix]. *Sahaj Bala* is inherited provided by maternal and paternal side as well as another factor which are responsible for *Prakriti*. Some races are protected from specific disease which represent *Sahaj Bala*. *Sahaja Bala* is very much important as this provides excellence protection from disease and healthy progeny. *Kalaja Bala* means gained as per season and age. *Yuktikruta Bala* represent acquired immunity

The *Janma Prakriti* or birth *Prakriti* does not change and is the foundation of the psychophysiological constitution or *Deha Prakriti* (body *Prakriti*) is dynamic which changes with time. The genotype corresponds to Ayurvedic birth *Prakriti* and the phenotype corresponds to Ayurvedic *Deha Prakriti*[xx].

IV. Concept of *Beeja, Beeja Bhaga, Bheejabhaga Avayava*

a) *Beeja* and its vitiation

Beeja means which is very small entity and replicate same here, sperm and ovum are *Beeja* (seeds) for progeny.[xxi] As sperm carry Paternal component (*Pitruaja Bhava*) and ovum carry Maternal component (*Matruja Bhava*) in foetus. Ayurveda has given importance six factors for proper development & growth of foetus. These procreative factors are *Matruja* (maternal), *Pitruja* (paternal), *Satvaja* (psyche), *Satmyaja* (habitual), *Rasaja* (nutritional) & *Atmaja* (soul). *Satmyaja, Rasaja* & *Satvaja* these three again received from parents of the foetus and hence, can be merged in *Matruja* & *Pitrujabhava*[xxii]

If mother and father is suffering from any disease which is potential enough to hamper quality and/or quantity of nucleus in sperm or ovum then it can develop the same disease in child.

It is clearly stated that *Beeja* is responsible for developing whole body and when one part of *Beeje* is vitiated/affected than only that part in child's body becomes diseased[xxiii]. when whole *Beeja* ether sperm or ovum get vitiated fertilisation do not get possible or abortion or still birth may be there. When part of *Beeja* is vitiated, organ which made through that vitiated part of *Beeja* will become abnormal and other part remain unaffected[xxiv]

If part of nuclease which produce female genital organ like uterus and ovary is vitiated than female child birth occur with structural abnormality like congenital malformation of reproductive tract e.g. didelphys (double uterus), arcuate uterus (uterus with a dent on the top part), unicornate uterus (one-sided uterus) etc. and hance such female remains infertile (*Vandhya)* ever[xxv].

Congenital uterine abnormalities result from embryological mal-development of the Mullerian ducts and depending on the degree and stages of Mullerian duct development, the types of Congenital uterine abnormalities vary. If abdominal B (*AbdB*) homeobox genes (*Hoxa9, Hoxa10, Hoxa11* and *Hoxa13*) of the mammalian *Hoxa* cluster that are responsible for differentiation and segmental patterning of the mularian duct go affected/ vitiated which leads to malformation of female genitalis.[xxvi]

When part of male *Beeja* that make male genital organ get vitiated then abnormal testicle or underdeveloped or undescended testicle is developed and male became *Vandhya* (male permanent sterile)[xxvii]

The indifferent gonad differentiates to testes under influence of the SRY gene on the Y chromosome, which encodes testis-determining factor. Defect or abnormality in gene leads to scrotal agenesis, hypoplasia, ectopia, or haemangioma; penoscrotal transposition; and bifid scrotum leads to male permanent infertile.[xxviii]

b) *Beejabhaga* and its vitiation

Beejabhaga means part of nucleus in sperm and ovum which can be correlated with chromosomes. Chromosome is single molecule of DNA (which contain many genes, regulatory elements, nucleotide sequence) and DNA binding protein

The human genome is divided into 23 different chromosomes, including 22 autosomes (numbered 1-22) and the X and Y sex chromosomes. Adult cells are diploid, meaning they contain two homologous sets of 22 autosomes and a pair of sex chromosomes. Females have two X chromosomes (XX), whereas males have one X and one Y chromosome (XY)[xxix]

If *Beejabhaga* is vitiated in either in male and female then *Putipraja* (Still berth or vitiated organ and part of body in live birth) is developed.

Beejabhaga Dusti means different types of chromosomal abnormality. Down's syndrome or trisomy 21. Edward's syndrome or trisomy 18. Patau syndrome or trisomy 13 are chromosomal abnormality which are seen in live birth. Trisomy 16, trisomy 22 and monosomy X (45, X) are common chromosomal abnormality leads to still birth or fatal death[xxx]

c) *Beejabhagavayava* and its vitiation

Beejabhagavayava means part of *Beejabhaga* (chromosomes) which can be correlate with gene.

In female if *Beejabhagavayava* (part of chromosomes which related to female reproductive system) which make female fertile is vitiated then foetus will have appearance of female but actually will not be female called *Varta.*[xxxi] Like turner syndrome (one X chromosome missing) where appearance of female but not complete female e.g. short stature, delayed puberty, ovarian dysgenesis, hypergonadotropic hypogonadism, infertility[xxxii]

Same happen with male when *Beejabhagavayava* of sperm which is responsible for the production of organs that responsible for male gender characteristic is greatly vitiated, then it gives birth to a child who is male by appearance but not having male gender characteristic is known as *Trinaputrika*.[xxxiii] Like Klinefelter syndrome (2 or more X chromosomes) where appearance of male but not complete male e.g. tall stature, small testes, gynecomastia, and azoospermia.[xxxiv]

V. Hereditary disorder (*Sahaj Vyadhi*)

Various word used in Ayurvedic classic like *Sahaj Vyadhi*, *Adibal Pravarita Vyadhi* or *Kulaja Vikara*. Disease run in family from generation to generation is called *Sahaja Vyadhi*, various skin disease (*Kustha*), *Prameha* (Diabetes) etc are common example of such disease.

There are two types of hereditary disorder on the basis of its origin i.e. received from maternal side (*Matruja*) and Paternal side (*Pitruja*).[xxxv]

In fact, it is explained when a pathogenesis of any disease affects *Sukra Dhatus* (Reproductive organ or related components) in either male, female or both) than it will get transferred to next generation. Once such weaker *Dhatu* is manifested to progeny; such victims are more prone to develop concern disease with indulgences of little causative factor. As occur with offspring of obese or type 2 DM patients. This subjects already having insulin resistance and polyphagia and due to this primary condition, they can develop insulin resistance diabetes mallets with little exposure of causative factor.

Further, dietary habit and life style of family member remained almost same. Hence, with such family habits it possible to alteration at epigenetic level[xxxvi]. Continues 2-3 generation passing on alteration at epigenetic level can lead to abnormal status at genetic level and that lead to gene vitiation which responsible for hereditary disease

An inherited medical condition caused by a DNA abnormality is called genetic disease. Since gene are passed from parents to child, change to DNA with in a gene are also passed. DNA change may also happen spontaneously showing up for the first time in Ayurveda such disease is considered as *Kulaja*.

Genetics of each disorder are unique. Mutation in some particular gene cause some specific genetic disorder. In other case different changes within the same gene can lead to different health or developmental problems or even different genetic disorder. Genetic disorder may or may not hereditary but hereditary disorder are always genetic[xxxvii].

This hereditary disease is incurable[xxxviii]

Table 2- Some of hereditary / genetic disease listed in Ayurveda are compared with its modern counterpart

Sr. No.	Ayurvedic term	Modern term
Metabolic Disorder		
1	*Sahaj Madhumeha*[xxxix]	Hereditary Diabetes Mellites
2	*Sahaj Sthaulya*[xl],[xli]	Hereditary obesity
Skin and *Mamsa*		
1	*Sahaj Arsha*[xlii], [xliii]	Hereditary piles
2	*Sahaj Kustha*[xliv]	Hereditary Leukoderma
3	*Sahaj Karnapali Vikar*[xlv]	Hereditary disorder of ear pinna
4	*Jatumani*[xlvi]	Melanocytic naevus
5	*Lachhana*[xlvii]	Strawberry mark
Reproductive related disorder		
1	*Sahaj Klaibya*[xlviii]	Hereditary Impotency
Endocrinal Disorder[xlix] (Genetic disorder)		
1	*Ati Harsva*	Dwarfism
2	*Ati Dirgha*	Giantism

3	*Ati Sthula*	Obesity
4	*Ati Krusha*	Leanness
5	*Ati Gaura*	Albinism
6	*Ati Krushna*	Hyper melanosis
7	*Ati loma*	Hypertrichosis
8	*Aloma*	Hypotrichosis

Conclusion

To prevent genetic disorder consanguineous marriage and consideration of age for marriage and conception are given in classic. Concept of *Sahaja Vikara* as well as description of *Beeja, Beejabhaga, Beejabhaga Avayava* and outcome of its vitiation shows that Ayurvedic classics having concise but stuff explanation regarding gene and genetic sciences available which need to explore in present era.

REFERENCES

[i] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sutrasthana, 11/7 Pg no.69

[ii] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sutrasthana, 11/8 Pg no.69

[iii] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sutrasthana, 11/22 Pg no.71

[iv] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi, 2017, Chikitsasthana, 6/57 Pg no.449

[v] Ashtanga Hridaya Vidyotini commentary edited by Kaviraj Atridev Gupta Chaukhambha Prakashana, Varanasi, 2009, Nidanasthana 10/38-39, pg no. 505

[vi] Ashtanga Hridaya Vidyotini commentary edited by Kaviraj Atridev Gupta Chaukhambha Prakashana, Varanasi, 2009, Sharirsthana 3/77, pg no. 401

[vii] https://medicover-genetics.com/the-origin-of-the-words-gene-genome-and-genetics/ assessed on 30/10/2023

[viii] Pesole G. What is a gene? An updated operational definition. Gene. 2008 Jul 1;417(1-2):1-4. doi: 10.1016/j.gene.2008.03.010. Epub 2008 Mar 26. PMID: 18457927.

[ix] https://www.who.int/news-room/questions-and-answers/item/genomics#:~:text=While%20genetics%20is%20the%20study,their%20functions%2C%20and%20related%20techniques. Assessed on 28/10/2023

[x] Sharma H, Keith Wallace R. Ayurveda and Epigenetics. Medicina (Kaunas). 2020 Dec 11;56(12):687. doi: 10.3390/medicina56120687. PMID: 33322263; PMCID: PMC7763202.

[xi] https://pressbooks.umn.edu/classroompartners/chapter/dominant-and-recessive-genes/ assessed on 21/10/2023

[xii] https://pressbooks.umn.edu/classroompartners/chapter/dominant-and-recessive-genes/ assessed on 21/10/2023

[xiii] Hamamy H. Consanguineous marriages: Preconception consultation in primary health care settings. J Community Genet. 2012 Jul;3(3):185-92. doi: 10.1007/s12687-011-0072-y. Epub 2011 Nov 22. PMID: 22109912; PMCID: PMC3419292.

[xiv] Prescott CA, Kendler KS. Twin Study Design. Alcohol Health Res World. 1995;19(3):200-205. PMID: 31798103; PMCID: PMC6875762.

[xv] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Vimanasthana, 8/95 Pg no. 277

[xvi] Susruta Samhita, Dalhana Commentary, edited by J.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi, reprinted 2017, ShariraSthana 10/59, pg no.382

[xvii] Gaulden ME. Maternal age effect: the enigma of Down syndrome and other trisomic conditions. Mutat Res. 1992 Dec;296(1-2):69-88. doi: 10.1016/0165-1110(92)90033-6. PMID: 1279409.

[xviii] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Vimanasthana, 8/95 Pg no.277

[xix] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 4/4 Pg no.316

[xx] Sharma H, Keith Wallace R. Ayurveda and Epigenetics. Medicina (Kaunas). 2020 Dec 11;56(12):687. doi: 10.3390/medicina56120687. PMID: 33322263; PMCID: PMC7763202.

[xxi] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 3/17 Pg no.315

[xxii]Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 4/4 Pg no.316

[xxiii]Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 3/17 Pg no.315

[xxiv]Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 4/30 Pg no.322

[xxv]Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 4/30 Pg no.322

[xxvi]Mullen RD, Behringer RR. Molecular genetics of Müllerian duct formation, regression and differentiation. Sex Dev. 2014;8(5):281-96. doi: 10.1159/000364935. Epub 2014 Jul 12. PMID: 25033758; PMCID: PMC4378544.

[xxvii]Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 4/31 Pg no.322

[xxviii] Makiyan Z. Studies of gonadal sex differentiation. Organogenesis. 2016 Jan 2;12(1):42-51. doi: 10.1080/15476278.2016.1145318. Epub 2016 Mar 7. PMID: 26950283; PMCID: PMC4882125.

[xxix] Cattanach BM, Beechey CV. Autosomal and X-chromosome imprinting. Dev Suppl. 1990:63-72. PMID: 2090432.

[xxx]https://www.fertilitycenter.com/fertility_cares_blog/pregnancy-losses-are-most-commonly-chromosomally-abnormal. Assessed on 25/10/2023

[xxxi] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 4/31 Pg no.322

[xxxii] Gravholt CH, Viuff MH, Brun S, Stochholm K, Andersen NH. Turner syndrome: mechanisms and management. Nat Rev Endocrinol. 2019 Oct;15(10):601-614. doi: 10.1038/s41574-019-0224-4. Epub 2019 Jun 18. PMID: 31213699.

[xxxiii] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 4/31 Pg no.322

[xxxiv] Los E, Ford GA. Klinefelter Syndrome. 2023 Feb 5. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 29493939.

[xxxv] Susruta Samhita, Dalhana Commentary, edited by J.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi, reprinted 2017, *Sutrasthana* 24/6, pg no.96

[xxxvi] Shankar S, Kumar D, Srivastava RK. Epigenetic modifications by dietary phytochemicals: implications for personalized nutrition. Pharmacol Ther. 2013 Apr;138(1):1-17. doi: 10.1016/j.pharmthera.2012.11.002. Epub 2012 Nov 16. PMID: 23159372; PMCID: PMC4153856.

[xxxvii] Löwy I. How diseases became "genetic". Cien Saude Colet. 2019 Sep 26;24(10):3607-3617. doi: 10.1590/1413-812320182410.19102019. PMID: 31576991.

[xxxviii] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Chikitsasthana, 6/57 Pg no.449

[xxxix] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Chikitsasthana, 6/57 Pg no.449

[xl] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sutrasthana, 21/4 Pg no.116

[xli] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sharirasthana, 3/14 Pg no.313

[xlii] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, chikitsasthana, 14/15 Pg no.502

[xliii] Susruta Samhita, Dalhana Commentary, edited by J.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi, reprinted 2017, Nidanasthana 16/2, pg no 332

[xliv] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sutrasthana, 15/32 Pg no.179

[xlv] Susruta Samhita, Dalhana Commentary, edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi, reprinted 2017, Sutrasthana 15/32, pg no. 53

[xlvi] Ashtanga Hridaya vidyotini commentary edited by Kaviraj Atridev Gupta Chaukhambha Prakashana, Varanasi, 2009, Uttarsthana 31/27 pg no. 889

[xlvii] Ashtanga Hridaya Vidyotini commentary edited by Kaviraj Atridev Gupta Chaukhambha Prakashana, Varanasi, 2009, Utars thana 31/27 pg no. 889

[xlviii] Susruta Samhita, Dalhana Commentary, edited by J.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi, reprinted 2017, *Chikitsasthan* 27/9-15, pg no.403

[xlix] Charaka Samhita, Chakrapani Datt commentary edited by Y.T. *Acharya* Chaukhamba Surbharati Prakashan Varansi,2017, Sutrasthana, 21/3 Pg no.116