Tilak Maharashtra Vidyapeeth

"Efficacy of Raktbasti in the management of Tridoshaj Panduroga W.S.R. to Thalassemia Major"

Dissertation

for

Ayurveda Vidyavachaspati (Ph. D.)

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The Late Vd. P.G. Nanal Department of Ayurveda

Tilak Maharashtra Vidyapeeth

CERTIFICATE

This is to certify that the thesis entitled **Efficacy of Raktbasti in the management of Tridoshaj Panduroga W.S.R. to Thalassemia Major** which is being submitted herewith for the award of degree of Vidyavachaspati (Ph.D.) in The Late Vd. P.G. Nanal Department of Ayurveda of Tilak Maharashtra Vidyapeeth,Pune is a result of original research work completed by **Shri Atul Mafatlal Bhavsar** under my supervision and guidance. To the best of my knowledge and belief, the work incorporated in this thesis has not formed the basis for the award of any degree or other similar title of this or any other Vidyapeeth or examining body upon him.

Research Guide

Vd. B. D. Nandurbarkar

Place :

Date :

DECLARATION

I hereby declare that the thesis entitled **"Efficacy of Raktbasti in the management of Tridoshaj Panduroga W.S.R. to Thalassemia Major"** completed and written by me has not previously been formed as the basis for the award of any degree or other similar title upon me of this or any other Vidyapeeth or examining body.

Research Student

Place :

Date :

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ABSTRACT

Thalassemia is the most common genetic disorder resulting from abnormality of Globin chain. It is the worldwide problem of today's era and until now there is no solution in any medical science. The nature of the disease is genetic. To add a new concept to the disease Thalassemia (Anukta Vyadhi In Ayurveda), an attempt has been made in this study.

On the basis of Charaka's dictum, present study has tried to reveal the etiopathogenesis of Thalassemia. Prakopana of Thalassemia is by means of the Mithyaaharavihara and Asatmyaindriyartha Samyoga of parents. Which will lead to Dushti of Doshas and Dhatus. The vitiated Beejabhagavayava of Rakta Dhatu already presents in the offspring but after manifestation of disease, excess intake of Pitta Prakopaka Ahara leads to Dushti of Tridosha but mainly dushti of Pitta. According to modern review, Thalassemia is a heterogeneous group of genetic disorders of Hb synthesis characterized by a lack or decreased synthesis of globin chain. The thalassemias are classified according to which chain of the globin molecule is affected: in α thalassemia, the production of α globin is deficient, while in β thalassemia the production of β globin is defective. Thalassemia produces a deficiency of α or β globin.

The Raktabasti treatment is selected from the Charak Samhita Siddhisthana Chapter-6 in this thesis as the treatment modality for Thalassemia major. Here, we used Aja Rakta (Goat blood). Goat is the healthiest animal on earth. No other infections or viruses are detected in the goat blood. So it is very safe for use in human body. Goat blood is also available freely and in required quantity from Government or Municipal Slaughter house. Basti is a very effective treatment in Ayurveda. Practically, it is acceptable. Because of the ano-rectal route Aja Rakta dose not mix with human blood directly. So it is free of risks and complications.

The present study was planned with the aims and objectives of evaluating the efficacy of Rakta basti treatment in Thalassemia Major w.s.r. Tridoshaj Pandu. Patients with signs and symptoms as per proforma were selected for clinical study from the OPD and IPD of Govt. Akhandanand Ayurved Hospital, Ahmedabad - Gujarat. Minimum 30 patients for treated and 30 patients for control group were selected with inclusive and exclusive criteria. Patients having Hb 5 gm % to 10 gm %

were selected having general symptoms of the Thalassemia. Any other types of Anemia except Thalassemia Major were excluded. Diagnosis was made on the basis of Vatik, Paitik and Kaphaj clinical signs and symptoms as mentioned in Ayurvedic texts and the signs and symptoms of Thalassemia major described in modern texts. A detail proforma was prepared for the purpose.

The patients were selected randomly and divided into two Groups, namely Trial & Control Group. In trial group, 30 patients were registered in this group, out of which all the patients completed the course. The Patients were administered Raktabasti in Scheduled dose. In control group, 30 patients were registered with modern medical treatment for four weeks and follow up study for three months. By observing clinical improvement in Vatik Paitik, and Kaphaj signs & symptoms among the Tridoshaj Panduroga as well as Thalassemia Major, assessment of the symptoms like Panduta, Krishna nakhtva, Swas, Sunakshikutata, Jwar, Daurbalya and Hrid dravatva. Necessary qualitative and quantitative tests were applied to the observed data. Laboratory investigations were assessed and evaluated before and after treatment. The observations were statistically analyzed and results were represented graphically.

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INTRODUCTION

INDRODUCTION

Generation, existence and destruction are the basic and fundamental laws of universe. In the series of these changes, newer diseases stand in front to all of us. Almighty thought about challenging changes as painful as Thalassemia towards the whole world.

Thalassemia is an inherited blood disorder in which the body is unable to make adequate and proper hemoglobin. Hemoglobin is present in the red cells. Normally red cells survive for 120 days, but in Thalassemia red cell survival is reduced.

Hemoglobin is made from proteins. These proteins consist of alpha and β chains (adult hemoglobin A_2B_2). Normally 2 α and 2 β chains are essential to form hemoglobin. It is important that these two types of chains should be in equal amount for the survival of red cells. Any imbalance in these chains results in reduced red cell survival. In α Thalassemia there is a deficient synthesis of α chains and the manifestations are due to the excessive β chains. While in β Thalassemia β chains are reduced and excess of α chains causes reduced survival. In our country β Thalassemia is very common.

NEED FOR THE PRESENT STUDY :

Over 250 million persons are affected by Thalassemia and allied disorders in the world. Over 1,00,000 Thalassemia Major are born annually around the world. It is estimated that throughout the world there is a "Thalassemia Belt" that includes countries around Mediterranean sea like Italy, Greece, Cyprus, Sardinia and passes through West and Central Asian countries like Turkey, Saudi Arabia, Iran, Afghanistan, Pakistan, India and South East Asian countries like Indonesia, Myanmar & Thailand. Migrants/Descendants from these areas to other parts of world are also at high risk of carrying β Thalassemia trait.

In India the combined carrier rate of β Thalassemia, HbE & Sickle Cell Anemia is 3.9%. i.e.3 crore Indians are Thalassemic carriers and 8000 to 10,000

Thalassemia major are born every year in our country. The prevalence for β Thalassemia carrier state varies 0-17% in different ethnic groups. It is very high among certain communities like Punjabis, Sindhis, Gujaratis, Bengalis, Parsis and Lohanas. However, it has been found up to 15% in Punjabis & Sindhis who have migrated from West Pakistan.

The Pattern shows that it is very high in Northern, Western and Eastern (N.E) parts of India than the Southern part. β Thalassemia Major is more prevalent in Delhi, Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir, Rajasthan, Maharashtra and Gujarat. While E - β Thalassemia (HbE Disease) is highly prevalent in Bihar, Bengal, Orissa, Assam and other North Eastern states.

According to the ICMR study in the year 2009, Gujarat shows second highest rate of mutation seen in thalessemia.

Thus the morbidity and mortality of this disease has aroused a lot of research for its alleviation and cure. Modern medical science started the quest for its genesis in the genes, aided with the recent advances in the molecular biology and genetics, to know the causative genes etc. However, these are, at present still in experimental stages, hence till they become available, approachable, and affordable reality, the palliation of this scourge of mankind named Thalassemia, lies in the basic amenities of blood transfusion and chelation. Hence there is the need to accept and prevent appropriately or manage the associated complications of blood transfusion. Iron overload in different vital organs like heart, liver and kidney is a major cause of death in Thalassemia major. So, it is the need of the society to find out the solution for the disease by the Ayurvedic therapy.

Keeping all these views in mind and cost effective therapy, great hopes are being laid on the Ayurvedi*c* science, which will help to prevent the complication and hazardous effects and act as an adjuvant therapy in Thalassemia. Basti treatment is Vaysthapan, Balya, Brihan and Rasyan. Rakt dhatu is also Jivan means life saver and Ras dhatu is Prinan means Rasayan. So, here we used Raktbasti treatment for Thalassemia major patients. which is an authentic treatment mentioned in Ayurveda, the science that imparts all the knowledge concerned to life. The main aim is being

able to provide guideline for maintenance and promotion of health as well as prevention and treatment of diseases. In other words *Ayurveda* is a science which helps in understanding creative and noncreative aspect of life, happy and unhappy life, congenial and non-congenial for life, life span, and also corporal dimensions. Among the eight different branches of Ayurveda, Kaumarabhritya has been considered as the most important specialty according to Maharshi Kashyapa (Ka.Vi.Sis/10), which covers each aspect of child health care. The field of Kaumarabhritya described in the Kashyapa Samhita starts from Garbhini up to Dhatri (Ka. chi. Dhatrichikitsadhayaya). Hence it shows the potential of Ayurveda that it prevents the diseases of children since conception. Children are the pillars of society; it is the duty of every science to avert them from diseases. Today is the era of advancement. Advancement is seen in each field. It might be media, electronic, science or in day-to-day life i.e. dietary habits and daily routine as well, hence the ultimate effect of all these changes goes toward the problems in coming generation. These changes occur in the field of medical science too. Among them Thalassemia is a new disease for Ayurveda thus it is called as "Anukta Vyadhi in Ayurveda". In our classics, word to word correlation of Thalassemia cannot be found, but we can understand the disease by careful study of its clinical presentation and investigations.

All the pathological conditions cannot be labeled. But they can be understood by Tridoshas Vaishamya, Dhatu Dushti etc, because in Ayurveda, every disease is caused by three Sharirika Doshas and two Manasika Doshas. The diagnosis according to Ayurveda is based on Roga Prakriti, Adhistthan, Samutthana (Ch.Su.18/46)

Keeping the well being of humanity as the chief concern, if the knowledge of two sciences are combined without making much chaos about the purity of science, an effective and successful national programme can be implemented for control of Thalassemia.

The present study is an attempt to analyze the efficacy of Raktbasti (Ch. Si. 6) in the management of Thalassemia. The study has been performed as under with comparison between two groups.

Group A : Raktbasti treatment as per Ayurveda as Treated group

Group B : Blood Transfusion therapy as per Modern medical science as Control group

REVIEW OF PREVIOUS RESEARCH WORK :

Until now only one dissertation has been submitted on Thalassemia and another is ongoing in Jamanagar.

1. Clinical role of indigenous drugs (Amalaki Rasayana and Gomed Bhasma) in Kulaja Pandu (Thalassemia) - A scientific study.
   Scholar – Dr. M.N. Jaiswal

   Dept. of K.B., Shree Ayurveda Mahavidyalaya, Nagpur. (2003)

2. One Ph.D. work is in progress :
   A comparative pharmaco-pharmaceutical clinical study of Gandhakadi Yoga-A and Gandhakadi Yoga- B on Iron overloading condition in Thalassemia due to Raktavikruti.

   Scholar Dr. Joban K. Modha

   Dept. of R.S. & B.K., I.P.G.T., & R.A. Jamnagar.

AIMS AND OBJECTIVES:

To evaluate the efficacy of Raktbasti treatment in Thalassemia Major.

PLAN OF STUDY :

The present study is carried out in following phases –

1) Conceptual study
2) Drug study
3) Clinical study
4) Discussion and Conclusion
5) Summary

CONCEPTUAL STUDY :

In this phase, a critical review of Modern and Ayurvedic literature regarding the subject was carried out. It covers all related information from ancient classics to latest researches and thus it was searched, compiled, criticized systematically.

DRUG STUDY :

In drug study, the detail about Goat blood, its property and utility in human being was analyzed.

CLINICAL STUDY :

- For this phase 30 patients in each group attending the O.P.D. and I.P.D. of Government Akhandanand Ayurved Hospital were registered and were given complete course of the treatment.
- A special research proforma was designed for the present study.
- Clinical trial and their results were recorded in this study.
- A suitable scoring pattern was adopted for the assessment of the clinical trial.

DISCUSSION :

In this chapter, the conceptual part of the study containing literary review of Thalassemia has been discussed. The goat blood under trial is also discussed with the possible mode of action. Observations drawn from the clinical study and the effect of therapy have been analyzed critically.

SUMMARY AND CONCLUSION :

The summarized aspects of all the chapters of the present study have been given in the summary section. The final outcome of the study has been given in the form of conclusion in this section.

Bibliography and the Clinical proforma have been incorporated in the end.

According to the aims and objectives, humble and honest efforts have been made to clarify the subject on the basis of scientific evidences. As per information collected from all academic centers of Ayurveda, no work has been completed so this

was an innovative approach to clinical research in Ayurvedic medical science. It was very difficult to explore all the concepts in the given stipulated time so some lacunas may be there.

CONCEPTUAL STUDY

CONCEPTUAL STUDY

- **Ayurvedic review**

Introduction and Historical Background

Thalassemia is the most common inherited single gene disorder in the world. Scientists and public health officials predict that Thalassemia will become a worldwide issue in the next century. A systematic approach should be implemented for proper analysis of a disease process. The methodology of understanding an unknown disease has been described in Charaka Samhita based on Aptopadesha Pramana. Comprising it they are Prakopana, Yoni, Uthana, Atmana, Adhisthana, Vedana, Samsthana, Sabda, Sparsa, Rupa, Rasa, Gandha, Upadrava, Vridhi, Sthana, Kshaya, Udarka, Nama, Yoga and Pratikararta Pravritti and Nivritti (Ca Vi.4-10).

Through various literatures, appropriate meanings of these terminologies are tried to be defined in accordance with the disease.

The factors by which the imbalance of Doshic status is triggered are discussed under this heading. The prime agent for the change in homeostasis is Ahita Sevana of Ahara or Vihara (A.H.Ni. 1). The causative factor of Thalassemia is either defective gene or deletion of gene that is responsible for the formation of hemoglobin. This genetic abnormality occurs due to mutational changes in maternal or paternal side. The reason for these mutational changes have not been described by the modern science yet. They suggest that the probability of mutation can be increased after exposure to certain chemical, physical or biological factors, migration is also one of them. These factors come under Anuchita Ahara and Vihara, through which the Doshic imbalance of body occurs. The disturbance of these three Doshas by Anuchita Ahara and Vihara in the parents affect the progeny.(Su.Su.2/49) Another reference is available in Astanga Hridaya which states that the Beeja Dushti depend on improper diet pattern of mother and father (Beejataptistu Matripitraapcharatah) or it may be due to Daiva prakopa which leads to Sannipata and diseases originate. (A.h.Ni.7/6, 7)

In Ayurvedic classics, these genetically determined diseases come under Adibalapravritta (Su.Ni5, 32, 33), Kulaja Vyadhi (Ch.Chi.6,A.H.Ni.7/6, 7) and Prognosis of these Kulaja Vyadhi is said to be Asadhya in nature (A.h.Ni.7/6,7).

Moolakarana of Thalassemia is Beeja Dushti. Here Beeja denotes Shukra and Shonita (Chakrapani Ch. Sha. 3/17).The seeds of Shukra and Artava have chromosomes with genes representing the future organs to be developed. These are described as a Beeja *(*Sperm/ovum*),* Beejabhaga (Chromosomes), & Beejabhag-avayava (Genes) in Ayurveda (A.S.Sh.3, Ch. Sha. 4/30, Ch. Sha. 3/17, and Ch. Sha. 4/34). Each of the chromosomes have definite sites with particular structure of DNA called Gene and these genes have a definite sequence which is described in Ayurveda as Beejabhagavayava. Any abnormality at the level of the genetic structure of maternal or paternal side leads to genetic disease in the progeny. The factors that responsible for these abnormalities in foetus are described in the classics (Ch. Sha .2/29*)*

ACCORDING TO ACHARYA CHARAKA :

- Defect in the Beeja (causative factor of Thalassemia)
- Atmakarma (Action of Atma*)*
- Ashaya (It may be Garbhashaya)
- Kala Dosha (Time factor, it may be reproductive period or menstrual period)
- Matusta Aharavihara.(Teratogenicity)

ACCORDING TO ACHARYA SUSHRUTA :

- Nastikata of parents
- Asubha karma in previous life
- Vatapittadi Prakopa

We can say that Garbhotapattikara Bhavas (Ch. Sha. 3) are genetic predisposing factors. They play a major role in the genetic abnormality. These can be understood in the following manner:

- Matruja Bhava : XX chromosome
- Pitruja Bhava : XY chromosome
- Atmaja Bhava : Inherited psychic factors
- Rasaja Bhava : Nutritional supplementation
- Satmyaja Bhava :Diet and regimen during pregnancy (Need for formation of healthy Sperm and Ovum)
- Satwaja Bhava : Psychic condition of the mother during Garbhavakranti and Garbhini period.(Regulate Hormonal axis)

INVOLVEMENT OF DOSHAS :

Due to Anuchita Ahara – Vihara of the parents Doshas, predominantly Vata and Pitta are vitiated and circulated throughout the body and at the cellular level they mutate the genetic code of cell. That's why normal functioning of that Dhatu will be altered, either leading to its destruction or abnormality. Changes in the Prakriti of Dhatu results into Dhatu Vikriti. Acharya Charaka very clearly describes the process of transformation of Ahara which brings the equilibrium of Dhatu. (Ch.Sha.6/15).

Here the involvement of Vata and Pitta Doshas can be considered because inside the body Vata Dosha is the initiator of any change, while the transformation or mutation caused by Pitta Dosha. Hence, in this condition Vata and Pitta Doshas are equally responsible for Prakriti Vaipareetya of Dhatu. Prakriti of each Dhatu is maintained by Kapha Dosha. Changes in Prakriti denotes Sleshma Kshaya tending to Dhatu Vaipareetya.

HISTORICAL ASPECT OF PANDU VYADHI

Nirukti : The word Pandu has been derived from "Padi Nashne Dhatu" by adding "Ku" Pratyaya in it, the meaning of which is always taken in sense of "Nashan" i.e loss. As Pandu has been kept under the group which is classified and named according to the change of color, therefore "Nashan" should be considered in the sense of "Varna" or color, which is further clarified by Charak with the word Vaivarna. Thus, Pandu is a disease in which there is Vaivarna or Change in the normal color of the body.

LITERAL MEANING OF PANDU :

In Sanskrit literature meaning of Pandu is taken as Shweta, Pitasanwalit Shukla, Ishat Pandu i.e Dhusar. Color of Pandu can be compared with Sankha, Pakwa Madanphala, Ketaki Dhuli (Pollengrains of Ketaki Flower), Apakwa Parushak Phala.

In Ayurvedic Samhitas Pandu has been described in various manners like :

- पाण्डुस्तु पीतभागार्ध केतकी धूलिसन्निभः ॥

शब्दार्णव

i.e. Pandu is like the color of pollen grains of Ketaki- flower, which is whitish yellow.

- पाण्डुता वक्ष्यमाण हरितादिवर्णेभ्यः प्रधानेन वर्णनोपलक्षितो रोगः पाण्डुरोगः ॥

च. चि. १६ चक्र टीका

i.e. Acharya Chakrapani has included "Hari*t*" Varna in Pandu.

- पंडयते इति पाण्डु। परिषीयते इति भावः। शब्दकोष
- पाण्डु पतिसंवलित शुक्ल। अमर भानुदिक्षित टिका
  पाण्डुः श्वेत वर्ण केतकीधूलिसन्निभेः पीतभागार्धे वर्ण भेदे च। शब्दस्तोमः
- हरिणः पाण्डुः पाण्डुः धुसरः ईषत् पाण्डुस्तु धुसरः। अमरकोषः
- हरिणः पाण्डुरः पाण्डुखदातश्च पाण्डुरः। अभिधान रत्नाकर
- सित पीत समायुक्तः पाण्डुवर्णः प्रकीर्तितः। सुमूतिः
- सर्वेषु चैतेष्विह पाण्डुभावो यतोधिकतः खलु पाण्डुरोग सु. उ. ४४-४
- पाण्डुवर्णाधिक्यात् स्वें एव पाण्डुरोगः प्रोच्यते। सु. उ. ४४-१ डल्हण टीका
- पाण्डुत्वं तेषु चाधिकं यतोतः पाण्डुरित्युक्तः स रोगः अ ह्र नि १३-३-४ अ सं नि १३-५-६
- पाण्डुवर्ण त्वेनोपताक्षितो रोगः पाण्डुरोग इति रुढिः। शा॥ दिपीका

Nomenclature of Disease :

In Ayurvedic texts, nomenclature of the disease has its own importance, The disease has been nomenclatured on various grounds, e.g. Gulm according to the Swaroopa of Vyadhi, Visarpa according to the progression of Vyadhi, Kasa according to the symptom of Vyadhi etc. In the same manner, the disease Pandu has been described on the basis of its presentation with colors.

Historical Reference :

The references about Pandu can be found since time immemorial, e.g. in Vedas, Garuda Purana, Agni Puran, Mahabharat, Valmiki Ramayana, Buddha literature etc

Vedas :

In Rigveda and Atharvaveda there is description of Pandu Roga as Vilohit, Halima, Haribha.

- पित्तेन पाण्डुना वापि धुम धम्रारुपेन वा ।
  विशिर्यता महाभ्रेण महता चानुष गुणा ॥

  अथर्ववेद् परिशिष्ट ५८ख २५

- उपप्रागाद् इति शुने पिण्डं प्रयच्छति ।

  कौशिक सुत्र४८-२६

In Rigveda and Atharvaveda, Pandu rog has been mentioned by names like Harimana in Birds called Shuka ,Ropanak and Haridrave. In rigveda mandal 1, sun is said to cure Harimana. The usefulness of red colour of sun Harimana is also mentioned in Athervaveda.

Purana :

In Garuda Purana, it has been mentioned that Takra mixed with Lauha Churna is useful in treatment of Pandu.

- लोहचुर्ण तक्रपीतं पाण्डु रोगहरं भवेत्।

इति गारुडे १८० अध्याय

It proves that the disease was prevalent in India from that time and physicians were able to diagnose and treat it.

Mahabharat :

- तस्य हेतस्य पुरुषस्य रुप तथा महारजनंवासो।
  तथा पाण्डूवि यथदे गोपो यथा अनयपिर्यथा पुण्डरिक।
  यस्यान् मान्ना विरुपंपे क्षामामपि।
  तस्यादेव स्तुतस्तुभ्यं पाण्डुत्वे भविष्यति॥

महाभारत

Vichitravirya, the son of king Shantanu, died without any heir. Hence his mother Satyavati called upon her son Rishi Vyasa to impregn are her daughters in law. When he approached one of her daughters in law Ambalica, she became pale with fear. At that moment Rishi Vyasa predicted that she would beget the son who will be pale or Pandu. Hence Ambalica delivered a son with disease Pandu and for that reason he was named so.

In Ayurvedic Samhitas :

The great Acharyas of Ayurveda - Charak, Sushruta, Vagbhatta, Kashyapa, Bhel, Harit, Madhav, Sharangdhara, Bhavmishra, Vangasena etc. have decribed this disease in details.

Charak Samhita

Pandu Roga has been described in Sutra -Sthana in the chapter "Ashtodariya Adhyaya" as well as in Chikitsa- Sthana 16th Chapter "Pandu Roga Chikitsa". Charaka has described Pandu Roga after Grahani Chikitsa, as Grahani is one of the causative disease of Pandu.

Acharya Sushruta

has mentioned Pandu Roga in Uttar-tantra Adhyaya - 44, "Pandu Roga Pratishedhanam Adhyaya". Acharya has described it after the chapter "Hridroga Pratishedha Adhyaya" because of the similarity in the types of both the diseases. Sushrut has mentioned Kamala, Panaki, Kumbhavhaya, Lagharak as the various stages of Pandu.

Acharya Vagbhata

Described Pandu in Nidan Sthana 13th Chapter "Pandu Roga- Shopha-Visarpa Nidan" and in Chikitsa Sthana 16th Chapter, "Pandu Roga Chikitsa."

Madhav Nidan

The description of Pandu Roga is in 8th Chapter "Panduroga- Kamla - Kumbhkamaladi Nidan" This chapter has been placed after Krimi Nidan because Purishaj Krimi are also responsible for developing Pandu Roga.

Sharangdhar Samhita *:*

Pradhan Khand 7th Adhyaya

Bhavprakash *:*

Madhyam Khand 8th Adhyaya.

In Modern System of Medicine, :

It is a fact that natural complexion and redness of skin is due to the proper blood flow through the skin. When there is diminution in quantity or quality of blood, pallor of the skin results. Monier Williams has considered pallor as Pandu- Varn. In Pandu also, lack of blood (Ala Rakta) leads to pale coloration, thus anemia can be considered under Pandu Roga.

The word anemia was first mentioned as "De Marbovergins" (the disease of virgins) in 1554 by Johannas Lange. He described it as pallor of cheeks, prominent pulsation of temporal vessels and dyspnoea on climbing stairs or dancing.

In 1661, the scientist Thomas Sydenhom and Willis proved that Loha is an important constituent of blood, so they initiated the use of iron. Our great Acharyas have already mentioned the use of Loha dhatu in the treatment of Pandu.

The word Anemia is from Greek language, which means lack of blood. The word anemia first appeared for medical use in 1824.

AETIOLOGY OR NIDANA OF PANDU ROGA :

- क्षाराम्लवणात्युष्ण विरुद्धासात्म्य भोजनात्।

  निष्पाव माषपिण्याक तिल तैल निषेवणात्॥

  विदग्धेऽन्ने दिवास्वप्नात् व्यायामात् मैथुनात् तथा।।

  प्रतिकर्मर्तु वैषम्यात् वेगानां च विधारणात्।

  कामचिंताभयक्रोध शोकोपहत चेतसः॥

  च चि १६-७-९

The general aetiology or samanya nidana of panduroga is described in Charaka, Sushruta etc. treatises in which all the factors, mainly related to ahara, vihara and other diseases are mentioned. They can be broadly classified into following groups (Cha. Chi. 16/8, Su.Su.44/3, A.S.Ni.13/3)

I. Casuses related to ahara.
II. Causes related to vihara.
III. Other diseases

1. Causes related to Ahara :

Food or diet plays an important role in the normal development and maintenance of different dhatus of the body. According to Ayurvedic texts, factors pertaining to diet which can cause pandu can be classified into following groups.

(a) Deficient to quantity.

Abhojana and Pramita bhojana both vitiate vatadosha, pittadosha and agni and produces malnutrition directly and aptarpanjanya pandu roga occurs.

(b) Deficient to quality :

Intake of dravyas like Nishpava, Tila taila, Pinyaka, Masa, Madya, Matsya, Mridbhaksana frequently causes Mandagni and Tridosha prakopa, mainly pitta thereby causing the disease. These factors are harmful for health and may over stimulate the metabolism e.g. madya may cause toxic effects on the body metabolism. In this group, most of the factors causes mandagni and pitta prakopa which is main reason in occurrence of pandu roga.,

(c) Faulty diet :

Asatmya bhojana, viruddha bhojana, Atisevana of amla, katu, lavana rasa, atisevana of kshara, ushna, tikshna and ruksha ahara causes mandagni, pitta prakopa and vata prakopa. Thus, over indulgence into various rasas is stated to be the cause of pandu in Ayurveda. Accordingly katu, amla, Iavana rasa singly or combined produce the roga. Asatmya bhojana or viruddha bhojana may inhibit normal process by antisubstance and may lead to disturbance of the digestive and assimilative process.

Kashaya rasa as an aetiological factor of pandu roga is found only in Harita samhita. Lavana rasa as a cause of pandu roga is mentioned by Charaka and Sushruta while amla rasa is mentioned by all acharyas. Amla rasa has also been said to possess the property of mamsa vidaha and causes kaya shaithily, Likewise, Lavana rasa vitiates the rakta. According to Sushruta, excessive intake of amla rasa and Lavana rasa produces Kayashaithilya and vaivarnata.

2. Cause related of Vihara :

This factor deals with both the mental and physical activities of an individual. Faulty treatment is also responsible for the manifestation of pandu roga. Thus, causes related to vihara can be of three types.

(a) Sharirika (b) Mansika (c) Pratikarmavaishamya

(a) Sharirika:

Diwaswapana, Ratrijagarana, Ativyayama, Ati vyavaya, Atidhvagamanrn, Adhika Sharma, Vegavarodha and Rituvaishamya are the sharirika factors causing pandu. Among these, diwasapana causes pandu by vitiation of kapha dosha mainly and ratrijagarana by vata prakopa.

Excessive activity in the form of ativyayma, ativyavaya, shramadhikya causes excessive calorie output which out balances the intake of calories. Vegas are the natural regulators of body functions. Habitual disregard or suppression of them causes stress to the body. Seasonal variations also upset the normal functions of the body. Ayurveda, with the concept of optimal positive health has always taken into consideration all the factors, however minor they may appear.

(b) Mansika :

Kama, Krodha, Bhaya, Chinta and Shoka like manasa bhavas are the major causes of pandu roga. If a person takes balanced diet even at proper time but with chinta or worries, the digestive functions are disturbed and the food would not be properly digested. The result is mandagni and deficient nutrition to dhatus or dhatu aposhana which is stated to be the cause of pandu roga. Not only the ayurvedic literature but other sciences also bear the testimony of this part.

(c) Pratikarmavaishamya :

Snehavibharam Snehatiyoga, Amatisara samgraha, Dushtaraktanigraha in raktarsha and Vegavidharana in vamana karma have also been taken as the

cause of pandu roga. Excessive loss of blood or body fluids out balance the blood formation. As is indicated, this may occur owing to some disease condition or due to over done or wrong panchakarma.

3. **Other Diseases (Secondary causes) :**

Ayurvedic literature has indicated a correlation of various diseases with pandu roga either as symptom or as upadrava. So, all these can be causes of pandu or nidanarthakara rogas of pandu. Some of which are Raktatipravartana, Raktarsha, Raktarbuda, Asrigdara or Raktapradara, Arsha Raktarsha or Kaphajarsha, Rajyakashma, Punaravartaka jwara etc. which directly or indirectly vitiate vata, pitta and kapha singly or in combination. Though pitta plays a predominant role in the manifestation of pandu roga, vata and kapha are also involved in the process.

Various Nidaanas or aetiological factors of Pandu according to Ayuuvedic text are mentioned in the table below.

Types of Pandu Roga :

According to Ayurvedic Acharyas there are main five types of Pandu Roga.

1. Vatik Pandu
2. Paittik Pandu
3. Kaphaj Pandu
4. Tridoshaj Pandu (Sannipataj Pandu)
5. Mrudbhakshanaj pandu

In Harit Samhita two more types Halimak and Panki are mentioned.

Lakshan of Pandu Roga :

Lakshan Summarized in tabular form

- **Vatik Pandu :**

	Lakshan	Cha.	Su.	A.H.	M.N.	Bha.	Ha.
1.	Krishnapanduta	+	-	-	-	-	-
2.	Krishnetratavam	-	+	-	+	-	-
3.	Krishnasiravnadhatava	-	+	-	-	-	-
4.	Krishnanakhatva	-	+	-	-	-	-
5.	Krishnananatva	-	+	-	-	-	-
6.	Arunanakhatva	-	-	+	-	-	-
7.	Arunasiratva	-	-	+	-	-	-
8.	Arunanetrata	-	-	+	+	-	-
9.	Twakapitata	-	-	-	-	-	+
10.	Netrapitata	-	-	-	-	-	+
11.	Nakhapitata	-	-	-	-	-	+
12.	Rukshangata	+	-	-	-	-	-
13.	Rukshasiratva	-	-	+	-	-	-
14.	Rukshanakhatva	-	-	+	-	-	-
15.	Rukshanetrata	-	-	+	+	-	-
16.	Paruushta	-	-	-	-	-	+
17.	Angamarda	+	-	-	-	-	-
18.	Angaruka	+	-	-	-	-	-
19.	Angatoda	+	-	+	+	-	+
20.	Kampa	+	-	+	+	-	-
21.	Parshvaruka	+	-	+	-	-	-
22.	Shiroruka	+	-	+	-	-	-
23.	Shirogaurava	-	-	-	-	-	+
24.	Asayavairasya	+	-	+	-	-	-
25.	Anaha	+	-	+	+	-	-
26.	Shofa	+	-	+	-	-	-
27.	Balakshaya	+	-	-	-	-	-

28.	Bhrama	-	-	-	+	-	-
29.	Varchshosha	+	-	+	-	-	-
30.	Gandhavitakta	-	-	-	-	-	+
31.	Krishnavitaka	-	+	+	-	+	-
32.	Arunavitaka	-	-	+	-	+	-
33.	Rukshamutrata	-	-	+	+	+	-
34.	Darunakoshthata	-	-	-	-	+	+
35.	Muttrapitata	-	-	-	-	+	+
36.	Rukshakrishnaruna Twak	-	-	-	+	-	-

- **Pittaj Pandu :**

After taking Pitta prakopa Ahara-Viharaja Pitta gets provoked and accumulatated in the boby of the person of Pitta prakriti, vitiates the Rasa & Rakta along with Mamsa dhatu and causes Pittaja Panduroga.

	Lakshan	**Cha.**	**Su.**	**A.H.**	**M.N.**	**Bha.**	**Ha.**
1.	Pitata	+	+	-	-	-	+
2.	Haritabhata	+	+	-	-	-	-
3.	Pitekshanatva	-	+	+	+	-	-
4.	Potasiravnasshata	-	+	+	-	-	-
5.	Pitanakhatva	-	+	+	-	-	-
6.	Pitananatva	-	+	+	-	-	-
7.	Pitachhavi	-	+	-	-	-	-
8.	Haritasiratva	-	-	-	-	-	+
9.	Jwara	+	+	+	+	-	+
10.	Daha	+	+	-	+	-	-
11.	Trishna	+	+	-	+	-	+
12.	Chardi	+	+	-	-	-	-
13.	Murcha	+	+	-	-	-	+
14.	Sweda	+	+	-	-	-	-
15.	Shitakamita	+	+	-	-	-	-
16.	Annabhinandana	+	-	-	-	-	-
17.	Katukasayata	+	+	-	-	-	+

18.	Ushnanupashayata	+	-	-	-	-	-
19.	Amlanupashyata	+	-	-	-	-	-
20.	Vidaha	+	-	-	-	-	-
22.	Amlodgara	+	+	-	-	-	-
23.	Daurgandhya	+	+	-	-	-	+
24.	Daurbalya	+	-	-	-	-	-
25.	Tama	+	+	-	-	-	-
26.	Shosh	+	-	-	-	-	+
27.	Shofa	-	-	-	-	-	+
28.	Pitamutrata	+	+	+	+	-	-
29.	Pitavitakta	+	+	+	+	-	-
30.	Bhinnavarchasatva	+	+	-	+	-	-
31.	Amatva	-	-	-	-	-	+
32.	Atipitabha	-	-	-	+	-	-

- **Kaphaj Pandu :**

Due to Kapha promoting Ahara Vihara, Kapha gets increased and causes Kaphaja Pandu. Madhava, Bhavaprakasha and Vagbhatta have described the same symptoms of Kaphaja Pandu as Charak and Sushruta. On the place of Madhurasya Vagbhatta has mentioned the symptom Lavana Vaktrata.

(A. S. Ni.13/13, M.N.8,B.P.Chi.8).

They can be summarized in tabular form as under :

	Lakshan	**Cha.**	**Su.**	**A.H.**	**M.N.**	**Bha.**	**Ha.**
1.	Shvetavabhasta	+	-	-	-	-	-
2.	Shveklakshita	+	+	+	+	-	-
3.	Shuklanantva	-	+	+	-	-	-
4.	Shuklanakhtva	-	+	+	+	-	-
5.	Shuklasiravnaddhata	-	+	+	-	-	-
6.	Gaurava	+	-	-	+	-	+
7.	Tandra	+	-	-	+	-	+
8.	Chhardi	+	-	+	-	-	-
9.	Praseka	+	-	-	+	-	-

10.	Lomaharsha	+	-	+	-	-	-
11.	Sada	+	-	-	-	-	-
12.	Murcha	+	-	-	-	-	-
13.	Bhrama	+	-	-	-	-	-
14.	Klama	+	-	-	-	-	-
15.	Swasha	+	-	-	-	-	-
16.	Kasa	+	-	+	-	-	+
17.	Alasya	+	-	-	+	-	+
18.	Aruchi	+	-	-	-	-	-
19.	Vakagraha	+	-	-	-	-	-
20.	Swaragraha	+	-	-	-	-	-
21.	Katukamata	+	-	-	-	-	-
22.	Rukshakamata	+	-	-	-	-	-
23.	Ushnakamata	+	-	-	-	-	-
24.	Shoth	+	-	-	+	-	+
25.	Madhurasyata	+	-	-	-	-	-
26.	Lavanaktrata	-	+	-	-	-	-
27.	Swarkshaya	-	-	+	-	-	-
28.	Shuklamutrata	+	+	-	+	-	-
29.	Shuklavarchasa	+	+	-	-	-	-
30.	Shuklatwaka	-	-	-	+	-	-

- **Sannipataj Pandu :**

Ahar and Vihar which are responsible for the tridosh prakop causes Tridoshaja Pandu, which is showing all the symptoms of Vataja, Pittaja and Kaphaja Pandu. (Cha.Chi.16/26) (Su.Utt. 44/10, A.S. Ni. 13/14). As per Ayurvedic text Tridoshaj Pandu is an uncurable (Asadhya) vyadhi. Thalassemia Major is also uncurable disease as per modern science. (M.N. 8, B.P.Chi. 8).

SAMPRAPTI GHATAKAS :

- **Dosha** – Tridosh (Mainly Vata and Piita)
- **Dushya** – Rasa, Rakta mainly (Sarva Dhatu, UpaDhatu & Malas)
- **Agni** – JatharAgnimandya & DhatwAgnimandya
- **Srotas** – Sarvasrotas (Rasavaha, Raktavaha mainly)
- **Srotodushti** – Sanga
- **Udbhavasthana** – Yakrita & Pleeha
- **Adhistthana** – Sarva Sharira
- **Vyaktasthana** – Twak
- **Rogamarga** – Abhyantara & Kosthagata

In the present context, the Doshic status of the disease can be analyzed as Vata Pitta provocation along with depletion of Kapha resulting in various disorders.

Pandu : Samprapti :

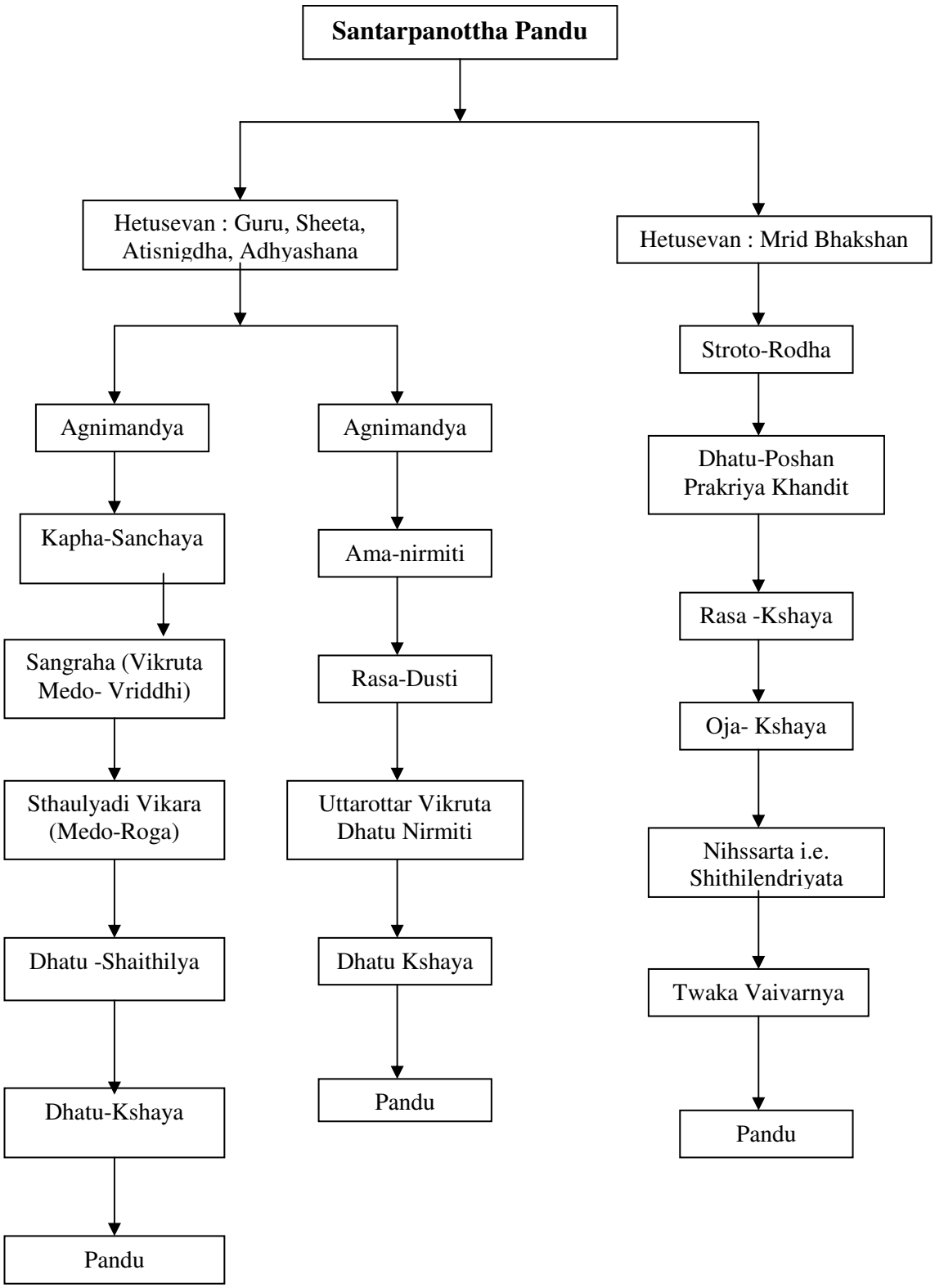
According to Vagbhatta, Samprapti is step by step progression of any disease. This deals with the process of vitiation of Doshas, Kha- Vaigunya, Dosha-Dushya Sammurchhana leading to signs or symptoms of a disease. It is concerned with both clinical as well as sub-clinical stages of the disease.

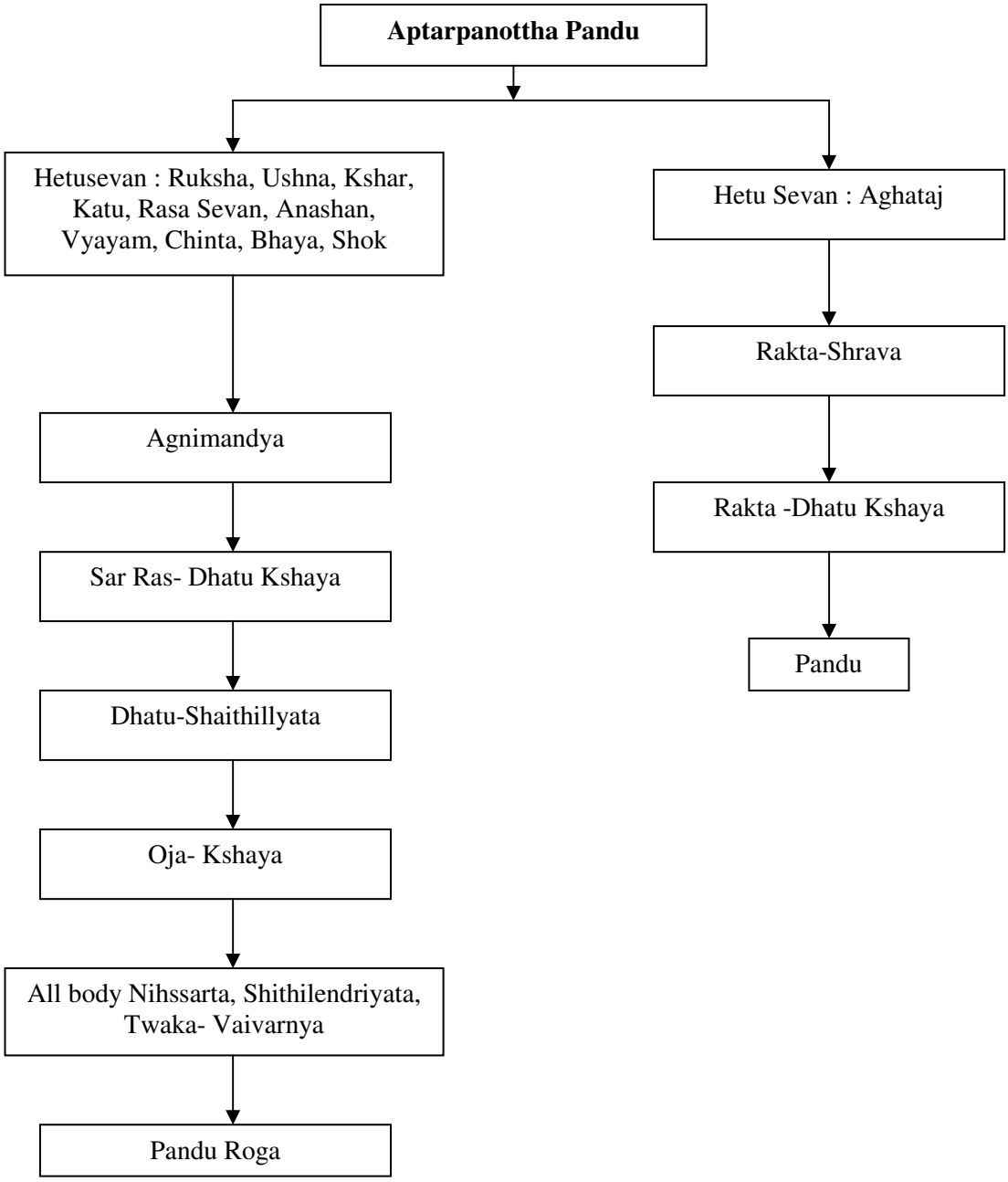
On the basis of various Hetus, Samprapti of Pandu can be divided into two -

1) Santarpanottha Pandu

2) Aptarpanottha Pandu

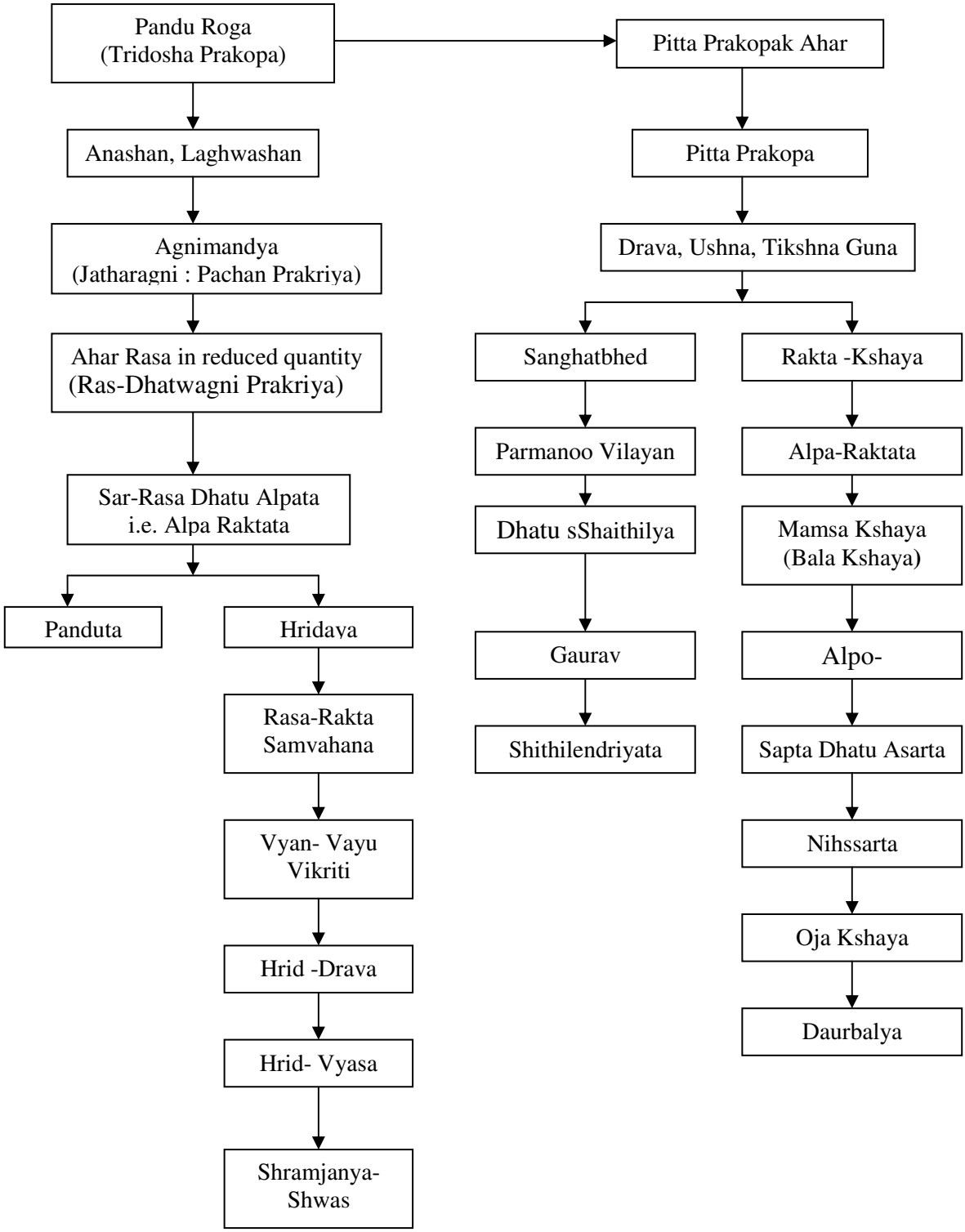
However, Acharya Charak has categorised Pandu under Santarpanottha Vikaras.


Santarpanottha Pandu
Hetusevan : Guru, Sheeta, Atisnigdha, Adhyashana
Hetusevan : Mrid Bhakshan
Agnimandya
Agnimandya
Stroto-Rodha
Kapha-Sanchaya
Ama-nirmiti
Dhatu-Poshan Prakriya Khandit
Sangraha (Vikruta Medo- Vriddhi)
Rasa-Dusti
Rasa -Kshaya
Sthaulyadi Vikara (Medo-Roga)
Uttarottar Vikruta Dhatu Nirmiti
Oja- Kshaya
Dhatu -Shaithilya
Dhatu Kshaya
Nihssarta i.e. Shithilendriyata
Dhatu-Kshaya
Pandu
Twaka Vaivarnya
Pandu
Pandu



The above charts show that like Apatarpanottha Pandu, Santarpanottha Pandu also lands into the entity like Dhatu-Kshaya. Thus, we can conclude that Dhatu-Kshaya or Aptarpana of the body is unavoidable condition of the disease Pandu.

Acharyas has described various signs and symptoms of Pandu. How these signs and symptoms develop in the pathological chain, can be shown in Chart as follows -


Pandu Roga
(Tridosha Prakopa)
Anashan, Laghwashan
Agnimandya
(Jatharagni : Pachan Prakriya)
Ahar Rasa in reduced quantity
(Ras-Dhatwagni Prakriya)
Sar-Rasa Dhatu Alpata
i.e. Alpa Raktata
Panduta
Hridaya
Rasa-Rakta
Samvahana
Vyan- Vayu
Vikriti
Hrid -Drava
Hrid- Vyasa
Shramjanya-
Shwas
Pitta Prakopak Ahar
Pitta Prakopa
Drava, Ushna, Tikshna Guna
Sanghatbhed
Parmanoo Vilayan
Dhatu sShaithilya
Gaurav
Shithilendriyata
Rakta -Kshaya
Alpa-Raktata
Mamsa Kshaya
(Bala Kshaya)
Alpo-
Sapta Dhatu Asarta
Nihssarta
Oja Kshaya
Daurbalya

दुष्या- रसः पाण्डुत्वंष्ठिवनं अंगमर्दः अरुचिः

रक्त- वैवर्ण्य

त्वक्- शीर्णलोमता

मांस- मांसशैथिल्यम्

मन - (उपहत चेतस्त्व) दुर्मनस्कत्वम्

- प्रदूष्य कफवातासृकत्वङ् मांसानिक रोतितत् ।

(च चि)

- हृत्पाण्डु रोग प्रवृत्तया रस प्रदोषजः विकाराः ।

(सु सू)

Samprapti :

- दोषाः पित्तप्रधानस्तु यस्य कुप्यन्ति धातुषु ।

शैथिल्यं तस्य धातूनां गौरवं चोपजायते ॥

ततो वर्णबलकर्मस्नेहाः ये चान्येऽप्योजसो गुणाः ।

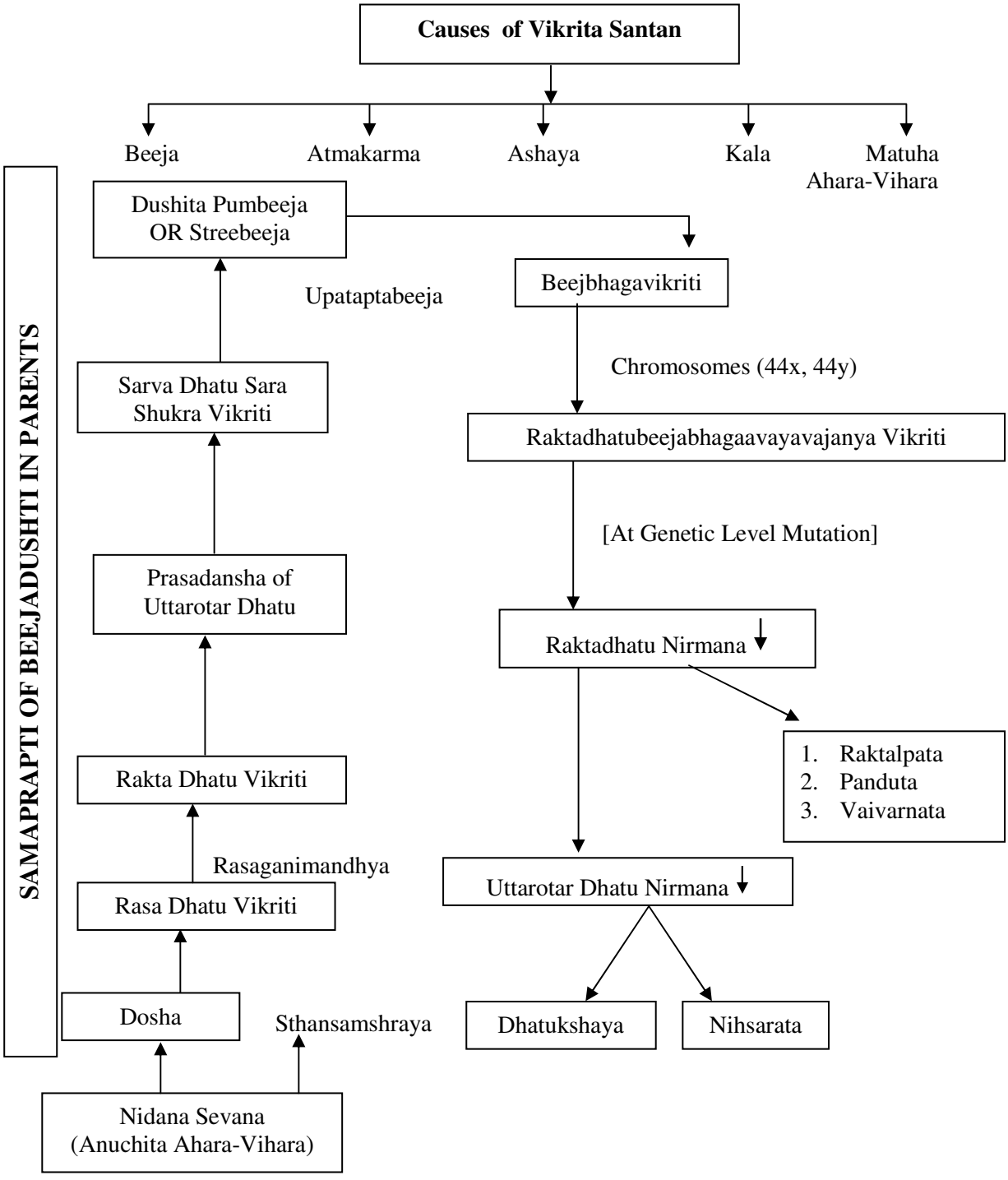
व्रजन्ति क्षयमत्यर्थं दोषदूष्य प्रदूषणात् ॥

सोऽल्परक्तोऽल्पमेदस्को निःसारः शिथिलेन्द्रियः ।

वैवर्ण्यं भजते तस्य हेतुं श्रृणु सलक्षणम् ।

(च चि १६-४-६)

SAMPRAPTI CHART



Pratyatmalinga (Cardinal symptoms) of disease is known as its Swaroopa. Santapa in Jwara, Saruja Sopha in Amavata etc. are the particular features of the diseases, which give them separate identity. The main symptom of Thalassemia is Panduta. This is the pratyatmalinga of Thalassemia where as Pandubhava is invariable feature mentioned in Pandu Roga. Second main

feature of Thalassemia is Alparaktata (Hb% decreases). Raktalpata word denotes both qualitative, quantitative and morphological changes in blood. The normal skin colour of the body is due to the normal blood. In the condition of Rakta Kshaya the symptoms appearing in Pandu Roga are also seen in the patients of Thalassemia. These symptoms are as follows:

- Hriddrava
- Trisha
- Raukshaya
- Glani
- Sheetprarthana
- Daha
- Shwasa
- Kasa
- Mandanala
- Panduta
- Dhatukshaya
- Daurbalya
- Varnabheda
- Tandra

PROBABLE RUPA [CLINICAL FEATURES]
OF THALASSEMIA SIMILAR TO PANDU

THALASSEMIA	PANDU
• **Pallor** • **Reduction in Hb gm %** • **General weakness** • **Dyspnea on exertion** • **Palpitation** • **Pyrexia** • **Anorexia, Dysphagia** • **Loss of appetite** • **Headache** • **General Bodyache**	• **Twak Pandutva** • **Alparaktata** • **Daurbalya** • **Arohaneayasa** • **Hridyaspandana** • **Jwara** • **Aruchi, Annadwesha** • **Kshudamandya** • **Shirahshula** • **Angamarda, Gatrashula**

The diseases may have their locus either in the Sareera or Mana. Adhistthana implies the main site of affliction. In Thalassemia the prime center of affliction is Beejabhagavayava (gene), which is responsible for the formation of Rakta Dhatu. Raktavaha Srotas are mainly involved. Improperly formed Rakta Dhatu circulate in the whole body hence Sarvasharir is the Adhisthana of disease .In Ayurvedic classics classification of diseases described on the basis of five different criteria in (Roganeekavimanadhayaya). On the basis of location theses may be Sharirika and Manasika but on the basis of nature of causative factor these are endogenous (Nija*)* and exogenous (Agantuja*)* (Ch.Su.11/45, Ch.Vi.6/3). Nija and Agantuja Nidana grossly divided into as follows:

<table>
<tr><th colspan="3">NIJA</th><th rowspan="2">AGANTUJA</th></tr>
<tr><th>SAHAJA</th><th>GARBHAJA</th><th>JANMOTTARA</th></tr>
<tr><td>(Inherited) genetic</td><td>(Antenatal)</td><td>(Postnatal)</td><td></td></tr>
<tr><td>1 Related to Atmakarma</td><td>1. Ashaya Dosha</td><td>1. Matridugdha</td><td>1. Bhutaveshaja</td></tr>
<tr><td>2. Related to Atmaja, Sattvaja and Satmyaja</td><td>2. MatuAhara</td><td>2. Asatmendri arthasamyoga</td><td>2. Shirobhighata (Akala Pravahana during labour)</td></tr>
<tr><td rowspan="3">3. Related to Beeja, Beejabhaga and Beejabhagavaya</td><td>3. MatuVihara</td><td>3. Ahara</td><td rowspan="3">3. Vishajanya</td></tr>
<tr><td rowspan="2">4. Dauhrida</td><td>4. Nidra</td></tr>
<tr><td>5. Manasika</td></tr>
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The nature of Thalassemia is inherited and it related to Beeja, Beejabhaga and Beejabhagavayava that is why it may come under Sahaja Nidana.The Adhistthana of Thalassemia lies on Vikriti of Beejabhagavayava which is responsible for the formation of Rakta Dhatu. Hence it is necessary to know the concept of Rakta Dhatu in Ayurveda, which is described below:

Concept of Rakta Formation :

The theories regarding Rakta Dhatu formation appears to have changed from time to time as is evident from the studies of Ayurvedic classics. In Charaka Samhita, it is clearly mentioned that Rakta is formed by the Ushma of the Pitta which renders the Rasa into a colored state.

Sushruta wrote the Rakta is formed in Yakrita and Pleeha with the help of Ranjakagni. (Su. Su. 21*)*

He again writes that Apa Rasa when circulates through Yakrita and Pleeha, it becomes coloured there and thus Rakta is formed.

Two organs are described primarily playing their roles in Rakta formation. After the period of Sushruta, Astanga Hrdayakara Sri Vagbhatta has mentioned that Rakta forming factor i.e. Ranjaka Pitta is also formed in Amasaya.

Theory of Rakta formation has evolved from time to time. From above, it can be inferred that Usma of the Pitta and Rasa are the main factors by which Rakta is formed and secondly Yakrit, Pleeha and Amasaya are the organs in which this process is taking place.

Pittoshma and Rasa:

Though every Doşha is composed of five elements, two Bhutas are predominant in each Doşha. The reference denoting this fact is found in Astanga Samgraha. He writes about Pitta that it is formed by Agni and Apa Mahabhuta. In this way Agni is the predominant one i.e. its fiery quality is the most abundant.

Agni's Guṇa is Usma and it provides Rupa to that particular substance. The real nature of the Agni is known by the fact that in which this Ushma and Rupa reside with Samavaya relation is named as Agni. Vayu particles when come in the contact with it then produce Agni.

Modern science also admits motion, and when that is arrested, it produces, under different conditions heat, electricity, magnetism and light (encyclopedic Britannica). It is concluded that the Agni Mahabhuta becomes responsible for Ushma and visual perception.

Sushruta while describing the definition of Rasa, writes that it is Tejobhuta (Su. Su. 14/3). Commenting upon it Acharya Dalhaṇa describes that Rasa is produced by Teja. Discussing other contemporary views, he said that some Ayurvedist accept it like Ghrita and Bhuta word as Upamanartha. It means that Rasa is like a Ghrita. The simily of Rasa with Ghrita may be explained like this. Just as Ghrita is produced from milk after it undergoes different changes so is the condition of Rasa formed from Ahara. According to Charaka Samhita, Ushma of the Pitta means the factors that will

mature the part of Rasa into colored form. These factors when combined with Rasa, produce Rakta.

At the time of Charaka definite organs for Rakta formation were not described. The Rakta, according to modern medicine is formed in different organs in different stages of life and also this variation occurs in diseased condition of life. So Charaka might have been more accurate to describe as universal law for its formation in one sentence.

Ranjaka Pitta:

Though all the functions of Pitta have been described by Acharya Charaka, the credit to divide the Pitta in five varieties within their functions goes to Acharya Sushruta. Among the five Pittas, Ranjaka Pitta is the one whose seat is described to be in Yakrita, Pleeha, and its Karma *(*function) is to give colour to the Rasa part of the body. In other words, Ranjaka Pitta is residing in the Yakrita and Pleeha, and is responsible for the formation of Rakta. What is Ranjaka Pitta in Ayurveda may be those factors which become responsible for the synthesis of hemoglobin and RBCs as described in modern medicine.

In particular, because these are the factor which are responsible for giving colour to the Rasa Dhatu viz. proteins, metals, porphyrins, pigments, vitamins. All these factors are mainly manufactured in liver and spleen.

Sarakta Meda (Red Bone marrow) :

Another reference of site of Rakta formation is available in Su. Sha. 4/13. This shows that there is some relation of Rakta with the Majja part of the bones also.

Our ancient Acharyas also know that marrow of the bones take part in the formation of Rakta. But the direct reference about the Rakta formation in the bone marrow is not available in Ayurvedic classics.

Acharya Sushruta has described that inside the space of long bones the Majja is present, but in short bones Sarakta Meda is present. In adult life the fat is stored inside the space of long bones named as Majja and from modern view it is called the yellow bone marrow. Inside the short bones Sarakta Meda is present proving that

when the network of blood capillaries are abundant, it is named as red bone marrow with modern view.

According to modern physiology, bone marrow is considered the main seat for the formation of RBCs in fetal life. The bone marrow of long bones also takes part in the formation of blood, but later on in the adult life i.e. after 20 years of age, fat is filled up in the bone marrow of long bones and only the small bones take part in the formation of Rakta.

This process is considered here taking typical example of short bone. The nutrient artery enters into the small bone through the nutrient foramen. After entering, it is devided into minute network like branches. Here the ends of the artery and vein mix to form the sinusoids. These sinusoids become responsible for the formation of the blood.

According to C. C. Chatterjee, two theories exist regarding the maturing of RBCs in the sinusoides –

- Intra-vascular theory
- Extra-vascular theory

1) Intra-vascular theory

This theory says that RBCs are formed by merely rounding of the endothelium of the sinusoids.

2) Extra-vascular theory

This theory puts forward the idea that first, cells of white colour are formed outside the sinusoids, which gradually enter into the sinusoids. After phasing through many stages, these cells are changed into RBCs. These sinusoides contain all the essential form from Yakrita, Pleeha, Amasaya and Anna.

The stages through which the matured RBCs are formed are as follows –

1) Haemocytoblasts
2) Early erythroblast

3) Early normoblasts
4) Intermediate normoblasts
5) Late normoblasts
6) Reticulocyte
7) Erythrocyte

According to Harita Samhita, the following colours are found in Rakta.

- Sweta
- Kapota
- Harita
- Haridra
- Padma
- Kinsuka
- Alaktak

The colours go on changing stage wise and in the end, crimson red colour is obtained. Hemoglobin begins to add in the late normoblast stage with which the colour begins to become red.

In this way, we can say that Acharya Harita tried to find all the stages of Rakta. Acharya Sushruta has mentioned that the seat of Rakta is Yakrita and Pleeha as stated before, hence it helps its other receptacles to serve their proper function.

Commenting on this, Ghanekar wrote that blood is formed in red bone marrow but in Yakrita and Pleeha such factors are present, which stimulate the red bone marrow to become able to produce blood, because in the deficiency of Rakta, Yakrita is taken as a therapeutic measure in order to fulfill that deficiency.

The seven Dhatus of the body are formed one after the other i.e. from Rasa Rakta is formed, from Rakta Mamsa is formed and so on. In the end from Majja Śukra is formed. The two words Guru and Laghu are mentioned by Acharya Charaka in connection with Dhatus. He opines that if Dhatus are counted from Rasa to Śukra, they go on becoming Guru in character while the reverse is of Laghu in character (Ca. Su. 27/337).

So the Rasa and Śukra are Laghutam and Gurutam respectively.Both of these theories are not accepted by the modern medicine.

Method of Rakta Formation:

The following are the methods of Rakta formation –

1) Kşira Dadhi Nyaya
2) Kedari Kulya Nyaya
3) Khale Kapota Nyaya
4) Eka Kala Dhatu Poshaka Nyaya

1) **Kşira Dadhi Nyāya**

Just as milk is converted into curd and curd into butter, similarly the Rasa is changed into Rakta and Rakta into Mamsa and so on. This method of conversion step by step is also known as Krama Parinama Paksa. Some texts support this view that whole of the preceding Dhātu is changed into second succeeding Dhatu. This method is known as Sarvatman Parinama Paksa. But this theory does not carry any weight, because if a person starts fast for a month then there will be no Rasa left in the body, which does not tally with the facts.

In part its importance can be appreciated because some of the constituents of the food when taken internally are absorbed as such for the formation of the Dhatus, as for instance glucose when taken is absorbed as such and become the part of the Dhatu more or less in the same form. (Ch. Su. 28/4; Ca. hi. 15/16 - Chakrapani)

2) Kedari Kulya Nyaya

This concept is indicate the way of Dhatu formation, as the water through Kulya flows to the nearer field, it fills the field i.e. after satisfying it fully, then the water flows over to the adjacent field and so on. Similarly, the same Ahara Rasa first provide nutrition to Rasa, when the Rasa part is fully nutrited then the same Ahara Rasa goes to give the nutrition to Rakta and so on. Thus, every Dhatu gets nutrition by different ways from the same Ahara Rasa. This rule can be applied to the patient of Rajyaksma where whole Mala part is increased more than Sara part, thereby nutrition of adjacent Dhatu is stopped. The decrement of primary Dhatu will consequently decrease Śukra Dhatu as well. Perhaps this is the cause when we say that the strength of such patients lies in faeces (Mala).

3) Khale Kapota Nyaya

This concept denotes the time factor. All the pigeons come together in order to take their food from the reservoir. They pick up their food particles and fly away together, but reach their nests sooner or according to the distance at which their nests are present. Similarly the Rasa reaches the different Dhatu at different intervals in view of their situation.

4) Eka Kala Dhatu Posana Nyaya

The commentator of Astanga Hṛidaya, Acharya Arundatta put forth the idea that all the Dhātus of the body gets nutrition at the same time with the same Ahara Rasa. (A. H. Sa. 3/64 - Arundatta)

Process of Dhatu Formation:

It categorized into three parts –

1) Sukshma part
2) Sthula part
3) Mala part

1) Sukshma part :

Any substance which plays the function of providing nutrition is named as nutrition providing factor. The Sukshma part does this role so its name is kept as nutrition providing factor. The Sukshma part of Rasa gives nutrition to Rakta. Accordingly its name is considered as nutrition providing factor of Rakta. When Rakta is nutrited, its Agni and Panchamahabhautika Agni will make change in its with the result that three constituents are formed, one of which is Sukshma part which satisfies the thirst of its adjacent Dhatu i.e. Sukshma part of Rakta becomes the nutrition providing factor of Mamsa, in this way we come to the conclusion that Sukshma part of preceding Dhatu gives nutrition to it succeeding Dhatu. This nutrition providing factor is also called by the name of Asthira Dhatu, because it has to circulate from one to another Dhatu for doing its function of nutrition. The name

Sukshma of Anu denotes that it is subtle and its presence can not be detected. It gives nutrition to its neighboring Dhatu, again its name is kept as Poshaka Dhatu.

2) Sthula part :

It is the stable part and does not possess the property of circulating in the body. This Sthula part is started to form at the time of Dhatu formation. As this is the stable part, so it is named as Poshya Dhatu.

3) Mala part :

During the process of Dhatu formation remaining part is named as Mala part. Acharyas have defined it; the thing which harms the body is called Mala. So these Mala are not to keep in the body, but ultimately thrown out from the body. Every Dhatu produces its Mala part during its formation. The Mala of Rakta is Mala Pitta, which is powered into the gut and thereby outside.

Time of Rakta Dhatu Formation:

The different views of Rakta Dhatu formation have already been discussed, but the opinion again differs regarding the time of its formation. The following are the theories found in different Ayurvedic Samhita.

Theory of one day
Theory of five days
Theory of six days
Theory of seven days

1) Theory of one day :

Acharya Charaka has mentioned that Ahara Rasa takes six days to be converted into Śhukra (Ch. Chi. 15/21-22). From this it is inferred that Rakta being second Dhatu, it must be formed after one day interval.

2) Theory of five days :

According to Acharya Sushruta, 3015 Kalas are necessary for Rasa to stay in every other Dhatu for its formation. If this time is calculated to Nimesha etc, five days

are counted. Hereby, conclusion is made that Rakta is formed after the five days of Rasa formation.

3) Theory of six days :

Some Ayurvedic scientists, who hold the opinion by translating the Charaka's verse in a bit different way, have not opined for six days to all Dhatu formation. But these six days indicate to one Dhatu formation individually. So they have decided six days for Rakta formation.

4) Theory of seven days :

Acharya Harita appears to have different opinion that Rakta is formed after passing through different colours and this entire process takes seven days in completion. So it is inferred that Rakta, according to Harita Samhita, is formed after seven days. (Acharya Harita)

FUNCTION OF RAKTA *:*

Though a great deal of information regarding function of Rakta is not available in Ayurvedic Samhitas, yet the facts derived are put down below. It is found that functions of Rakta are not described at one place of Ayurvedic Samhitas. So after consulting various Ayurvedic classics what we have found in connection with the functions is to be tackled here. As in Ayurveda, the structure of substance is known on the basis of its function. So, on this rule, the necessity is felt here to know first about its functions. All the functions of the Rakta can be summarized as -

1) It provides colour to the body.
2) The Chetana (life) to the body is given by it.
3) It produces the Mamsa Dhatu.
4) The growth of all other Dhatu directly depend upon it.

1) It provides colour to the body :

Rakta is the site of Pitta. Pitta are five in number. From these five Pittas, Ranjaka Pitta plays the part of providing pigmentation to Rakta. So the Rakta gets colour due to its formation from Ranjaka Pitta, because Pitta gives colour to the body.

According to modern view, the pigmented layer of epidermis of the skin is responsible for providing colour to the body. When the skin is exposed to sun rays, the colour of the skin is darkened. Similarly, the hemoglobin is also responsible for imparting colour to the body. The hemoglobin saturated with oxygen i.e. oxyhemoglobin gives redness to the body, while the carboxy hemoglobin gives bluish tinge to the skin and mucous membranes. Form this, it is inferred that it is responsible for colouring the body.

2) The Chetana (life) to the body is given by it :

It carries the life giving factor. This can easily be shown while considering the importance of Rakta in the brain. Being the seat of action, the mind controls all the activities of the body and adjusts it with external environment.

The nerves emerging and entering the brain and spinal cord conveys the impulses. Just as the rays of sun are being supported by sun similarly, the sense of perception and channels of sense of life are also being supported by brain (Ch..Si. 9/4).

If this important part of the body is only putrited by Rasa, it will be unable to do its functions. The Rakta which carries oxygen is only responsible for giving Chetana to that part. If the oxygen is not supplied even for a single moment, the cells of the brain begin to paralyze. So here it is a fact that of Prana Vayu is necessary for our body, especially to the brain. Seeing this fact Acharya Charaka has mentioned the symptoms of Shuddha Rakta that it invests the person with strength, complexion, happiness and long life. Life is upheld by Rakta.

Acharya mentioned that a person who has a clear complexion, senses, desires, sense pleasures has strength of unimpaired digestion, well built and strong, has been said to be having Shuddha (pure) Rakta.

3) It produces the Mamsa Dhatu :

Mamsa is produced by Rakta, this is clearly mentioned in Charaka and in other Ayurvedic classics. While commenting on this idea Chakrapanidatta put forward a different concept (which has been discussed earlier in the concept of Rakta formation).

The common concept granted by the majority, is that Rakta is first acted upon by Rakta Dhatwagni and from this Sukshma Māmsa is formed which receives its essential nutritional substances from Rasa. Thus formed Mamsa plays the important role of providing Lepana to the body.

According to the modern view, fibril is first formed; those million fibrils unite to form the fiber. Thus formed fibers are again united in thousands of numbers and form the muscles. These fibrils and fibers are connected with each other by connective tissues. The plasma and hemoglobin are primarily concerned with the formation of the body organs. These two main constituents correspond to Rasa and Rakta of Ayurvedic view.

4) The growth of all other Dhatu directly depends upon it :

Rasa is the primary Dhatu of the body. The nutrition and malnutrition of all other Dhatus depend upon Rasa, because the theory of "stage wise Dhatu formation" indicates that Rasa contains the nutrited substances needed by all other body Dhatus. But Rakta is considered to be responsible for the growth of Dhatus in proper proportion. Thus, it is derived that Rakta has its own importance which is not at all dependant on Rasa. Perhaps this is the reason that, Acharya Sushruta the best surgeon of his time, advised for the special care of Rakta.

Acharya mentioned that Rakta is the origin of the body, maintains its vitality and life and should be preserved with the greatest care. Its special property that it gives Prana to the body seems to be holding its whole importance. Acharya Charaka has mentioned that Rakta is site of Prana among the ten Pranayatanas.

When Prana Vayu will not be conveyed to the tissues, they will become unable to respire, with the result of instantaneous death, though Rasa is playing its function to give nutrition to them. Here, the modern and Ayurvedic concept exactly coincide with each other.

Vedanam denotes knowledge. Here it can be applied for the various diagnostic tests for Thalassemia. The diagnostic methods in Ayurveda are by means of Sabda Sparsa, Rupa, Rasa, Gandha i.e. Prathyaksha Pariksha and Anumana Pariksha which includes the provisional diagnosis.

Samsthana refers to the clinical manifestations of the disease. At this stage, Dosha Dushya Sammurchana would be completed and onset of disease would have commenced. The specialty of Thalassemia is that its progression adversely involves almost all the systemic processes. Thence the various symptoms may appear and persist throughout the lifetime one after another. The Rupas may change from time to time according to the progress or retrogress of the disease. The uniqueness of Thalassemia is that lies in the fact that, the symptoms change before and after blood transfusion.

Upadrava is a disease produced after the formation of main disease and it is dependent on the main disease whether Upadrava is major or minor. It is a secondary complication, produced by same Dosha that is responsible for formation of main disease. Thalassemia syndrome is followed by a spectrum of diseases after a period of clinical latency.

VRIDDHI, STHANA, KSHAYA :

This implies for the aggravating, static and reliving factors of disease. In short, it implies for Upas'ya and Anupas'ya. The factors which result in depletion of Dhatus and deterioration of Bala (Immunity) will enhance the disease progress. The use of Antioxidants, Hepatoprotectives, and Immunomodulators decreases the progression. The static stage can be managed by proper health care i.e. intake of proper diet (Decrease iron absorption & diet helpful for chelating extra iron from the body) and also give the psychological as well as psychosocial support etc.

Vyadhi Vyaktavastha :

Udarkam means the outcome of disease process. The Udarka of a Vyadhi is determined by considering following features.

(a) Number of prodromal symptoms appearing
(b) Severity of prodromal symptoms
(c) Involvement of Doshas and Dushyas in its Samprapti.
(d) Season
(e) Place
(f) Gati of Doshas

(g) Afflicted Vyadhimargas

(h) Afflicted organs

(i) Upadravas

(j) Response to medicines (Ch. Su. 10)

As per the severity of these features, the Vyadhi becomes Sadhya or Asadhya.

In case of Thalassemia, prodromal symptoms of the disease are similar to the symptoms of anemia. Nature of disease is progressive and due to repeated blood transfusions, severity also increases day by day. Continuous breakdown of RBCs leads to defective immune response of host that could create poor prognosis of disease.

According to Ayurved it may be Tridoshaja Vyadhi but the involvement of V&P are maximum and Saptadhatu are involved gradually. Acharya Sushruta mentions "YAKRIT PLEEHA SHONIT JO" *(*which means Liver and spleen are the main seat of Rakta formation) that is why ultimately these organs are also affected and Hepato- Spleenomegaly is seen practically.

Even though the disease allows the patient to prolong his life to a certain extent, the slightest cause will aggravate the disease. As the disease remains lodged in the Raktavaha Srotas and thereby gradually affects all the Dushyas and becomes deep seated, the outcome of disease is always poor. Moreover, the response of disease to medicines is also diminished.

Vyadhi Nam :

Acharyas named the diseases according to its

(1) Pratyatmalinga (Rupa)

(2) Involved Dosha and Dushyas (Samprapti Ghatakas)

(3) Adhisthana

Pratyatmalinga :

This is the specific symptom of particular disease. Pratiniyata laxana and Avyabhichari laxana are its synonyms. It indicates the Swarupa of Vyadhi. Prameha (Prakarshena Mehati) i.e. excessive micturition is the swarupa of that Vyadhi, Atisarana (Loose motion) is the pratiniyata laxana of Atisara.

In Thalassemia pratyatmalinga is Panduta (Discoloration of skin) and Raktalpata is the landmark of disease. Due to these features, it may be considered under Pandu Roga. In Ayurvedic literature, the classification of the disease is based on different aspects, color of skin is one of them.

The word Pandu derived from "Padi – Nashne" Dhatu by adding "Ku" Pratyaya in it. (Shabdakalpadruma, Part-3, Page 104). Meaning of it is always taken in sense of "Nashana". The disease Pandu is classified and named according to change in colour therefore Nashana will be of Varna or colour which is further approved by Charaka by the word "Vaivarna". Thus Pandu is such disease in which there is Vaivarna or change in normal colour of the body. After considering all these descriptions, one may find it difficult to decide about actual colour of Pandu varna, but if we give a due consideration to samprapti of Pandu by Charaka who has mentioned that in this disease kashaya or loss of varna or general complexion occurs. It is a fact that the natural complexion and redness of skin is maintained by proper blood flow through skin and when there is diminution in quality and quantity of blood, pallor in the skin follows. So in Pandu Roga, there is a lack of blood (Alpa-Rakta) which causes the pale colouration. This situation is same in Thalassemia. Improper formation of blood due to defective hemoglobin synthesis or globin chain defect leads to Panduta in Thalassemic patients. Pallor is seen because of deficiency of blood. RBC destruction occurs repeatedly which leads to iron deposition. It is maximum beneath the skin and develops bluish – black colour and excess bilirubin accumulation creates yellow colour. Ultimately, the skin becomes Greenish – Brown coloured. According to this description as well as transmission of disease (Inherited character) it may be named as Kulja Pandu in Bal / Anuvanshik Pandu in Bala.

Involvement of Dosha and Dushya:

Another criterion of naming is according to the pathogenesis of disease e.g. Rakta Pitta is named after the chiefly involved Dosha and Dushya in the disease. In Thalassemia during the study it is observed that Vatapitta Prakriti was found predominant. It may be due to vitiation of Vata and Pitta along with Sleshmakshaya. This disturb sleshma loses its preventive phenomenon as well as stabilizing character. Mainly affected Dhatu is Rasa and Rakta, so uttarotar Dhatu poshana becomes hampered and symptoms of Dhatukshaya develop. Rakta Dhatu involvement can be seen clearly in the form of Hepato-spleenomegaly. Yakrit and Pleeha are said to be fundamental organs of Rakta Dhatu formation.

Prakrita Shlesma is called as Bala (Prakratastu Balam Shlesma, Ch. Su.17 / 117). Bala is nothing but the Oja which is the ultimately product of Dhatu paka (Su. Su.15 / 19).

Oja is the essence of all bodily elements, responsible for Vyadhibala Virodhitva in body. The disease affects Ojas and thereby lastly Ojakshaya results. All the symptoms like Raktalpata, Alpamedaskata, Ojogunakshaya, Nihsara, & Sithilendriya described in the Samprapti of Pandu Roga are visible in the patient of Thalassemia and theses symptoms appear due to Dhatukshaya.

As per Dosha and Dushaya, the disease shows the involvement of all the three Doshas (V, P & K) with the Dhatukshaya. That's why we can understand, Thalassemia may be comes under the Anuvanshika Tridosaja Pandu. Tridosaja Pandu is the severest form of all the types of Pandu. Acharya Madhav called it Tyajya and the three symptoms like Arochaka, Ksheenata & Hatendriya are mostly seen in the Thalassemia.

Adhistthana:

The next criterion in naming a disease is according to its Adhisthtana. Grahani Roga has been named after its Adhistthana, Grahani. Adhisthana of Thalassemia is the Beejabhagavayava, which is responsible for the formation of Rakta-Dhatu .Hence the Vyadhi can also be named as Beejadushtijanya Pandu in Bala.

Even though the naming is based on these three criteria, it has been told by Acharyas, naming is not necessary, but the knowledge of involved Doshas, Dushyas, Agni, Srotas and other Samprapti Ghatakas are essential for therapeutic purpose (Ch. Su. 19.44)

Chikitsa :

Yogam implies planning of treatment i.e. stratagem of therapy. The treatment should be arranged in such a way as to deal with the problems of chronic, life threatening illness. Before starting treatment procedures disease must be studied first (A. S. Su. 23). Regarding ailments of Thalassemia, following points should be considered.

1) Pratyatmalinga of Thalassemia is Panduta. (Change skin colour)

2) Main feature of Thalassemia is Alparaktata.(Hb % decreases)

3) Manifestation of lakshanas is according to Srotodusti.

4) Status of Jatharagni and Dhatwagnis is very poor

5) All the Dushyas gradually undergo depletion in which prime importance is for Rasa-Dhatu & Rakta-Dhatu.

6) Involvement of Ama (As a chemical component of heme in hemoglobin iron is capable of carrying oxygen throughout the body. Behaving in this way, iron is a lifesaver. However, "free" or unbound iron can contribute to free radical development.)

7) Thalassemia may be a Apatarpanotha Vyadhi (In the classics,Ch. Su.23/5; Pandu comes under Santarpanajanya vikara but Thalassemia disease seems to differ from it because approximately all the features of Aptarpnotha Vyadhi like emaciation of body, reduction in digestive power, strength, complexion, oja muscle tissue, problems related with heart, pain in bones and joints are presents due to the vitiation of Vata Dosha.That's why Thalassemia may be comes under Aptarpan janya vikara.)

The treatment package must include

1) Nidana Parivarjana
2) Agni Sandeepana
3) Pachana
4) Sroto-anusari Chikitsa
5) Snehana
6) Balya
7) Brimhana
8) Jeevaneeya
9) Vayasthapana
10) Vrishya
11) Rasayana
12) Pandu Chikitsa
13) Apatarpanotha Vyadhi Chikitsa
14) Dosha Pratyaneeka Chikitsa
15) Raktadhatu vardhaka and Raktadhatu Sthapaka Chikitsa
16) Rakta Basti

(1) Nidana Parivarjana :

As told earlier, Thalassemia is an inherited or Kulaja / Sahaja disease, ultimate Nidana can not be discarded without modern therapy today, But an attempt should be made to maintain the equilibirium of vitiated Dosha, Dhatu, Mala and to prevent further vitiation. By this way, we can maintain the normalcy of these factors in patients and prevent complications.To avoid the Ahara-Vihara which causes Vata-Pitta Dushti and Raktadhatu Kshaya.

(2) Agni Vardhaka :

It has been postulated that Agni is the foundation stone for Bala, Ayu, Varna, Swasthya, Utsaha, Upachaya, Ojas and Prana (Ch. Chi.. 15-3) So for the maintenance of Bala, Ojas, Prana, Ayu etc, Agnivardhaka Chikitsa both at Jatharagni level as well as Dhatwagni level should be included. By Deepana and Pachana therapy the Agni will be stimulated there by enhancing the Dhatu Poshana.

(3) Sroto-anusari Chikitsa :

After the attainment of Agni, the importance should be given to Srotodusti. According to the difference in the manifestation symptoms varies. The disease manifests through Rasavaha, Raktavaha, Mamasvaha, Medavaha Majjavaha upto Sukravaha Srotas. Hence if the Lakshana appearing is of Raktavaha Srotodusti, the managent for that Srotas should be incorporated. For example in Yakrita-Pleehavriddhi i.e. one of the commonest Lakshana of this Vyadhi along with Pradhana Vyadhi Chikitsa (Raktavardhaka together with Raktakana sthapaka chikitsa) the treatment for Raktavaha Srotas should be done (Ch. Vi. 5). In Atisara Pure-eshavahasroto chikitsa should be included. Like wise, along with Pradhana Vyadhi chikitsa the Laxanika Chikitsa (Symptomatic treatment) also must be thought of.

(4) Santarpana Chikitsa :

This comprises the main treatment for the Vyadhi. In this Apatarpanotha Vyadhi Chikitsa, Vyadhikshamatva Janya Chikitsa, Dhatuposana Janya Chikitsa, have to be incorporated. Usage of Snehana, Balya, Brimhaneeya, Jeevaneeya, Vayasthapana, Vrishya, Rasayana drugs can be included.

(5) Dosha Pratyaneeka Chikitsa :

Diseases manifest when Doshas lose their rhythm. It is the Abyantara Hetu of disease. So treatment package should include the drugs for the maintenance of Doshic rhythm. Mainly Vata-Pitta Shamaka Chikitsa should be done.

(6) Raktadhatu vardhaka along with Raktadhatu sthapaka chikitsa :

Some drugs mentioned in our classics act on Rakta Dhatu. These drugs might act by their Panchabhautik configuration that is similar to the configuration of Rakta Dhatu. (Sarvada Sarva Bhavanam Samanyam Vriddhi Karanam, Ch.su.1/44).

INDIVIDUAL DRUGS REPORTED BY VARIOUS SCHOLARS OF AYURVEDA MAY BE USED AS RASAYANA

Abutilon indicum (Atibala)	Aegle mermalos (Bilva)	Aloe vera (Kumari)	Azadirachtia Indica (Nimba)
Asparagus racemosus (Satavari)	Acorus calamus (Vaca)	Adathoda vasica (Vasa)	Acacia catechu (Khadira)
Allium sativum (Lasuna)	Bacopa monnieri (Brahmi)	Bitumen (Silajatu)	Butea frondosa (Palasa)
Boerhavia diffusa (Punarnava)	Curcuma longa (Haridra)	Centella asiatica (Manduka parni)	Cyperus rotundus (Musta)
Cinnamomum zylanicum (Twak)	Curculigo orchioides (Musali)	Cissampelos pareria (Patha)	Dioscorea bulbifera (Varahikanda)
Emblica officinalis (Amalaki)	Embelia ribes (Vidanga)	Gloriossa superba (Langali)	Hemedesmus indicus (Sariba)
Hydnocarpus laurifolia (Tuvarak)	Microstyllis musifera (Jivaka)	Momordica charantia (Karavella)	Microstyllis wallichi (Rshabhak)
Mucuna prurita (Swayamgupta)	Marsdenia tenassima (Murva)	Plumbago zylanica (Chitrak)	Piper longum (Pippali)
Premna integrifolia (Agnimantha)	Stereospermum suvaelones (Patala)	Sida cordifolia (Bala)	Semicarpus anacardium (Ballatak)
Solanum indicum (Brihati)	Solanum xanthocarpa (Kantakari)	Oroxylem indicum (Syonaka)	Terminalia chebula (Haritaki)
Tinospora cordifolia (Guduchi)	Vettivira zizanoides (Usira)	Vitis vinifera (Draksha)	Withania somnifera (Aswagandha)
Gmelina arbora (Kasmari)	Leptadena reticulata (Jivanti)	Psoralia cordifolia (Bakuchi)	Eclipta alba (Bhringaraj)

Some Hepatoprotective drugs:

A scientific study was done in Banaras hindu university to know the mechanism of action and important active constituents of eight drugs which act on liver disorder:

DRUGS	LATIN NAME
Katuki	Picrorhiza kuroa Royle ex Benth
Guduchi	Tinospora cordifolia wild Miers
Bhumyamalki	Phyllanthus amarus Linn
Daruharidra	Berberis aristata DC
Bhringraja	Eclipta alba Hassk
Haridra	Curcuma longa Linn
Punarnava	Boerhavia diffusa Linn
Kalmegh	Andrographis paniculata Benth

MODERN REVIEW:-

Thalassemia

Thalassemia is the commonest of the genetic disorders. Most of the initial literature about it comes from Europe and North America. Although the credit for first clear- cut description of Thalassemia must undoubtedly go to Thomas B. Cooley (and his colleague Pearl Lee) in 1925, the earliest description of features similar to Thalassemia existed in Hippocrate's "Coan Prognosis". Thalassemia bony changes have been found in the skulls of mummies which are well preserved in ancient burial places**.**

The historical development of Thalassemia falls into 4 phases:

1. Phase - 1 (1925 - 1940): During this period, the clinical feature major, Intermedia and minor were recognized.

2. Phase–2 (1940 – 1950): During this period, the exact inheritance of Thalassemia and its genetic basis were found out.

3. Phase–3 (1950–1960): During this period, the widespread geographical distribution of Thalassemia was realized which was otherwise thought to be localized to the Mediterranean region. At the same time the various diverse types were realized, e.g., beta, alpha, gamma, and so on.

4. Phase – 4 (1960 – 1985) : This is the period, during which the nature of molecular defects underlying Thalassemia were spotted .The antenatal diagnosis of Thalassemia came up and this gave the goal of controlling the birth of Thalassemia major. The scientific treatment of Thalassemia major using the hypertransfusion regimen, subcutaneous desferal and marrow transplantation also evolved during this era.

INCIDENCE :

As per WHO estimate 4.5% of the word's populations are carriers of Haemoglobinopathies. The largest concentration of Thalassemia patients is seen in South East Asia, Sri Lanka, Bangladesh, North West India, Pakistan, Middle East countries, North Africa, Greece and Italy. Frequency of Thalassemia gene in Indian population varies between 0-17% in different ethnic groups with average of over 3%. Its prevalence is high among Gujaratis, Punjabis, Sindhis, and Lohanas etc. Over 30 million people are carriers of Thalassemia gene in our country. Ten thousand Thalassemic children are born per year in India

Why is it common in some parts of the world or certain communities?

There is a hypothesis that thousands of years ago, certain parts of world were endemic for Malaria. People used to die of Malaria (Plasmodium Falciparum). A genetic mutation took place and the people with ß Thalassemia gene used to survive. The Geographic distribution of ß Thalassemia follows that of Malaria. It has been suggested that Thalassemia exerted a protective effect against Plasmodium Falciparum. Low concentration of Hb in Thalassemic cells provides a protective effect

Cooley and lee in 1925, described children having anemia, large liver and spleen, dark yellowish brown skin without any bile in the urine.

Thalassemia (American English) or thalassaemia (British English) is a recessive trait inherited disease of the red blood cells. In thalassemia, the genetic defect results in reduced rate of synthesis of normal hemoglobin chains. Thalassemia is a type of hemoglobinopathy, a generic term for any structural abnormality of hemoglobin, including thalassemia, sickle cell anemia, Hemoglobin E, and thousands of other hemoglobin changes. The blood cells are vulnerable to mechanical injury and therefore have a shortned survival time. Blood transfusions on a regular basis may be necessary to maintain an acceptable hemoglobin concentration. Allogeneic stem cell transplants can be performed to prevent the complications of chronic transfusion: iron

accumulation. Stem cell transplantation for thalassemia is usually performed after age three, when a child's immune system is more fully developed.

The disease's geographical association with the Mediterranean sea was responsible for its naming: Thalassa is Greek for the sea, Haima is Greek for blood. Thalassemia occurs in all populations and ethnic groups, however the prevalence differs among different populations. Thalassemia may protect from malaria infections, explaining its geographic distribution.

MUTATION:

This term refer to the permanent change in the DNA. Those that affect the germ cells are transmitted to the progeny and may give rise to inherited disease. Mutations in the somatic cells are not transmitted to the progeny. Mutation occurs by any three mechanisms, substitution, deletion and insertion.

MODE OF TRANSMISSION :

Thalassemia is an inherited disease, which means it is passed on from parents to their child through their genes. It is not infectious and cannot be “caught” like a cold. It will not develop later in life, nor can a child outgrow it. Both parents must have Thalassemia trait in order to pass the disease on to their child, but it only takes one parent to pass trait on to his/her child. Thalassemia trait will never develop into disease. Thalassemia trait can be passed on for many generations without being detected before a child is born with disease. The probabilities to get Thalassemia exist for each child independently of what happened with prior children the couple may have had. In other words, each new child has a one-in-four chance of having severe Thalassemia. The inheritance of Thalassemia genes is purely a matter of chance and cannot be altered. For example if a Thalassemic gets married with normal, all the children will be healthy carriers. They must inherit a Thalassemia gene from their Thalassemic parent, but they must also inherit a normal gene from the normal parent, so none of them can possibly have Thalassemia major. If a Thalassemic marries with a Thalassemia carrier, in each pregnancy there is a 50% chance that the child will be Thalassemic, and a 50% chance that it will be a healthy carrier.

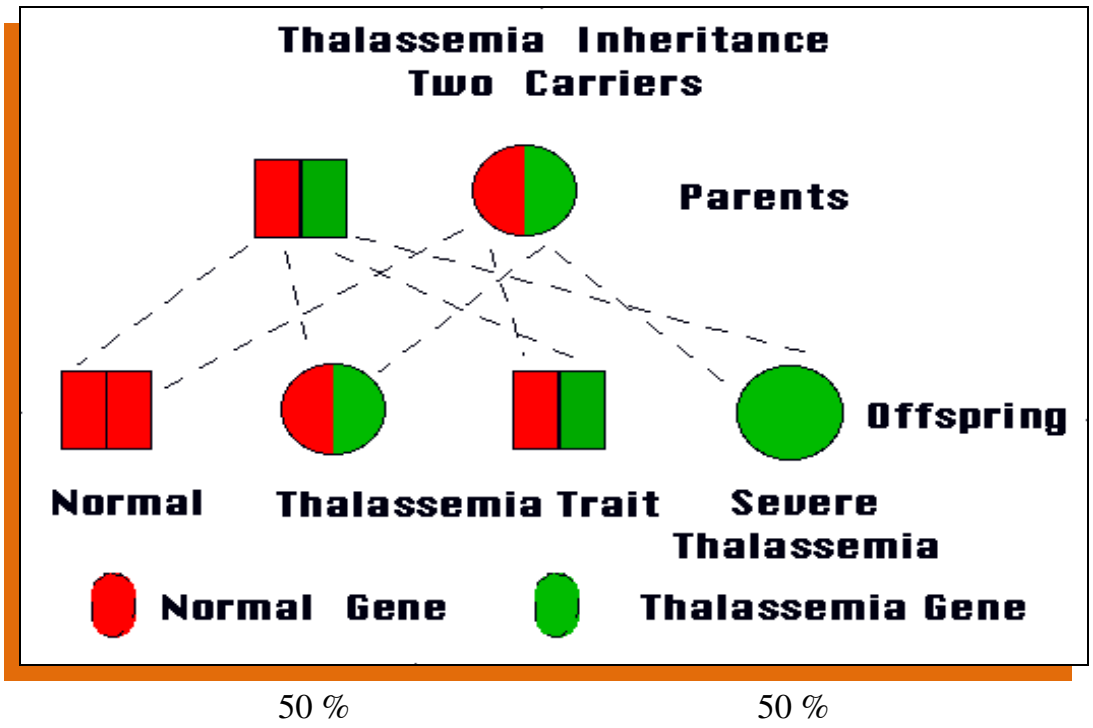


Figure: 1 (Mode of transmission of disease Thalassemia)

Thalassemia is a heterogeneous group of genetic disorders of Hb synthesis characterized by a lack or decreased synthesis of globin chain. Globin is the protein part of Hemoglobin. Like all proteins, the "blueprint" for hemoglobin exists in DNA (the material that makes up genes). Normally, an individual has four genes that code for the α protein, or α chain. Two other genes code for the β chain. (Two additional genes code for the gamma chain in the fetus). The α chain and the β chain are made in precisely equal amounts, despite the differing number of genes. The protein chains join in developing red blood cells, and remain together for the life of the red cells.

With the exception of the very first weeks of embryogenesis, one of the globin chains is always α. A number of variables influence the nature of the non-α chain in the hemoglobin molecule. The fetus has a distinct non-α chain called gamma. After birth, a different non-α globin chain, called β, pairs with the α chain. The combination of two α chains and two non-α chains produces a complete hemoglobin molecule (four chains per molecule).

The combination of two α chains and two gamma chains form "fetal" hemoglobin, termed "Hemoglobin F". With the exception of the first 10 to 12 weeks after conception, fetal hemoglobin is the primary hemoglobin in the developing fetus. The combination of two α chains and two β chains form "adult" hemoglobin, also called "hemoglobin A". Although hemoglobin A is called "adult", it becomes the predominant within about 18 to 24 weeks of birth.

The pairing of one α chain and one non- α chain produces a hemoglobin dimer (two chains). The hemoglobin dimer does not efficiently deliver oxygen, however. Two dimers combine to form a hemoglobin tetramer, which is the functional form of hemoglobin. Complex biophysical characteristics of the hemoglobin tetramer permit the exquisite control of oxygen uptake in the lungs and release in the tissues that is necessary to sustain life. The genes that encode the α globin chains are on chromosome 16 (Figure 2) those that encode the non-α globin chains are on chromosome 11. Multiple individual genes are expressed at each site. Pseudogenes are also present at each location. The α complex is called the "α globin locus", while the non-α complex is called the "β globin locus". The expression of the α and non-α genes is closely balanced by an unknown mechanism. Balanced gene expression is required for normal red cell function. Disruption of the balance produces a disorder called Thalassemia.

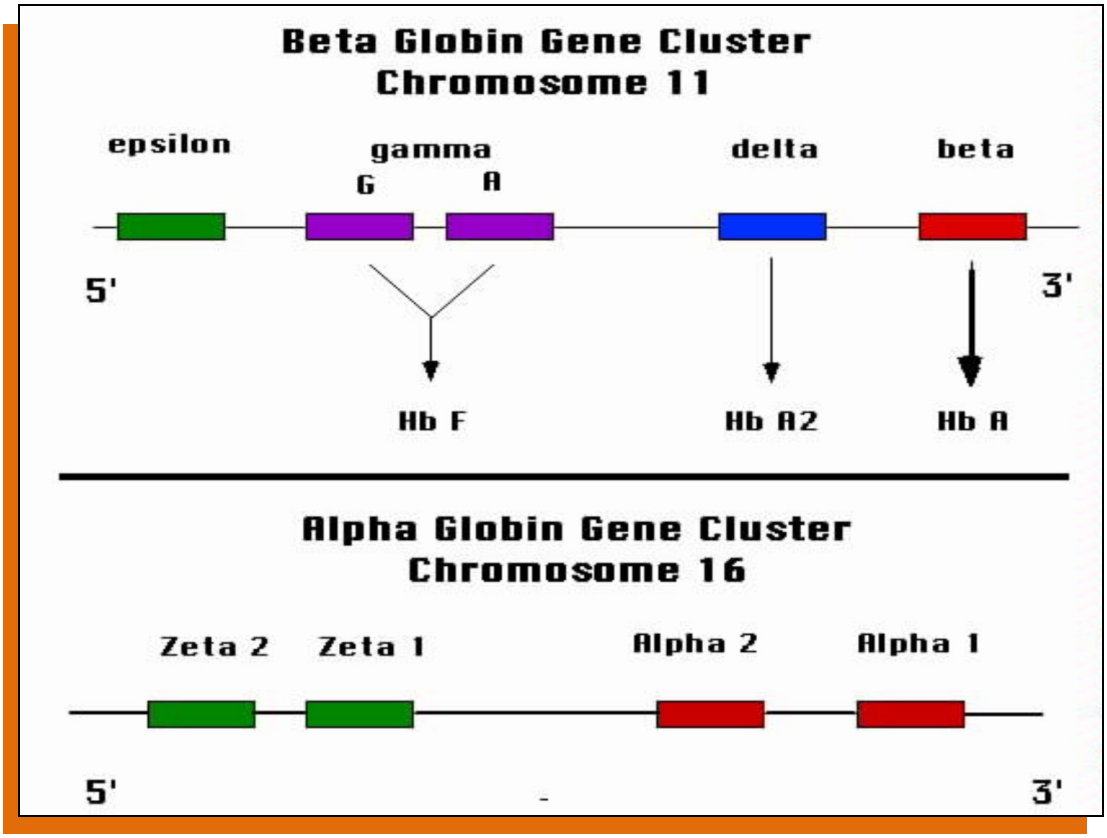


Figure 2. This show the Schematic representation of the globin gene loci. The lower panel shows the α globin locus that resides on chromosome 16. Each of the four α globin genes contributes to the synthesis of the α globin protein. The upper panel shows the β globin locus. The two gamma globin genes are active during fetal growth and produce hemoglobin F. The "adult" gene, β, takes over after birth.

α GLOBIN LOCUS :

Each chromosome 16 has two α globin genes that are aligned one after the other on the chromosome. For practical purposes, the two α globin genes (termed α 1 and α 2) are identical. Since each cell has two chromosomes 16, a total of four α globin genes exist in each cell. Each of the four genes produces about one-quarter of the α globin chains needed for hemoglobin synthesis. The mechanism of this coordination is unknown. Promoter elements exist 5' to each α globin gene. In addition, a powerful enhancer region called the locus control region (LCR) is required for optimal gene expression. The LCR is many kilobases upstream of the α globin locus. The mechanism by which DNA elements are so distant from the genes control

their expression is the source of intense investigation. The transiently expressed embryonic genes that substitute for α very early in development, designated zeta, are also in the α globin Locus.

β GLOBIN LOCUS :

The genes in the β globin locus are arranged sequentially from 5' to 3' beginning with the gene expressed in embryonic development (the first 12 weeks after conception; called episolon). The β globin locus ends with the adult β globin gene. The sequence of the genes is: epsilon, gamma, delta, and β. There are two copies of the gamma gene on each chromosome 11. The others are present in single copies. Therefore, each cell has two β globin genes, one on each of the two chromosomes 11 in the cell. These two β globin genes express their globin protein in a quantity that precisely matches that of the four α globin genes. The mechanism of this balanced expression is unknown.

ONTOGENY OF HEMOGLOBIN SYNTHESIS :

Human Hemoglobins

Embryonic hemoglobins	Fetal hemoglobin	Adult hemoglobins
Gower 1- zeta(2), epsilon(2) gower 2- (2), epsilon (2) Portland- zeta(2), gamma (2)	hemoglobin F- (2), gamma(2)	Hemoglobin A- (2), β (2) hemoglobin A2- (2), delta(2)

The globin genes are activated in sequence during development, moving from 5' to 3' on the chromosome. The zeta gene of the α globin gene cluster is expressed only during the first few weeks of embryogenesis. Thereafter, the α globin genes take over. For the β globin gene cluster, the epsilon gene is expressed initially during embryogenesis. The gamma gene is expressed during fetal development. The

combination of two α genes and two gamma genes form fetal hemoglobin or hemoglobin F. Around the time of birth, the production of gamma globin declines in concert with a rise in β globin synthesis. A significant amount of fetal hemoglobin persists for seven or eight months after birth. Most people have only trace amounts, if any, of fetal hemoglobin after infancy. The combination of two α genes and two β genes comprises the normal adult hemoglobin, hemoglobin A. The delta gene, which is located between the gamma and β genes on chromosome 11, produces a small amount of delta globin in children and adults. The product of the delta globin gene is called hemoglobin A2, and normally comprises less than 3% of hemoglobin in adults, is composed of two α chains and two delta chains.

On the basis of genetic abnormality classification of Thalassemia are as follows:

Classification

- α thalassemia
- β thalassemia
- Delta (δ) thalassemia
- In combination with other hemoglobinopathies

The thalassemias are classified according to which chain of the globin molecule is affected: in α thalassemia, the production of α globin is deficient, while in β thalassemia the production of β globin is defective. Thalassemia produces a deficiency of α or β globin, unlike sickle-cell disease which produces a specific mutant form of β globin.

α thalassemia
β thalassemia

- Thalassemia trait
- Thalassemia intermedia
- Thalasemmis major
- Hemoglobin E thalassemia

Alpha (α) thalassemias

The alpha thalassemias involve the genes HBA1 and HBA2 inherited in a Mendelian recessive fashion. It is also connected to the deletion of the 16p chromosome. α thalassemias result in decreased alpha-globin production, therefore fewer alpha-globin chains are produced, resulting in an excess of β chains in adults and excess γ chains in newborns. The excess β chains form unstable tetramers (called hemoglobin H) that have abnormal oxygen dissociation curves.

There are four genetic loci for α globin, two of which are maternal in origin and two of which are paternal in origin. The more of these loci that are deleted or affected by mutation, the more severe will be the manifestations of the disease:

- If all four loci are affected, the fetus cannot live once outside the uterus and may not survive gestation: most such infants are dead at birth with hydrops fetalis, and those who are born alive die shortly after birth. They are edematous and have little circulating hemoglobin, and the hemoglobin that is present is all tetrameric γ chains (hemoglobin Barts). Usually, this involves homozygous inheritance of an alpha thalassemia trait, type 1.

- If three loci are affected, Hemoglobin H disease results. Two unstable hemoglobins are present in the blood, both hemoglobin Barts (tetrameric γ chains) and hemoglobin H (tetrameric β chains). There is a microcytic hypochromic anemia with target cells and Heinz bodies (precipitated Hb H) on the peripheral blood smear. The disease may first be noticed in childhood or in early adult life, when the anemia and splenomegaly are noted. This is usually due to compound heterozygous inheritance of alpha thalassemia type 1 and type 2 traits.

- If two of the four α loci are affected, alpha thalassemia trait, type 1 results. Two α loci permit nearly normal erythropoiesis, though there is a mild microcytic hypochromic anemia. There is a high prevalence (about 30%) of deletion of one of the two α loci on chromosomes of people of recent African origin, and so the inheritance of two such chromosomes is not uncommon. The

disease in this form can be mistaken for iron deficiency anemia and treated inappropriately with iron. Two modes of alpha thalassemia trait, type 1 has been noted. One involves cis deletion of two alpha loci on the same chromosome; another involves trans deletion of allelelic genes on homologous chromosomes no. 16.

- If one of the four α loci is affected, alpha minor or alpha+ thalassemia trait or alpha thalassemia trait, type 2 results and there is minimal effect. Three α-globin loci are enough to permit normal hemoglobin production, and there is no anemia or hypochromia in these people. They have been called α thalassemia carriers.

Beta (β) thalassemias

Beta thalassemia (Cooley's Anemia) is due to mutations in the HBB gene on chromosome 11 (Online Mendelian Inheritance in Man, OMIM (TM). Johns Hopkins University, Baltimore, MD. MIM Number: 141900. World Wide Web URL: http://www.ncbi.nlm.nih.gov/omim/), also inherited in a Mendelian recessive fashion.[4] In β thalassemia, a decrease in beta-globin production occurs, causing a less-than-normal amount of beta-globin chains to be made. This results in a relative excess of α chains, but these do not form tetramers: rather, they bind to the red blood cell membranes producing membrane damage, and at high concentrations have the tendency to form toxic aggregates. The severity of the damage depends on the nature of the mutation. Some mutations (β^o) prevent any formation of β chains; others (β^+) allow some β chain formation to occur. Recently, increasing reports suggest that up to 5% of patients with beta-thalassemias produce fetal hemoglobin (HbF), and use of hydroxyurea also has a tendency to increase the production of HbF, by as yet unexplained mechanisms.

Any given individual has two β globin alleles, one from their mother and one from their father:

- If both have thalassemia mutations, a severe microcytic, hypochromic anemia called β thalassemia major or Cooley's anemia results. Untreated, this results

in death before age twenty: treatment consists of periodic blood transfusion; splenectomy if splenomegaly is present, and treatment of transfusion-caused iron overload. Cure is possible by bone marrow transplantation.

- If only one β globin allele bears a mutation, β thalassemia minor results (sometimes referred to as β thalassemia trait). This is a mild anemia with microcytosis. Symptoms include weakness and fatigue - in most cases β thalassemia minor may be asymptomatic and many people may be unaware they have this disorder. Detection usually involves counting the mean corpuscular volume (size of red blood cells) and noticing a slightly decreased mean volume than normal.

- Thalassemia intermedia is a condition intermediate between the major and minor forms. Sufferers can often manage a normal life but may need occasional transfusions e.g. at times of illness or pregnancy. This really depends on the severity of their anemia.

The actual genetic cause of β thalassemias are actually very diverse and a number of different mutations can cause reduced or absent β globin synthesis. Usually, superscripts 0 and + are added to β to indicate complete absence, and deficient synthesis of β globins respectively.

Mainly there are two forms of genetic defects which produce β thalassemias:

- Nondeletion forms: These defects generally involve a single base substitution or small deletion or inserts near or upstream of the β globin gene. Most commonly, mutations occur in the promoter regions preceding the beta-globin genes. Less often, abnormal splice variants are believed to contribute to the disease.

- Deletion forms: Deletions of different sizes involving the β globin gene produce different syndromes such as (β^o) or hereditary persistence of fetal hemoglobin syndromes.

Delta (δ) thalassemia

As well as alpha and beta chains being present in hemoglobin about 3% of adult hemoglobin is made of alpha and delta chains. Just as with beta thalassemia, mutations can occur which affect the ability of this gene to produce delta chains. A mutation that prevents formation of any delta chains is termed a delta^{0} mutation, whereas one that decreases but does not eliminate production of delta chain is termed a delta^{+} mutation. When one inherits two delta^{0} mutations, no hemoglobin A2 (alpha2,delta2) can be formed. Hematologically, however, this is innocuous because only 2-3% of normal adult hemoglobin is hemoglobin A2. The individual will have normal hematological parameters (erythrocyte count, total hemoglobin, mean corpuscular volume, red cell distribution width). Individuals who inherit only one delta thalassemia mutation gene will have a decreased hemoglobin A2, but also no hematological consequences. The importance of recognizing the existence of delta thalassemia is seen best in cases where it may mask the diagnosis of beta thalassemia trait. In beta thalassemia, there is an increase in hemoglobin A2, typically in the range of 4-6% (normal is 2-3%). However, the co-existence of a delta thalassemia mutation will decrease the value of the hemoglobin A2 into the normal range, thereby obscurring the diagnosis of beta thalassemia trait. This can be important in genetic counseling, because a child who is the product of parents each of whom has beta^{0} thalassemia trait has a one in four chance of having beta thalassemia major.

In combination with other hemoglobinopathies, Thalassemia can co-exist with other hemoglobinopathies. The most common of these are:

- hemoglobin E/thalassemia: common in Cambodia, Thailand, and parts of India; clinically similar to β thalassemia major or thalassemia intermedia.
- hemoglobin S/thalassemia, common in African and Mediterranean populations; clinically similar to sickle cell anemia, with the additional feature of splenomegaly
- hemoglobin C/thalassemia: common in Mediterranean and African populations, hemoglobin C/β^{o} thalassemia causes a moderately severe

hemolytic anemia with splenomegaly; hemoglobin C/β^+ thalassemia produces a milder disease.

Causes & Development :

Genetic Classification of the Thalassemias:

- **Alpha Thalassemia.** Alpha thalassemia occurs when one or more of the four alpha chain genes fails to function. Alpha chain protein production, for practical purposes, is evenly divided among the four genes. With alpha thalassemia, the failed genes are almost invariably lost from the cell due to a genetic accident.

    a) The loss of one gene diminishes the production of the alpha protein only slightly. This condition is so close to normal that it can be detected only by specialized laboratory techniques which, until recently, were confined to research laboratories. A person with this condition is called a "silent carrier" because of the difficulty of detection.

    b) The loss of two genes (two-gene deletion alpha thalassemia) produces a condition with small red blood cells, and at most a mild anemia. People who have this condition look and feel normal, butt the condition can be detected by routine blood testing.

    c) The loss of three alpha genes produces a serious hematological problem (three-gene deletion alpha thalassemia). Patients with this condition have a severe anemia, and often require blood transfusions to survive. The severe imbalance between the alpha chain production (now powered by one gene, instead of four) and beta chain production (which is normal) causes an accumulation of beta chains inside the red blood cells. Normally, beta chains pair only with alpha chains. With three-gene deletion alpha thalassemia, however, beta chains begin to associate in groups of four, producing an abnormal hemoglobin, called "hemoglobin H". The condition is called "hemoglobin H disease". Hemoglobin H has two problems. First it does not carry oxygen properly, making it functionally useless to the cell. Second, hemoglobin H protein damages the membrane that surrounds

the red cell, accelerating cell destruction. The combination of the very low production of alpha chains and destruction of red cells in hemoglobin H disease produces a severe, life-threatening anemia. Untreated, most patients die in childhood or early adolescence.

d) The loss of all four alpha genes produces a condition that is incompatible with life. The gamma chains produced during fetal life associate in groups of four to form an abnormal hemoglobin called "hemoglobin Barts". Most people with four-gene deletion alpha thalassemia die in utero or shortly after birth. Rarely, four-gene deletion alpha thalassemia has been detected in utero, usually in a family where the disorder occurred in an earlier child. In utero blood transfusions have saved some of these children. These patients require life long transfusions and other medical support.

- **Beta Thalassemia.** The fact that there are only two genes for the beta chain of hemoglobin makes beta thalassemia a bit simpler to understand than alpha thalassemia. Unlike alpha thalassemia, beta thalassemia rarely arises from the complete loss of a beta globin gene. The beta globin gene is present, but produces little beta globin protein. The degree of suppression varies. Many causes of suppressed beta globin gene expression have been found. In some cases, the affected gene makes essentially no beta globin protein (beta-(zero)-thalassemia). In other cases, the production of beta chain protein is lower than normal, but not zero (beta-(plus)-thalassemia). The severity of beta thalassemia depends in part on the type of beta thalassemic genes that a person has inherited

    a) One-gene beta thalassemia has one beta globin gene that is normal, and a second, affected gene with a variably reduced production of beta globin. The degree of imbalance with the alpha globin depends on the residual production capacity of the defective beta globin gene. Even when the affected gene produces no beta chain, the condition is mild since one beta gene functions normally. The red cells are small and a mild anemia may exist. People with the condition generally have no symptoms. The condition can be detected by a routine laboratory blood evaluation. (Note that in many ways, the one-gene beta thalassemia and the two-gene alpha

thalassemia are very similar, from a clinical point of view. Each results in small red cells and a mild anemia).

b) Two-gene beta thalassemia produces a severe anemia and a potentially life-threatening condition. The severity of the disorder depends in part on the combination of genes that have been inherited: beta-zero-thal/ beta-zero-thal; beta-zero-thal/ beta-plus-thal; beta-plus-thal/ beta-plus-thal. The beta-plus-thalassemia genes vary greatly in their ability to produce normal hemoglobin. Consequently, the clinical picture is more complex than might otherwise be the case for three genetic possibilities outlined.

Clinical Classification of the Thalassemias:

- **Alpha thalassemia.** Alpha thalassemia has four manifestations, correlating with the number of defective genes. Since the gene defect is almost invariably a loss of the gene, there are no "shades of function" to obscure the matter as occurs in beta thalassemia.

  a) **Silent carrier state**. This is the one-gene deletion alpha thalassemia condition. People with this condition are hematologically normal. They are detected only by sophisticated laboratory methods.

  b) **Mild alpha-thalassemia**. These patients have lost two alpha globin genes. They have small red cells and a mild anemia. These people are usually asymptomatic. Often, physicians mistakenly diagnose people with mild alpha-thalassemia as having iron deficiency anemia. Iron therapy, of course, does not correct the anemia.

  c) **Hemoglobin H disease**. These patients have lost three alpha globin genes. The result is a severe anemia, with small, misshapen red cells and red cell fragments. These patients typically have enlarged spleens. Bony abnormalities particularly involving the cheeks and forehead are often striking. The bone marrow works at an extraordinary pace in an attempt to compensate for the anemia. As a result, the marrow cavity within the bones is stuffed with red cell precursors. These cells gradually cause the

bone to "mold" and flair out. Patients with hemoglobin H disease also develop large spleens. The spleen has blood forming cells, the same as the bone marrow. These cells become hyperactive and over expand, just as those of the bone marrow. The result is a spleen that is often ten-times larger than normal. Patients with hemoglobin H disease often are small and appear malnourished, despite good food intake. This feature results from the tremendous amount of energy that goes into the production of new red cells at an extremely accelerated pace. The constant burning of energy by these patients mimics intense aerobic exercise; exercise that goes on for every minute of every day.

d) **Hydrops fetalis**. This condition results from the loss of all four alpha globin genes. The affected individual usually succumbs to the severe anemia and complications before birth.

- **BetaThallasemia**

a) Thalassemia minor, or thalassemia trait. These terms are used interchangeably for people who have small red cells and mild (or no) anemia due to thalassemia. These patients are clinically well, and are usually only detected through routine blood testing. Physicians often mistakenly diagnose iron deficiency in people with thalassemia trait. Iron replacement does not correct the condition. The primary caution for people with beta-thalassemia trait involves the possible problems that their children could inherit if their partner also has beta-thalassemia trait. These more severe forms of beta-thalassemia trait are outlined below.

b) Thalassemia intermedia. Thalassemia intermedia is a confusing concept. The most important fact to remember is that thalassemia intermedia is a description, and not a pathological or genetic diagnosis. Patients with thalassemia intermedia have significant anemia, but are able to survive without blood transfusions. The factors that go into the diagnosis are the degree to which the patient tolerates the anemia and the threshold of the physician to transfuse patients with thalassemia.

With regard to the tolerance of the anemia, most patients with thalassemia have substantial symptoms with a Hemoglobin of much below 7 or 8gm/dl. With hemoglobins of this level, excess energy consumption due to the profound hemolysis can produce small stature, poor weight gain, poor energy levels, and susceptibility to infection. Further, the extreme activity of the bone marrow produces bone deformities of the face and other areas, along with enlargement of the spleen. The long bones of the arms and legs are weak and fracture easily. Patients with this clinical condition usually do better with regular transfusions. The need for regular transfusions would then place them under the heading of thalassemia major (see below). On the other hand, some patients with marked thalassemia can maintain a hemoglobin of about 9-10gm/dl. The exercise tolerance of these patients is significantly better.

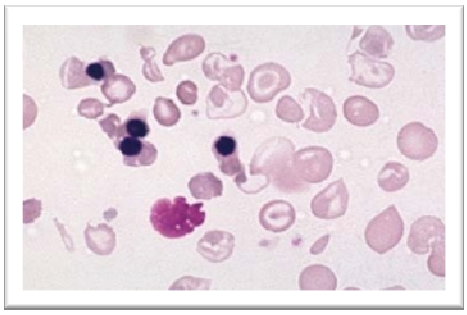
The question then becomes whether the accelerated bone marrow activity needed to maintain this level of hemoglobin causes unacceptable side-effects such as bone abnormalities or an enlarged spleen. This is a judgment decision. A given patient at the critical borderline would be transfused by some physicians to prevent these problems, even if they are slight. The patient then would be clinically classified as having thalassemia major. Another physician might choose to avoid the complications of chronic transfusion. The same patient then would be clinically classified as thalassemia intermedia. The patient has thalassemia that is more severe than thalassemia trait, but not so severe as to require chronic transfusion as do the patients with thalassemia major.

A patient can change status, and the spleen is enlarged in these patients. The spleen plays a role in clearing damaged red cells from the blood stream. Since all of the red cells in patients with severe thalassemia have some degree of damage, clearance by the spleen accelerates the rate of cell loss. Therefore the bone marrow has to work harder to replace these cells. In some patients, removal of the spleen slows the rate of red cell destruction just enough, that they can manage without transfusion, and still

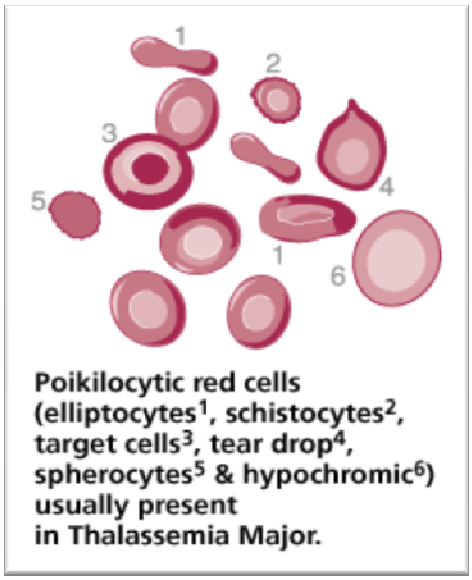
not have the unacceptable side-effects. In this case, the patient converts clinically from thalassemia major to thalassemia intermedia.

c) Thalassemia major. This is the condition of severe thalassemia in which chronic blood transfusions are needed. In some patients the anemia is so severe, that death occurs without transfusions. Other patients could survive without transfusions, for a while, but would have terrible deformities. While transfusions are life-saving in patients with thalassemia major, transfusions ultimately produce iron overload. Chelation therapy, usually with the iron-binding agent, desferrioxamine (Desferal), is needed to prevent death from iron-mediated organ injury.

Blood smear, ß-thalassemia major - High power



Nucleated red cell, Target cell



Treatment of Thalassemia

Thalassemia minor and most cases of Thalassemia Intermedia do not require transfusion therapy. Yet, Thalassemia Major, whether due to homozygous Beta° Thalassemia or some (not all) HbH disease, requires careful treatment with a combination of transfusion and chelation therapy. The chelation therapy is extremely important because cases of Thalassemia Major may have clinically significant iron overload by the first year or two of life. In the past few years, hydroxyurea, sometimes together with recombinant erythropoietin, has been used to encourage the production of larger amounts of HbF which ameliorates the disease. By raising the level of HbF, some patients with Thalassemia Major and others with homozygous sickle disease have had transfusion requirements dramatically reduced. The use of bone marrow and stem cell transplants have been reported with some success. Unfortunately, such transplants are subject to severe problems with Graft-versus-Host disease and are not yet considered standard therapy.

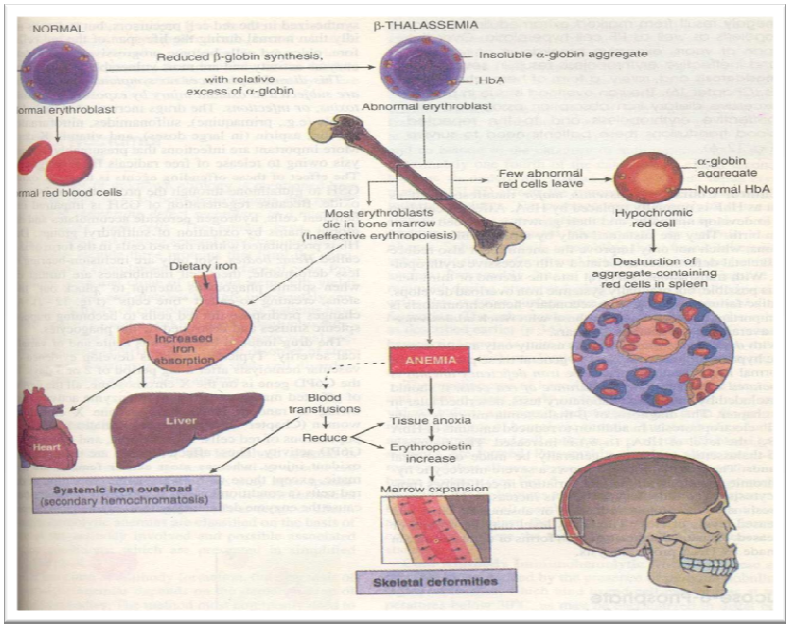


Figure – Pathogenesis of ß- Thalassemia major. Note that aggregate of excess œ-globin are not visible on routine blood smears. Blood transfusion, on the one hand, correct the anemia and reduce stimulus for erythropoietin secretion and deformities induced bone marrow expansion; on the other hand , they add to systemic iron overload.

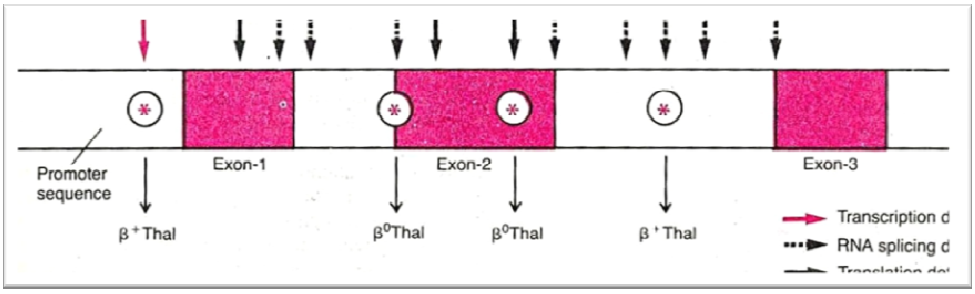


Figure - Diagrammatic representation of β- globin gene and some site where point mutation giving rise to β- Thalassemia have been localized

Investigation :

Mean corpuscular volume

Hemoglobin A2

Hemoglobin F

Mean corpuscular volume

The accuracy of the mean corpuscular volume (MCV) < 80 fl for Thalassemia traits (defined as hemoglobin A2 4.1–9.0%) is:[5]

- sensitivity = 93%
- specificity = 84%

Hemoglobin A2

The accuracy of an elevevated hemoglobin A2 at detecting abnormal DNA testing is uncertain. There are several situations in which its value will be normal:

- Specific mild mutations such as the Beta+ IVS-1 nt6 mutation
- In delta beta-thalassemia, creation of Hemoglobin A2 is impaired due to delta.
- The triple alpha globin arrangement.
- Silent beta thalassemia, which also has mean corpuscular volume. The most common mutation for this is the -101 C to T substitution with the distal CACC box.

Prevalence

The estimated prevalence is 16% in people from Cyprus, 3-14% in Thailand, and 3-8% in populations from India, Pakistan, Bangladesh, and China. There are also prevalences in descendants of people from Latin America, the Caribbean, and Mediterranean countries (e.g. Spain). A lower prevalence has been reported from black people in Africa (0.9%) and northern Europe (0.1%).(4)

Treatment and complications

Anyone with thalassemia should consult a properly qualified hematologist.

Thalassemias may co-exist with vitamin deficiencies such as folic acid (or folate, a B-complex vitamin) and iron deficiency (only in Thalassemia Minor). Thalassemia patients may also demonstrate iron overload due to concomitantly inherited defects in the iron regulatory system.

Thalassemia prevention and management

α and β thalassemias are often inherited in an autosomal recessive fashion although this is not always the case. Reports of dominantly inherited α and β thalassemias have been reported the first of which was in an Irish family who had a two deletions of 4 and 11 bp in exon 3 interrupted by an insertion of 5 bp in the β-globin gene. For the autosomal recessive forms of the disease both parents must be carriers in order for a child to be affected. If both parents carry a hemoglobinopathy trait, there is a 25% chance with each pregnancy for an affected child. Genetic counseling and genetic testing is recommended for families that carry a thalassemia trait.

There are an estimated 60-80 million people in the world who carry the beta thalassemia trait alone. This is a very rough estimate and the actual number of thalassemia Major patients is unknown due to the prevalence of thalassemia in less developed countries in the Middle East and Asia. Countries such as India, Pakistan and Iran are seeing a large increase of thalassemia patients due to lack of genetic counseling and screening. There is growing concern that thalassemia may become a

very serious problem in the next 50 years, one that will burden the world's blood bank supplies and the health system in general. There are an estimated 1,000 people living with Thalassemia Major in the United States and an unknown number of carriers. Because of the prevalence of the disease in countries with little knowledge of thalassemia, access to proper treatment and diagnosis can be difficult.

As with other genetically acquired disorders, aggressive birth screening and genetic counseling is recommended.

A screening policy exists on both sides of the island of Cyprus to reduce the incidence of thalassemia, which since the program's implementation in the 1970s (which also includes pre-natal screening and abortion) has reduced the number of children born with the hereditary blood disease from 1 out of every 158 births to almost zero.

PRIMARY DEFENCE:

This is again subdivided in to 2 types.

(1) **Antioxidant Nutrients:** Antioxidant defence rely heavy on vitamins and minerals from the diet, Vit E, Vit A, carbotienoids, **Vit C**, β carotene, uric acid glutathione are the examples of such primary defence nutrients.

(2) **Antioxidant scavenging enzymes :** Important antioxidant scavenging enzymes are superoxide dimutases, catalase and glutathione peroxidase.

a) Superoxide dimutase (SOD): Superoxide dimutases are important biological antioxidant defence enzymes, apparently specific for the catalytic removal of $O_2^{\circ -}$ radical. SODs contain metals essential for their catalytic function copper and iron, if free, are powerful promotor of oxidative damage, they are required for antioxidant defence system too. The metals bond to SOD, catalyse the reaction of two O_2^{o-} molecules with H^+ ions to form H_2O_2 and O_2. SOD accelerates this reaction by 10,000 times.

b) **Catalase*:*** Catalase is a large enzyme, containing haem bound iron at its active site. In most of the mammalian tissues, catalase is located in small organelles called peroxisomes. Catalase has enormous capacity to destroy H_2O_2 in terms of molecules of H_2O_2 destroyed per minute per molecule of enzyme, it is one of the most active enzymes known. However, its affinity for H_2O_2 is also low, thus it needs high H_2O_2 concentrations to work fast.

c) **Glutathione and glutathione peroxidases :** Human tissues contain glutathione peroxidases as their major peroxide remaining enzymes. These enzymes remove H_2O_2 at a high rate by using to oxidise reduced glutathione (GSH) in to oxidazed glutathione (GSSG).

$$2\ GSH + H_2O_2 \longrightarrow GSSG + 2\ H_2O$$

There is only very little glutathione (GSH) in human plasma. It appears to originate from the liver. GSH has antioxidant properties in addition to its use by glutathione peroxidases. Many toxins are metabolized to safer products by being combined with GSH in reactions catalysed by glutathione transferases enzymes which are wide spread in mammalian cells. Glutathione peroxidase requires selenium for its activity. The scavenging function of free radicals are efficiently carried out by antioxidant defence enzymes through glutathione redox cycle.

SECONDARY DEFENCE:

(a) **Lipolytic enzymes:** A group of phospholipases are concerned with the maintainence of cell membrane integrity (Yu. et al. 1994).

(b) **Proteolytic enzymes:** Various proteolytic enzymes act as a secondary antioxidant defense mechanism by preferentially degrading many oxidatively altered proteins. They prevent an accumulation of damaged protein in the

cells. The enzymatic action is believed in some investigators to be important one in aging (Yu. et al. 1994).

(c) **Proteosome :** A multicatalytic protinase may also play an important role in degradation and elemination of oxidatively damage proteins.

IMMUNOMODULATORS :

The drugs which act as either immunopromotive or immunosystem corrective comes under this group Cytokines, Interlukin etc. are examples. Ayurvedic *Rasa*yana drugs be able to enhance the immunity.

Benefits

Being a carrier of the disease may confer a degree of protection against malaria, and is quite common among people from Italian or Greek origin, and also in some African and Indian regions. This is probably by making the red blood cells more susceptible to the less lethal species Plasmodium vivax, simultaneously making the host RBC environment unsuitable for the merozoites of the lethal strain Plasmodium falciparum. This is believed to be a selective survival advantage for patients with the various thalassemia traits. In that respect it resembles another genetic disorder, sickle-cell disease.

Epidemiological evidence from Kenya suggests another reason: protection against severe anemia may be the advantage.

People diagnosed with heterozygous (carrier) Beta-Thalassemia have some protection against coronary heart disease.

Notable patients

- Former professional tennis player Pete Sampras is known to have Thalassemia minor.
- Former professional football (soccer) player Zinedine Zidane is known to have Thalassemia minor.
- Rabbi Kohan Shalomim Y. Halahawi, Founder of the African Hebrew Israelites of Jerusalem Ha' Yisrayli Torah Brith Yahad, and Doctor of Electro-

homeopathic Medicine MD(AM), Edenic-Light Natural Medicine Research Foundation, is known to have Thalassemia B+.

The fundamental abnormality in cases of thalassemia is impaired production of either the alpha or beta hemoglobin chain. Thalassemia is a difficult subject to explain, since the condition is not a single disorder but a group of defects with similar clinical effects. More confusion arises from the fact that the clinical descriptions of thalassemia were in use before the molecular basis of the thalassemias were uncovered. A review of thalassemia is best approached by examining it from a genetic basis and from it's clinical expression.

(d) Complications:

Those children who receive intermittent transfusion and no desferal (Iron chelating), develop various complications during the late first decade and early second decade of life, and usually succumb by the age of 15 to 20 yrs. The commonest problems are described as follows:

- **Bone and joint :** Bony disease is related to erythroid expansion but not to iron overload or abnormalities in vitamin-D metabolism. Bone marrow expansion causes bones to become distorted, fragile and thinner interrupting their growth and leaving patient vulnerable to fractures.

  Radiological abnormalities may be present during the first 6 months of life but are usually not marked until about 1 year of age. In small bones of hands and feet the trabecular pattern is coarse, cystic abnormalities are present and the bones are tubular.

  The long bones of the extremities exhibit thinning of cortices & marked dilation of meddulary cavities. Accordingly they become extremely fragile and prone to pathological fractures. The skull is also classically involved with marked widening of dipolic and arrangement of the trabeculae in vertical rows tending to give a “hair on end” or “sun - ray” appearance to skull radiograph.

  Osteoporosis is common and associated bone pain may be relieved by calcitonin therapy.

COMPLICATION DUE TO IRON OVERLOAD:

In normal subjects when a red cell is broken down into iron & protein, the Iron released is recycled. Iron balance is maintained by limiting iron absorption from gut. Normal iron absorption is 1-1.5 mg/day; additional iron is absorbed only when it is required.

Iron absorption is proportional to

a) Severity of anemia.
b) Serum iron levels.
c) Erythropoiesis (Formation of RBCs).
d) Amount of iron in the food.
e) Presence of vitamin C.
f) Presence of sugars and
g) Other amino acids.

While absorption of iron is inhibited by presence of:

a) High fiber diet.
b) Phytates.
c) Tannic which binds with iron etc.

In Thalassemia major, body mistakes anemia for iron deficiency and absorbs iron as much as 3-4 mg/day depending upon severity of anemia from the iron present in food. Absorption may increase up to 10 mg/day if iron tonics are administered to correct anemia. Iron absorbed from food adds to body iron stores.

On an average each unit of blood contains 200-250 mg of iron. A patient receiving 30 units of blood/year receives 6gm of elemental iron annually.

The human body is unable to excrete this extra iron from the body. Extra iron absorbed from digestive route & released from blood transfusion accumulates, gets deposited in the liver and various organs resulting in poor functioning of these

organs. Free iron is toxic to body but more to the heart, liver, brain and various endocrine glands.

Results of iron overload

Organ	**Results**
Thyroid Gland	Hypothyroidism
Parathyroid Gland	Hypoparathyroidism
Pancreas	Diabetes Mellitus
Pituitary	Hypopitutrism
Gonads	Hypogonadism, hypofunction of sex organs, and delayed Puberty, infertility

Cardiovascular system :

Patient with Thalassemia major have traditionally succumbed to cardiac complication of iron overload. Majority of untransfused / low transfused do not reach the second decade of life with heart disease the main cause of death. While those well transfused but not adequately chealated die commonly of heart problems in their 20.

Patient with history of more than 100 units of transfused red cells without chronic blood loss generally exhibit significant cardiac iron deposition.

Microscopic evaluation suggests that iron is first deposited in ventricular myocardium and later in conduction tissue. As iron loading takes place, peroxidation products accumulate and contractility and rhythm are disturbed.

Common problems seen are diastolic dysfunction, systolic dysfunction, Arrhythmias, Pericarditis, pericardial effusion & ultimately all ending in congestive heart failure.

- **Growth :** About 30 – 50% of patient with Thalassemia major are affected by disturbed growth which may be due to :

  a) Chronic anemia with inadequate nutrition

  b) Impaired growth hormone production

c) Impaired production of somatomedin (which is produced in liver in response to growth hormone that promote cartilage growth)

d) Impaired adrenal androgen production

e) Hypothyroidism & hypoparathyroidism

f) Chronic liver disease

g) Emotional stress

h) Desferrioxamine therapy

i) Growth retardation is less evident in well transfused and well chealated patients.

Puberty :

If no pubertal sign is seen by the age of 16 years, the patient is diagnosed as having hypogonadism – in boys, the testis and the

penis remain small in size; while in girls, breasts have not developed and the onset of menstrual cycle has not occurred (Primary amenorrhea).

Many females who progress through puberty normally will develop secondary amenorrhea due to progressive iron accumulation. In multiple transfused patients, failure of sexual maturation may be the first indication of iron toxicity.

Gonadotropin deficiency (follicle stimulating hormone & lutenizing Hormone) have been implicated as primary lesion in hypothalamo – pituitary gonadal axis.

Hypothyroidism :

Even though iron deposition in thyroid is often extensive, dysfunction is usually limited to primary subclinical hypothyroidism. Patients with hypothyroidism feel extremely cold and sleepy and often show mental and physical sluggishness with weight gain.

Hypoparathyroidism :

Symptomatic parathyroid disease presenting as classic tetany, hypocalcaemia and hyperphosphatemia is an uncommon complication of iron overload.

Diabetes Mellitus :

Diabetes mellitus is a frequent and often unrecognized complication of Thalassemia which is due to pancreatic hypoproduction and to insulin resistance Blood glucose level between 140-200 mg / dl at two hours after ingestion of 75 gm of glucose tolerance indicates glucose intolerance.

Nearly half of the patients of Thalassemia major suffer from glucose intolerance. Glucose intolerance correlates with number of transfusion received, age of patient and genetic predisposition.

Blood transfusion reaction :

A transfusion reaction is unwanted reaction or complication that occurs in a patient during or after blood transfusion. About 4 % of blood transfusion are associated with some form of unwanted or adverse reaction.

There are two main types:

Immune mediated: Patient's immune system reacts to transfused blood. Various types of reaction are hemolytic, anaphylactic, allergic (Urticarial) and febrile, alloimmune. Alloimmunisation to minor blood group antigens occur in 20-30% of patients.

Nonimmune mediated :

Reactions that are not result of patients immune system.It include;

1) **Metabolic:** Coagulopathy, hypothermia, citrate toxicity, hypocalcemia, hyperkalemia.
2) **Embolism:** Cerebral, Pulmonary, and Peripheral.
3) **Circulatory overload :** Congestive cardiac failure

4) **Infections:**

a) Virus: Hepatitis B, Hepatitis C, HIV and others HTLV, CMV, EBV.

b) Bacterial: Gram positive are more common than gram negative.

5) **Psychosocial problems :** At various times in the life of Thalassemic patients may experience many emotions such as;

- Frustation
- Grief
- Depression
- Fear of death
- Isolation
- Helplessness
- Mistrust
- Low self steem
- Disappointment
- Hostility
- Anxiety
- Lack of confidence
- Anger
- Feeling of being unloved
- Feeling of being overprotected
- Feeling of burden to family

DRUG STUDY

DRUG STUDY

- **INTRODUCTION :**

In Ayurveda, Aushadha is considered as one of the four fold constituents of Chikitsa Chatushapada. The consideration of formulation during the line of treatment for particular ailments has a great importance. In the modern age, WHO also stresses the importance of drug and defines it as a substance or product that is used or intended to be used ,to modify or explore physiological system or pathological status for the benefit of the recipient. Ayurveda was the first to give an elaborate description of various therapeutic measures calculated to aim at not merely the radical removal of the causative factors but also at the restoration of Doshika equilibrium.

Process of Vitiation of Dosha till the disease manifests fully are known as Samprapti and the measures which brings in Sampraptivighatana is known as Chikitsa. According to Ayurveda, the drug or diet articles that reverse or break the Samprapti is ideal for the particular disease. The drug can be used singly or in combination to achieve the prescribed objective. It is often the total effect of all the ingredients in case of a formulation rather than the action of individual drugs that plays a vital role in therapeutics. Drug combinations are envisaged to serve synergistic action, combined action, toxicity, neutralizing and specific action.

- **SELECTION OF DRUG :**

The Sampraptighataka, signs, and symptoms produced in particular disease and the lines of treatment laid down are to be considered for the selection of drug or combination. This approach has been accepted for this study. The main clinical features of diseases Thalassemia is Panduta for which parents seek treatment and other symptoms like Alparakata, Alpameda, Nihasara and Sithilendriya described in Ch. Chi.16 Pandurogadhikara, are found to be much nearer to the symptoms of Thalassemia. The line of treatment of Pandu Roga has different single and combined formulations mentioned in the classics but in the severe blood loss condition, Charak Acharya mentioned Rakt basti treatment.

Keeping in view the above facts the Raktabasti treatment is selected from the Charak Samhita Siddhisthana Chapter-6. All the Ayurvedic texts had also described about the role of Rakt dhatu in life. Maharshi Sushrut mentioned that Rakt is Jivan (Su. Ut. 14/44) and life is possible only when Rakt dhatu is in proper quantity and quality in the body.

In various blood loss conditions like Raktpitta, Raktatisar, Pandu and jivadan - Rakt is the only treatment.Maharshi Charak also mentioned that Rakt is giving Bal, Varna, Ayush, Sukh etc.(Ch. Su. 24/4).

Rationale of Aja Raktabasti :-

The therapeutic use of different types of animal blood like Mrug(Deer), Go (Cow), Mahish (Buffalo) and Aja (Goat) are described in Charak Samhita Siddhi sthan chapter -6/82,83.

Here, we used Aja Rakta (Goat blood). Goat is the healthiest animal on earth. No other infections or viruses are detected in the goat blood. So it is very safe for use in human body. Goat blood is also available freely and in required quantity from Government or Municipal Slaughter house.

Maharshi Charak has mentioned Raktabasti treatment in severe blood loss conditions.(Ch. Si. 6/83). Oral use of Aja Rakt is not practical. Patients find it uncomfortable. Basti is a very effective treatment in Ayurveda. Practically, it is acceptable. Because of the ano-rectal route Aja Rakta dose not mix with human blood directly. So it is free of risks and complications.

Dr. H. S. Kasture and C.Dwarkanath have mentioned in their books that Basti is useful to grow the useful bacteria in the body which synthesize Vit. B_{12}. This vitamin is very useful in the production of RBCs. Devraj T. L. and Chaturvedi G. N. (1971) have also mentioned that Basti improves the level of serum protein and Hemoglobin. Premature RBC destruction occurs in Thalassemia major. Rakta Basti improves the RBCs and Hemoglobin.

So, after consideration of all these references and thoughts, here we select Aja Rakta basti treatment in Thalassemia major.

- **SELECTION OF DRUG DOSAGES :**

It is very important that drug dose and method of administration must acceptable and convenient. Dose should be harmless and should not produce any complications. For this study we decide to use goat blood in 250ml dose by ano rectal route. This dose is appropriate for the age of 1 year to 20 years. Basti is harmless and painless procedure.

In my previous post graduation dissertation I used to give 500ml Ajarakta in adult patients per Basti. I got Hopeful results and no complications were reported during the study.

- **<u>COLLECTION OF GOAT BLOOD</u>** :

Goat blood was collected from the Slaughter house of Ahmedabad Municipal Corporation. No specific blood collection method is described in Ayurveda. So, Blood was collected from the carotid artery of goat after the physical check up. Blood was mixed at the time of collection with an ayurvedic anti-coagulant, which is made by Nimbuswaras and parpatkshar. Investigations like Blood smear, HIV etc. were done. Collected blood was stored at 4^0 C temperature.

- **<u>RAKTA BASTI PROCEDURE :</u>**

Collected and stored blood was administered by ano rectal route. Goat blood was filled up in well sterilized glass bottle. A special blood transfusion set made from suction tube was attached with the bottle. End of the set was attached with a catheter of required size.

Patient with prior shuddhi with Haritakyadi Yog which was given on the day before were advised to lay down in left lateral posture. Raktabasti was given in this posture. Total 250ml. blood was administered in 30 minute by drop system. Drops and speed was controlled by a cock in the prepared transfusion set.

After Basti, patient was advised to lay down in same posture for 30 minutes. Basti was administered on alternate days for 4 weeks. And regular pre and post procedure investigations were carried out.

Patients were advised to take low iron diet with maximum intake of chelating drinks like tea, coffee etc. Iron overloading is a main problem in thalassemic patients and extra iron deposited in liver, kidney and other vital organs leads the patient to death. Food like tea, coffee are useful to excrete overloaded iron.

- **RAKTA BASTI KARMUKATVA :**

All the Ayurved Acharyas said that Dhatu loss should be replaced by same Dhatu. Rakta Kshay means blood loss should be replaced by blood. Basti is a safe and painless procedure with scientific value.

Dr. H. S. Kasture and C.Dwarkanath have mentioned in their books that Basti is useful to grow the useful bacteria in the body which synthesize Vit. B_{12}. This vitamin is very useful in the production of RBCs. Devraj T. L. and Chaturvedi G. N. (1971) have also mentioned that Basti improves the level of serum protein and Hemoglobin. Premature RBC destruction occurs in Thalassemia major. Rakta Basti improves the RBCs and Hemoglobin.

- **ABOUT GOAT BLOOD :**

No more detail is given in our texts about Aja Rakta. Modern veterinary science is the source of some detailed biochemistry about the goat blood. It is as given below.

Erythrocyte Series

	Range	**Average**
Erythrocytes	8-18	13
Hemoglobin	8.0-14.0	11
PCV (Wintrobe method 30 min) 24-48	35	
PCV (Microhematocrit Method 5min)	19.5-38.5	28.5
MCV (Wintrobe method)	19.5-37.5	27.5
MCV (Microhematocrit Method) 15.5-30.0	22.8	
MCHC (Wintrobe method)	30.0-35.0	32.0
MCHC (Microhematocrit Method) 35.0-42.0	38.2	

Reticulocytes %		None	
ESR (After 1 hour)		None	
RBC diameter		2.5-3.9	3.2
Resistance to Hypotonic Saline	(Minimum)	0.74	
	(Maximum)	0.44	
M.E. Ratio	104	0.69	1.0

- : Leucocytes Series :-

	Range	**Avg.**	**%**
Leucocytes	4000-13000	9000	30-48
Neutrophils	Rare		
Neutrophils Mature	1200-7200	3250	
Lymphocytes	2000-9000	5000	0-4
Monocytes	0-550	250	
Eosinophils	50-650	450	1-8
Basophils	0-120	50	0-1

* **Prominent Factors in Goat Blood :**

- Number of RBCs are more than other animals (13 mil/cmm)
- Diameter of RBC is less than other animals (3-4 micron)
- Sugar level in Blood is 30-40 mg/100 ml)

* **Other Data :-**

- Thrombocytes	50000/mm
- Leterus Index	2.5mm
- Specific Gravity - Blood	1.042 - 1.062
- Specific Gravity - Plasma	1.0234 - 1.0276
- Refractive Index-Plasma	1.3468 - 1.3496
- Refractive Index-Plasma Protien	6.0 - 7.5gm%

* **Biological estimation In Healthy Goat :-**

	Avg.	**SE**
- Glucose	52.03mg/dl	11.97mg/dl
- Phosphorus	8.26mg/dl	10.12mg/dl
- BUL	15.38mg/dl	10.66mg/dl
- Iron	184.20mcg/dl	17.96mcg/dl
- TB	0.25mg/dl	0.01mg/dl
- TSP	6.95g/dl	0.17g/dl
- Albumin	3.27mg/dl	0.01g/dl
- A/G	0.89	0.04
- Creatinine	1.48	0.07

* **Important Note :-**

There are seven major types of blood group in goat blood. They are A, B, C, D, M, R and X. In goat blood, there is no evidence & findings of HIV, Hepatitis, Malaria, Syphilis, Cytomegalovirus(CMV), Epstein-Barr virus(EBV) & other harmful virus and bacteria. Recent study shows that CAEV(Caperin Arthritis Encephalitis) antibodies nutrilise HIV. This can be potential immuno prophylaxis for HIV in Human.

CLINICAL STUDY

CLINICAL STUDY

INTRODUCTION:

Ayurveda has developed a lot from the clinical observations over several centuries and medicine was tried directly on human. The ultimate aim of any researcher of Medical Science is appropriate management of the particular disease and promoting healthy living. The clinical therapeutical trials are of paramount importance in the context of Ayurveda. Ayurveda believes more in clinical than experimental study because it has been observed that there is much difference between in-vitro and in-vivo studies. So clinical trial is a carefully and ethically designed experiment, aimed at finding the answers of some precisely framed questions.

The diseases have been classified on the basis of Prognosis into Sadhya [Curable] & Asadhya [Fatal] by ancient Acharyas (C. Su. 10). The Asadhya Group of diseases are further classified into Yapya and Pratyakheya. The disease Thalassemia can be classified under Pratyakheya because the symptoms of Thalassemia can be relieved with regular blood transfusion and other supportive treatment but when Hb gm% decreases again, the symptoms reappear. And this disease persists throughout the life of the patient.

The disease Thalassemia and its management through Raktabasti was taken for the study with a hope to provide better quality of life to the Thalassemic patients. As the chief complaint of the patients is Pallor or Panduta the clinical study has been undertaken with Ajarakta, which is specially mentioned for Rakta kshaya in Ch. Si 6.

AIMS AND OBJECTIVES:

The present study was planned with the following aims and objectives.

- To evaluate the efficacy of Rakta basti treatment in Thalassemia Major w.s.r. Tridoshaj Pandu.

MATERIALS AND METHOD:

Literary Study:

It was compiled from basic Ayurvedic texts and commentaries, modern medical books, recent researches, published articles & research papers from well-known journals.

Clinical Study:

Patients with signs and symptoms as per proforma were selected for clinical study from the OPD and IPD of Govt. Akhandanand Ayurved Hospital, Ahmedabad - Gujarat. Minimum 30 patients for treated and 30 patients for control group were selected with inclusive and exclusive criteria. Patients treated with conventional medical treatment were taken in control group and the patients treated with only Raktabasti treatment were taken in treated group.

Inclusive Criteria:

Patients having Hb 5 gm % to 10 gm % were selected having general symptoms of the Thalassemia. In proforma, the cardinal symptoms and associated symptoms of the patients will be defined.

Exclusive Criteria:

Any other types of Anemia except Thalassemia Major were excluded.

Diagnostic Criteria:

Diagnosis was made on the basis of Vatik, Paitik and Kaphaj clinical signs and symptoms as mentioned in Ayurvedic texts and the signs and symptoms of Thalassemia major described in modern texts. A detail proforma was prepared for the purpose.

Investigations:

1) Hemoglobin
2) R.B.C. Morphology
3) CBC.
4) E.S.R.

5) Thalassemic trait.
6) Total Iron Binding Capacity.
7) Platelet Count

Plan of Treatment:

Selected patients as per proforma were given Raktabasti by method given below.

Preparation of Raktabasti Material and Method of Raktabasti:

Goat blood 250ml along with Ayurvedic Raktaskandavrodhak

Ratio of the Goat blood and Ayurvedic Raktaskandavrodhak is studied and proved to prevent the coagulation by pilot study. So the dose of Goat blood and Ayurvedic Raktaskandavrodhak is decided on this base (Paper is enclosed).

Above material was mixed and given as raktabastidravya through anus by a raktabasti set. Prior to the raktabasti patients were given Haritakyadi yog 10 gm at night for Koshth Shudhdhi (duration three days).

According to Charak Samhita, pharmacological action of Haritakyadi yog as Koshth Shudhhi is mentioned in the same chapter. We used it for koshth shudhhi only.

A well sterilized 500ml glass bottle was attached with blood transfusion set and the other end of the set was attached with catheter which was introduced per rectum. 250 ml total quantity of anti coagulated goat blood was transferred within 30 minutes by anorectal route.

No complications of Raktabasti were reported during my PG study. No complications were encountered during this study also.

Duration of Raktabasti Treatment:

Raktabasti was given on alternate day for four weeks. Follow up study was carried out weekly for 3 months as per various parameters of the performa. So the complete study was carried out for four months.

SELECTION OF PATIENTS:

The study was conducted in Govt. Akhandanand Ayurved College. Patients attending the O.P.D. and I.P.D. of the hospital, fulfilling the criteria of selection were incorporated in the study irrespective of age, sex, caste etc.

CRITERIA FOR SELECTION OF PATIENTS:

1. On the basis of clinical signs and symptoms and pathological investigations.

2. Patients having Hb 5 gm% to 10gm% were selected.

DURATION OF TRIAL:

Raktabasti was given on alternate day for four weeks. Follow up study was carried out weekly for 3 months as per various parameters of the performa. So the complete study was carried out for four months.

SELECTION OF DRUG:

The trial drug of the present Study i.e. Goat blood was obtained from the Ahmedabad Municipal Corporation Slaughter House with prior physical check up of goat and pathological investigations.

STUDY DESIGN:

The patients were selected randomly and divided into two Groups, namely Trial & Control Group, and examined clinically along with laboratory investigations.

(1) Trial Group: (Group A)

30 patients were registered in this group, out of which all the patients completed the course. The Patients were administered Raktabasti in Scheduled dose.

Dose : 250 ml Goat blood by each enema. Raktabasti was given on alternate day for four weeks. Follow up study was carried out weekly for 3 months

(2) Control Group: (Group B):

30 patients were registered in this Group with modern medical treatment for four weeks and follow up study for three months.

PATHYA-APATHYA:

Patients were advised to take low iron diet with maximum intake of chelating drinks like tea, coffee etc.

CRITERIA OF ASSESSMENT:

By observing clinical improvement in Vatik Paitik, and Kaphaj signs & symptoms among the Tridoshaj Panduroga as well as Thalassemia Major, assessment of the symptoms like Panduta, Krishna nakhtva, Swas, Sunakshikutata, Jwar, Daurbalya and Hrid dravatva which are mentioned in proforma were assessed with gradation system as below.

Dyspnea:

Grade 0 Able to walk at my own place on the level without getting breathless over any distance

Grade I Become breathless if I walk more than 100m (yards) on the level at my own pace

Grade II Become breathless if I walk around the house or in the ward on the level at my own pace

Grade III Become breathless if I move around in bed or get out of bed

Grade IV Become breathless on talking

Grade V Breathless at rest

(Author: Hayes-Moore LH.)

Panduta (Anemia): <u>Hb level</u>

Grade I	10g/dl but < 14 g/dl (male)
	Between 10g/dl and 12g/dl (female)
Grade II	8 g/dl to 9.4 g/dl
Grade III	6.5 g/dl to 8 g/dl
Grade IV	Below 6.5 g/dl

(WHO)

Fatigue:

Grade I	Any physical activity does not cause undue fatigue
Grade II	Ordinary physical activity results in fatigue
Grade III	Less than Ordinary physical activity results in fatigue
Grade IV	Any physical activity without discomfort cause fatigue

(NYHA)

Clubbing

Grade I	Softening of nail bed
Grade II	Obliteration of the angle of the nail bed
Grade III	Swelling of the subcutaneous tissues over the base of the nail causing the overlying skin to become tense, shiny and wet and increasing the curvature of the nail, resulting in parrot beak or drumstick appearance.
Grade IV	Swelling of the fingers in all dimensions associated with hypertrophic pulmonary osteoarthropathy causing pain and swelling of the hand, wrist etc, and radiographic evidence of subperiosteal new bone formation.

(WHO)

Hrid – dravatva (Palpitation):

Grade I	Any physical activity does not cause palpitation
Grade II	Ordinary physical activity results in palpitation
Grade III	Less than Ordinary physical activity result in palpitation
Grade IV	Any physical activity without discomfort cause palpitation

(NYHA)

Necessary qualitative and quantitative tests were applied to the observed data. Laboratory investigations with improvement of 1.0 Hb gm% were assessed and evaluated before and after treatment.

[1] **Maximum Improvement**: More than 75% improvement of clinical signs and symptoms.

[2] **Moderate Improvement**: More than 50% to 75% improvement of the above mentioned clinical sign and symptoms.

[3] **Mild Improvement**: More than 25% to 50% improvement of the above mentioned clinical sign and symptoms.

[4] **No Improvement**: Equal or Less than 25% improvement of clinical sign and symptoms.

STATISTICAL ANALYSIS:

The mean value ± S.D. before and after treatment for each sign and symptoms was compared with that of the 30 days [01 month] after the treatment.

Student‘t’ test [Paired] was used for the purpose of testing the level of significance of the investigation results. The effectiveness of Trial drug in comparison to Control in different sign and symptoms and laboratory findings was assessed through ‘p’ value and through the unpaired ‘t’ test also. For subjective crieteria Wilcoxon’s test is performed.

The results were interpreted as follows

Insignificant result		P>0.05
Mild Significant	[*]	P<0.05
Marked Significant	[**]	P<0.01
Highly Significant	[***]	P<0.001

PRESENTATION OF DATA:

The data of the study has been presented in two sections.

1. The first section deals with the general observations.
2. The second section contains the effect of the therapy in terms of improvement in the subjective and objective criteria and the total effect of the therapy.

GENERAL OBSERVATIONS & RESULTS

TABLE NO.1

GENERAL DATA OF PATIENTS UNDERGONE STUDY

Groups	Registered	Completed	Discontinue
Group-A	30	30	0
Group-B	30	30	0
Total	60	60	0

The total number of registered patients in the study were 30 in each group. Among which all the patients completed the course.

TABLE NO. 2

AGE WISE DISTRIBUTION OF 30 PATIENTS

Group	Group A	(%)	Group B	(%)
1 – 5 years	09	30.00	12	40.00
6 - 10 years	09	30.00	05	16.66
11 – 15 years	08	26.66	08	26.66
16 – 20 years	04	13.33	05	16.66

In the present clinical Study 09 (30 %), patients were from age Group of 1 to 5 years. 09 (30 %) patients were from 6 to 10 years. 08 (26.66 %) patients were from age Group of 11 to 15 years and 04 (13.33 %) patients were from 16-20 years in group A. While in group B 12 (40.00 %), patients were from age Group of 1 to 5 years. 05 (16.66 %) patients were from 6 to 10 years. 08 (26.66 %) patients were from age Group of 11 to 15 years and 05 (16.66 %) patients were from 16-20 years

TABLE NO. 3

SEX WISE DISTRIBUTION OF 30 PATIENTS

Sex	Group A	(%)	Group B	(%)
Male	24	80	22	73.33
Female	06	20	08	26.66

In this study, out of 30 patients, 24 (80 %) were Male while 06 (20 %) were Female in group A. While in group B, 22(73.33%) were male and 08(26.66%) were female.

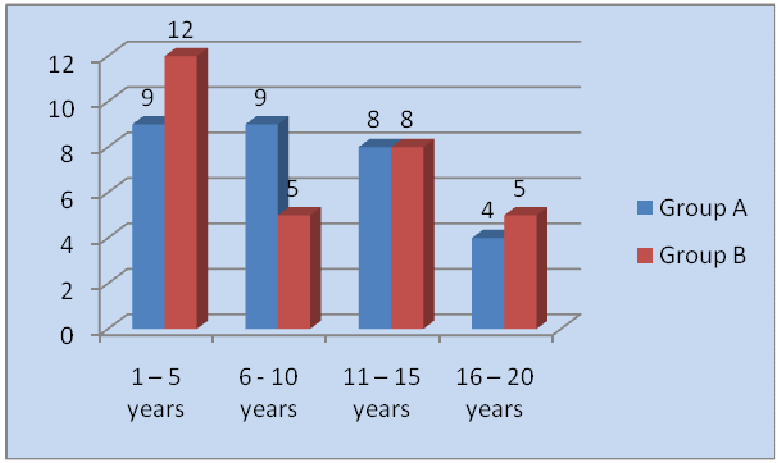
TABLE NO. 4

RELIGION WISE DISTRIBUTION OF 30 PATIENTS

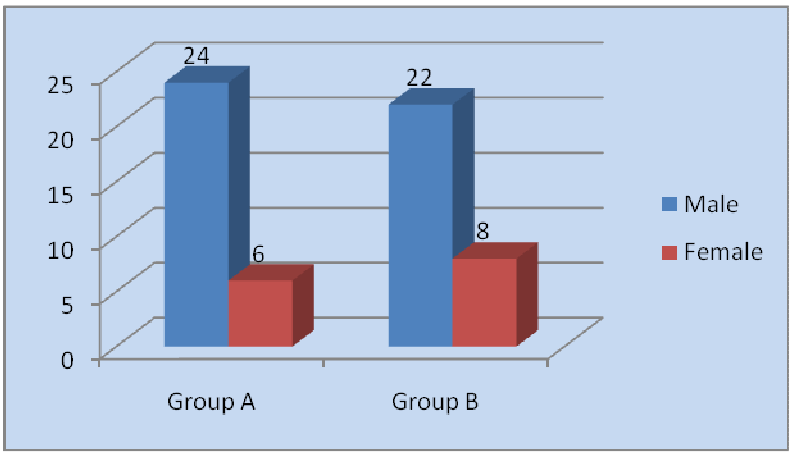
Religion	Group A	(%)	Group B	(%)
Hindu	24	80	24	80
Muslims	05	16.66	06	20
Sikh	01	3.33	00	00.00

In this study 24 (80 %) patients registered were found to be from Hindu religion while 05 (16.66 %) Patients were found Muslims and 01 (3.33 %) were found Sikh in group A. While in group B it was 24(80.00%) patients were Hindu and 06(20.00%) patients were found Muslims.

Age group



Gender



Religion

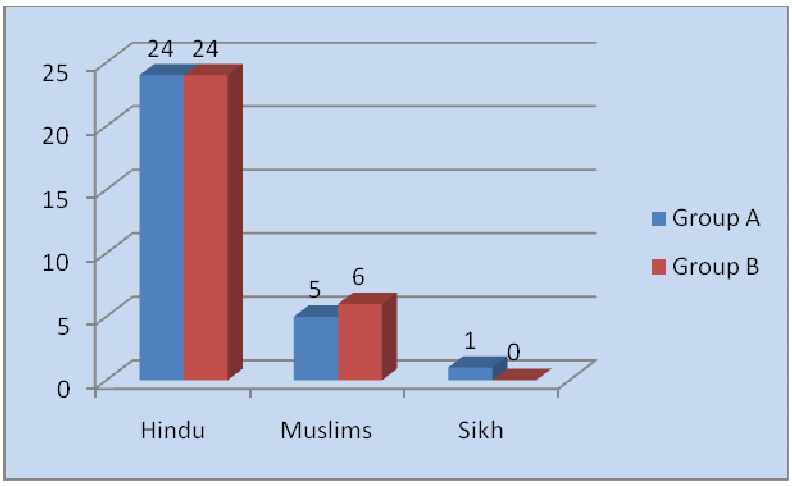


TABLE NO. 5

CASTE WISE DISTRIBUTION OF 30 PATIENTS

Caste	Group A	(%)	Group B	(%)
Patel	01	3.33	04	13.33
Lohana/Thakkar	02	6.66	05	16.66
Prajapati	02	6.66	01	3.33
Chavda	02	6.66	02	6.66
Bhavsar	01	3.33	00	00.00
Sindhi	01	3.33	03	10.00
Parmar	05	16.66	02	6.66
Sheikh	03	10.00	03	10.00
Sikh	01	3.33	00	00.00
Kansara	01	3.33	00	00.00
Brahmin	04	13.33	04	13.33
Chauhan	02	6.66	00	00.00
Others	05	16.66	06	20.00

In the present clinical study patients belonging to the caste Patel, Lohana/Thakkar, Prajapati, Chavda, Bhavsar, Sindhi, Parmar, Sheikh, Sikh, Kansara, Brahmin, Chauhan, were found 01(3.33%), 02(6.66 %), 02(6.66 %), 02(6.66%), 01(3.33%), 01(3.33%), 05 (16.66%), 03(10%), 01(3.33%), 01(3.33%), 04(13.33%), 02(6.66%) respectively. 05(16.66%) patients were belonging to some other castes in group A. While in group B patients belongs to the caste Patel, Lohana/Thakkar, Prajapati, Chavda, Sindhi, Parmar, Sheikh, Brahmins and others were found 04(13.33%), 05(16.66%), 01(3.33%), 02(6.66%), 03(10.00%), 02(6.66%), 03(10.00%), 04(13.33%), 06(20.00%) respectively.

TABLE NO. 6

EDUCATION WISE DISTRIBUTION OF 30 PATIENTS

Education	Group A	(%)	Group B	(%)
Educated	17	56.66	20	66.66
Uneducated	13	43.33	10	33.33

It has been found that 17 (56.66%) patients were educated and 13 (43.33%) patients were uneducated in group A. While in group B 20(66.66%) patients were educated and 10(33.33%) were uneducated.

TABLE NO. 7

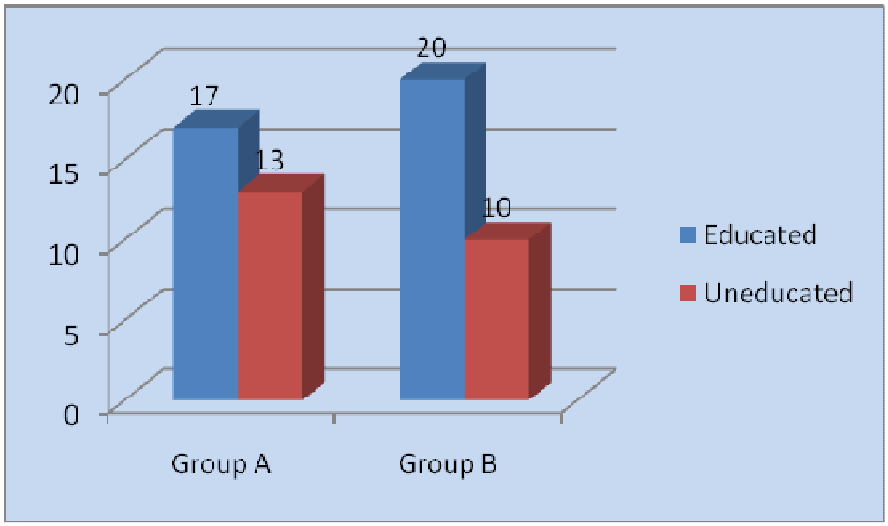
SOCIO-ECONOMICAL STATUS WISE

DISTRIBUTION OF 30 PATIENTS

Socio-Economical Status	Group A	(%)	Group B	(%)
Lower Class	03	10.00	05	16.66
Lower Middle Class	16	53.33	13	43.33
Middle Class	08	26.66	06	20.00
Upper Class	03	10.00	06	20.00

In this clinical study 03 (10 %) patients found from lower class, 16 (53.33 %) patients found from lower middle class. 08 (26.66%) patients found from middle class and 03(10%) from upper class in group A. While in group B there were 05 (16.66 %) patients from lower class, 13 (43.33 %) patients found from lower middle class. 06 (20.00%) patients from middle class and 06(20.00%) from upper class

Education



Socio-Economy

TABLE NO. 8

AGE OF DIAGNOSIS WISE DISTRIBUTION OF 30 PATIENTS

Age of diagnosis	Group A	(%)	Group B	(%)
< 1 yrs	09	30	10	33.33
>1 yrs to 5 yrs	18	60	14	46.66
>5 yrs	03	10	06	20.00

In this present research work 09(30 %) patients were found to be diagnosed before the age of 1 year, 18 (60 %) patients were found to be diagnosed within the age of 1 year to 5 years, 03 (10 %) patients were found to be diagnosed after the age of 5 years in group A. But in group B, 10(33.33 %) patients were found to be diagnosed before the age of 1 year, 14 (46.66 %) patients were found to be diagnosed within the age of 1 year to 5 years, 06 (20.00 %) patients were found to be diagnosed after the age of 5 years.

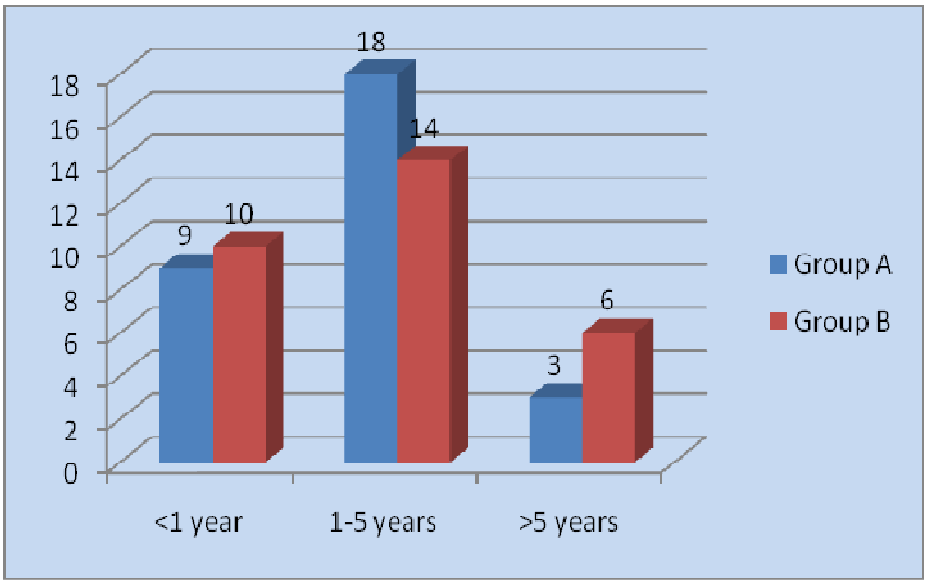
TABLE NO. 9

SHOWING NO. OF BLOOD TRANSFUSION (B.T.) BEFORE STARTING THE TREATMENT WISE DISTRIBUTION OF 30 PATIENTS

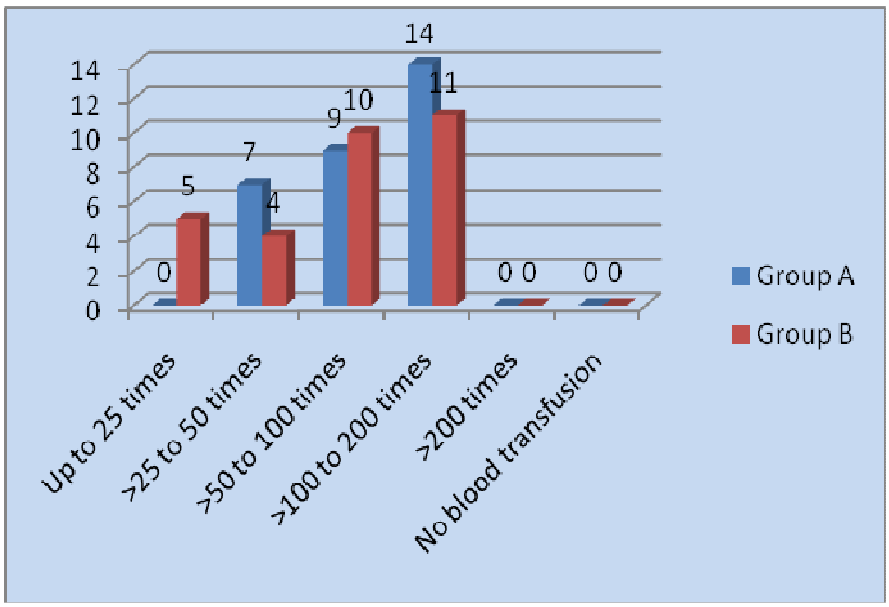
No. Of B.T.	Group A	(%)	Group B	(%)
Up to 25 times	00	00	05	16.66
>25 to 50 times	07	23.33	04	13.33
>50 to 100 times	09	30	10	33.33
>100 to 200 times	14	46.66	11	36.66
>200 times	00	00	00	00.00
No blood transfusion	00	00	00	00.00

In this present research work, before starting of the Raktabasti 07(23.33 %) patients were found to be blood transfused >25 to50 times, 09(30 %) patients were found to be blood transfused >50 to 100 times, 14(46.66 %) patients were found to be blood

Diagnosed Age



Blood Transfusion before treatment



transfused >100 to 200 times in group A. While in group B 05(16.66 %) patients were found to be blood transfused upto 25 times, 04(13.33 %) patients were found to be blood transfused >25 to50 times, 10(33.33 %) patients were found to be blood transfused >50 to 100 times, 11(36.66 %) patients were found to be blood transfused >100 to 200 times.

TABLE NO. 10

MEDICAL HISTORY (TAKING IRON CHELATORS) WISE DISTRIBUTION OF 30 PATIENTS

Medical history (Taking iron Chelators)	Group A	(%)	Group B	(%)
Present	25	83.33	26	86.66
Absent	05	16.66	04	13.33

In the present clinical study 25 (83.33%) patients found under iron chelating therapy, in rest of the patients 05(16.66%) that history was absent in group A. But in group B 26 (86.66%) patients found under iron chelating therapy, in rest of the patients 04(13.33%) that history was absent

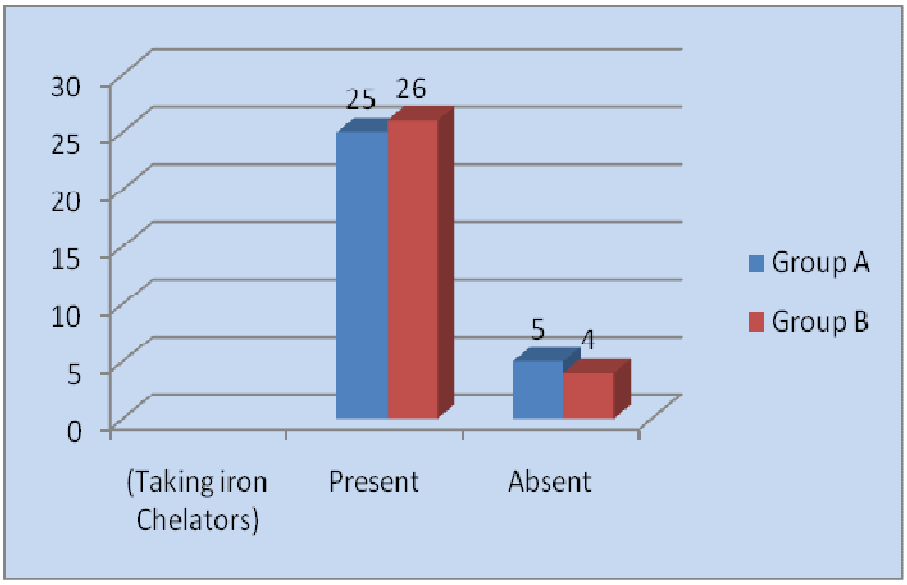
TABLE NO. 11

SURGICAL HISTORY (SPLEENECTOMY STATUS) WISE DISTRIBUTION OF 30 PATIENTS

Surgical history (Spleenectomy)	Group A	(%)	Group B	(%)
Done	03	10	04	13.33
Not done	27	90	26	86.66

In the present clinical study in group A 03 (10 %) patients were found with the history of Spleenectomy, in rest of the patients 27(90 %) that history was absent. While in group B, 04 (13.33 %) patients were found with the history of Spleenectomy, in rest of the patients 26(86.66 %) that history was absent.

Iron Chelation



Spleenectomy

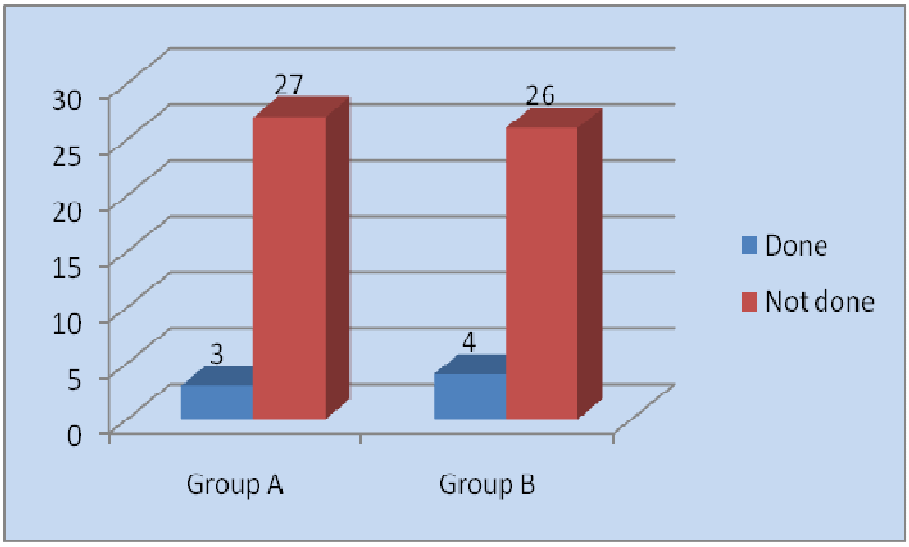


TABLE NO. 12

CONSANGUINEOUS MARRIAGE WISE

DISTRIBUTION OF 30 PATIENTS

Consanguineous Marriage	Group A	(%)	Group B	(%)
Present	24	80.00	23	76.66
Absent	06	20.00	07	23.33

Here we can see that maximum patients in group A those are 24 (80.00%) belong to the non consanguineously married parents and only in 06(20.00%), patients belong to the parents having positive consanguineous marriage history. While in group B, 23 (76.66%) belong to the non consanguineously married parents and only in 07(23.33%), patients belong to the parents having positive consanguineous marriage history.

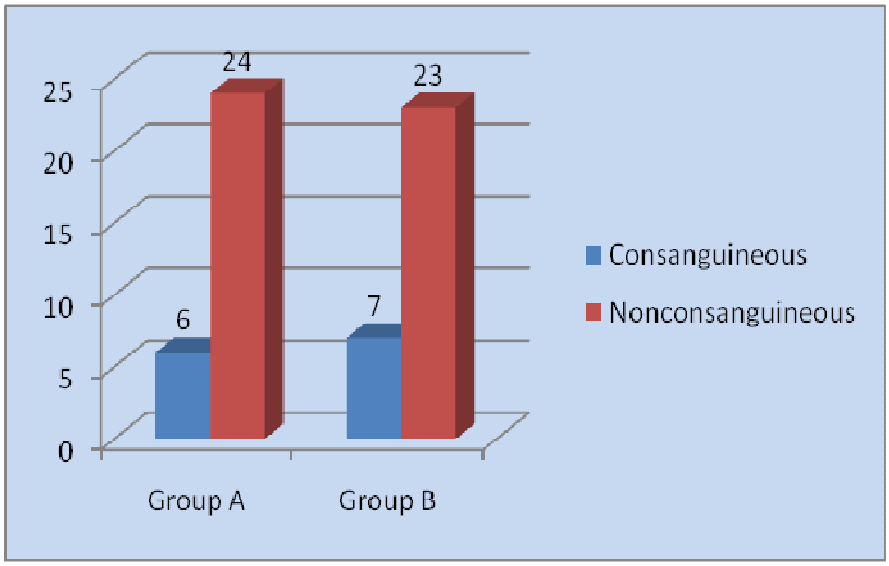
TABLE NO. 13

BIRTH HISTORY WISE DISTRIBUTION OF 30 PATIENTS

Birth History	Group A	(%)	Group B	(%)
F.T.N.D.	28	93.33	26	86.66
L.S.C.S.	02	6.66	04	13.33
P.T.N.D.	00	00.00	00	00.00

It has been found that almost all the patients i.e. 28 (93.33 %), had a normal birth history while 02 (06.66 %) were born by L.S.C.S in group A. But in group B 26 (86.66 %), had a normal birth history while 04 (13.33 %) were born by L.S.C.S.

Marriage type



Birth History

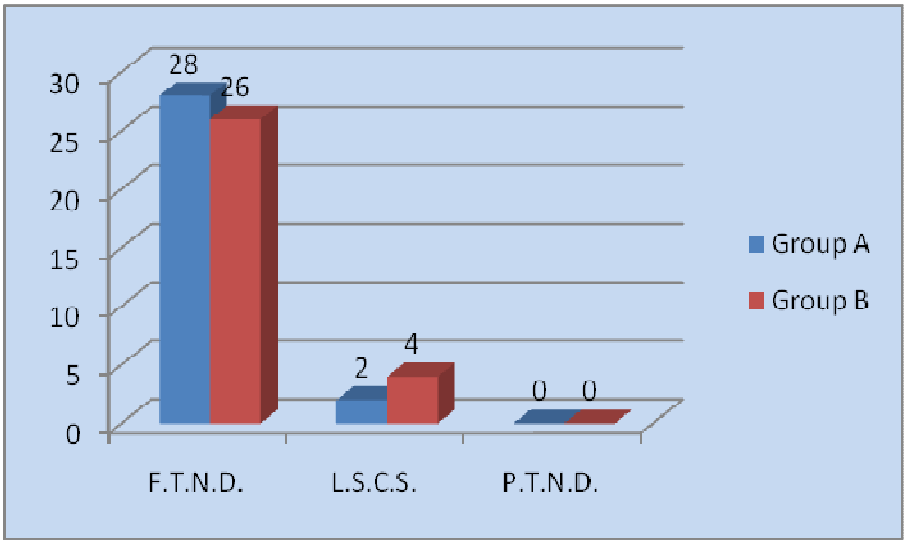


TABLE NO. 14

ORDER OF BIRTH WISE DISTRIBUTION OF 30 PATIENTS

Order of birth	Group A	(%)	Group B	(%)
First	18	60	20	66.66
Second	10	33.33	08	26.66
Third	02	6.66	02	6.66

The birth order of maximum i.e. 18 (60 %) patients was 1st while 10 (33.33 %) were having 2nd order of birth and 02 (6.66 %) were 3rd in group A. While in group B, the birth order of maximum 20 (66.66 %) patients was 1st while 08 (26.66 %) were having 2nd order of birth and 02 (6.66 %) were 3rd

TABLE NO. 15

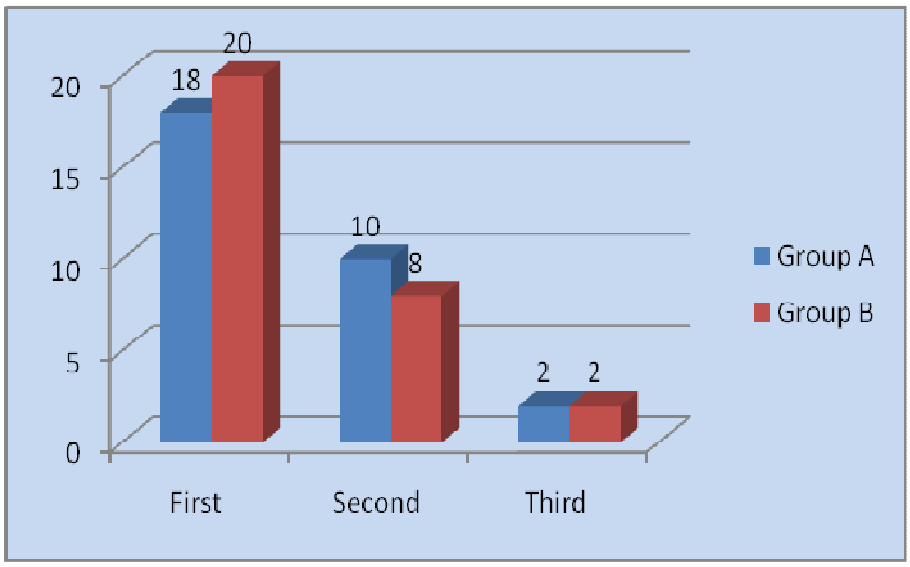
IMMUNIZATION HISTORY WISE

DISTRIBUTION OF 30 PATIENTS

Immunization Status	Group A	(%)	Group B	(%)
Proper to age	09	30.00	10	33.33
Improper to age	21	70.00	20	66.66

It has been found 09 (30 %) patients had received immunization proper to age and 21 (70 %) patients are having immunization status improper to age in group A. While in group B 10 (33.33 %) patients had received immunization proper to age and 20 (66.66 %) patients are having immunization status improper to age.

Birth Order



Immunization

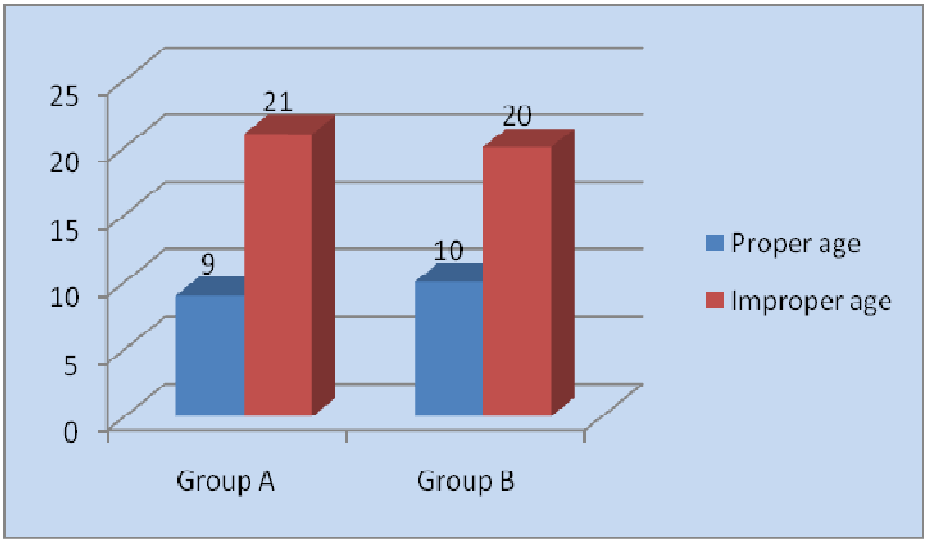


TABLE NO. 16

STATUS OF SPLEENOMEGALY WISE

DISTRIBUTION OF 30 PATIENTS

Spleenomegaly	Group A	(%)	Group B	(%)
Non palpable	09	30.00	07	23.33
Palpable up to 2 cm	11	36.66	12	40.00
Palpable up to 4 cm	06	20.00	08	26.66
Palpable >4 cm	04	13.33	03	10.00

In the present research work, spleenomegaly was not found in 09 (30 %) patients, spleen was palpable up to 2cm in 11(36.66%), up to 4cm in 06 (20%) and more than 4cm in 04 (13.33%) patients in group A. spleenomegaly was not found in 07 (23.33%) patients, spleen was palpable up to 2cm in 12(40.00%), up to 4cm in 08 (26.66%) and more than 4cm in 03 (10.00%) patients in group B.

TABLE NO. 17

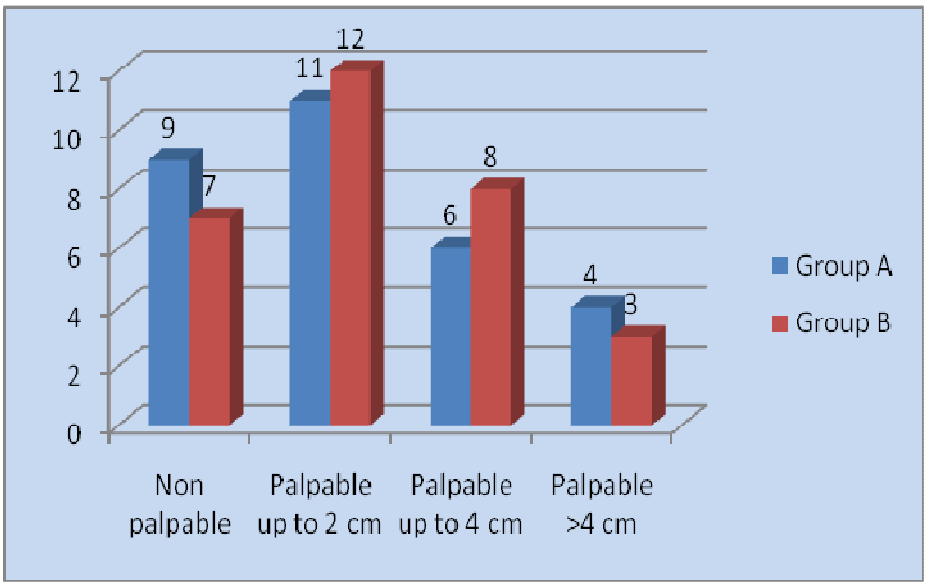
STATUS OF HEPATOMEGALY WISE

DISTRIBUTION OF 30 PATIENTS

Hepatomegaly	Group A	(%)	Group B	(%)
Non palpable	24	80	25	83.33
Palpable up to 2 cm	04	13.33	04	13.33
Palpable up to 4 cm	02	6.66	01	3.33

In the present research work, hepatomegaly was not found in 24 (80%) Patients, liver was palpable up to 2cm in 04 (13.33%) Patients and up to 4cm in 02 (6.66%) Patients in group A. But in group B, hepatomegaly was not found in 25 (83.33%) Patients, liver was palpable up to 2cm in 04 (13.33%) Patients and up to 4cm in 01 (3.33%) patient.

Spleenomegaly



Hepatomegaly

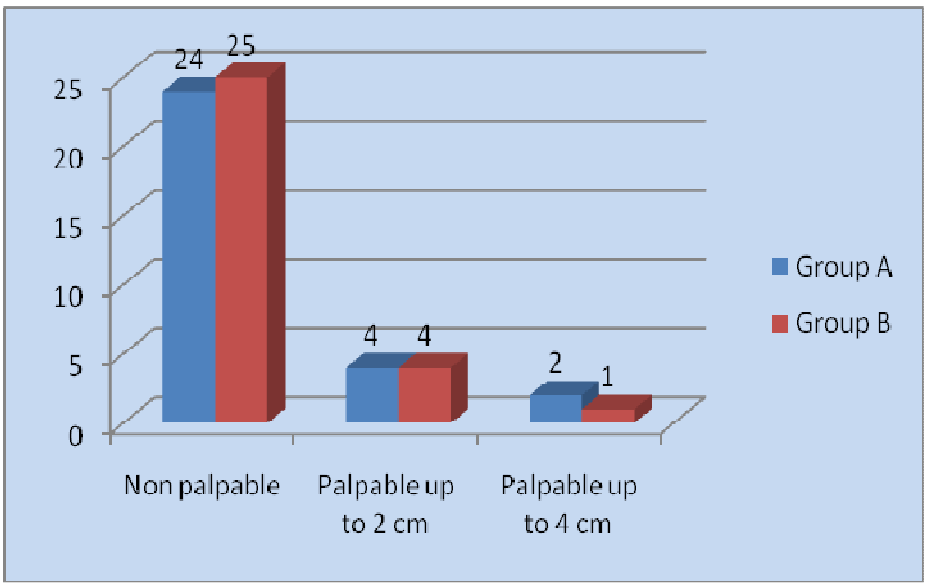


TABLE NO. 18

PERSONAL HISTORY WISE

DISTRIBUTION OF 30 PATIENTS

Nature of Food	Group A	(%)	Group B	(%)
Vegetarian	21	70.00	21	70.00
Mixed	09	30.00	09	30.00

In this study, in both group A and group B 21(70%) patients were having vegetarian diet and 09 (30%) patients were having mixed diet.

TABLE NO. 19

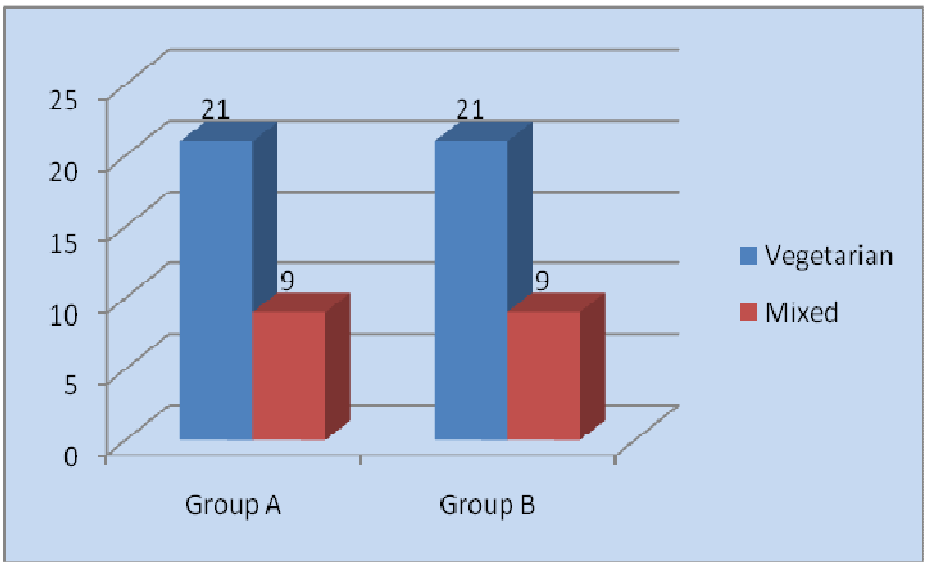
PREDOMINANCE OF RASA IN DIET WISE

DISTRIBUTION OF 30 PATIENTS

Rasa	Group A	(%)	Group B	(%)
Madhura	11	36.66	12	40.00
Amla	09	30	07	23.33
Lavana	00	00	00	00.00
Katu	10	33.33	11	36.66
Tikta	00	00	00	00.00
Kshaya	00	00	00	00.00

In the present research work, predominance of Madhur Rasa was found in diet of 11(36.66%) patients while Amla Rasa Pradhanya in diet was found in 09 (30%), 10(33.33%) patients showed Katu Rasa Pradhanya respectively in group A. While in group B, predominance of Madhur Rasa was found in diet of 12(40.00%) patients while Amla Rasa Pradhanya in diet was found in 07 (23.33%) patients and 11(36.66%) showed Katu Rasa Pradhanya.

Diet



Ras Predominance

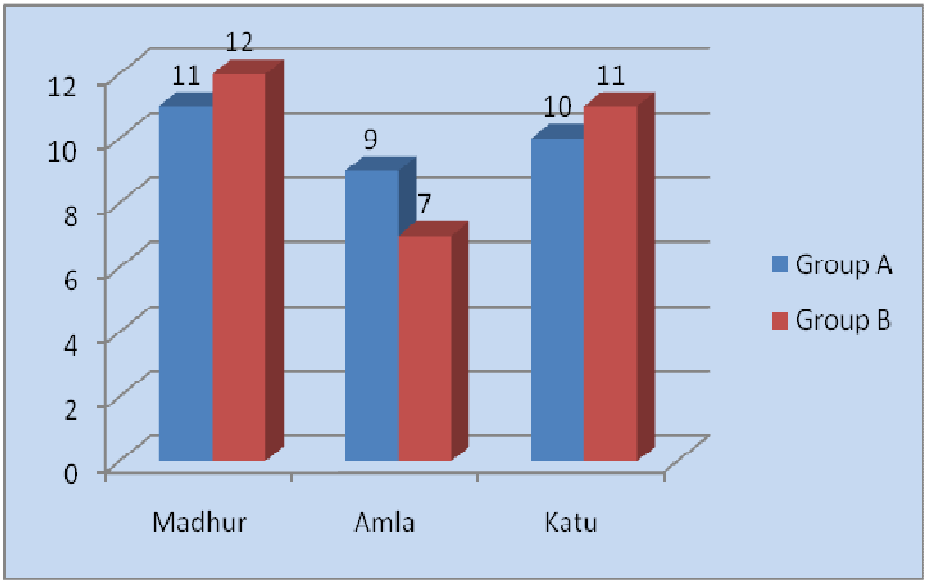


TABLE NO. 20

PREDOMINANCE OF GUNA IN DIET WISE

DISTRIBUTION OF 30 PATIENTS

Guna	Group A	(%)	Group B	(%)
Guru	05	16.66	06	20.00
Laghu	05	16.66	05	16.66
Snigdha	01	3.33	01	3.33
Ruksha	10	33.33	08	26.66
Mridu	00	00	00	00.00
Tikshna	04	13.33	04	13.33
Sheeta	05	16.66	06	20.00
Ushna	00	00	00	00.00

In the present clinical research work Ruksh ghun pradhan diet was found in 10(33.33%) patients, Guru, Laghu and Sheeta guna diet each was found in each 05(16.66%) patients. While 04(13.33%) with Tikshna guna and 01(3.33%) was found with predominance of Snigdha *Guna* in Diet in group A, Ruksh ghun pradhan diet was found in 08(26.66%) patients, Guru, and Sheet gun diet each was found in each 06(20.00%) patients. While 05(16.66%) Laghu gun, 04(13.33%) found with Tikshna *Guna* and 01(3.33%) was found with predominance of Snigdha *Guna* in Diet in group B.

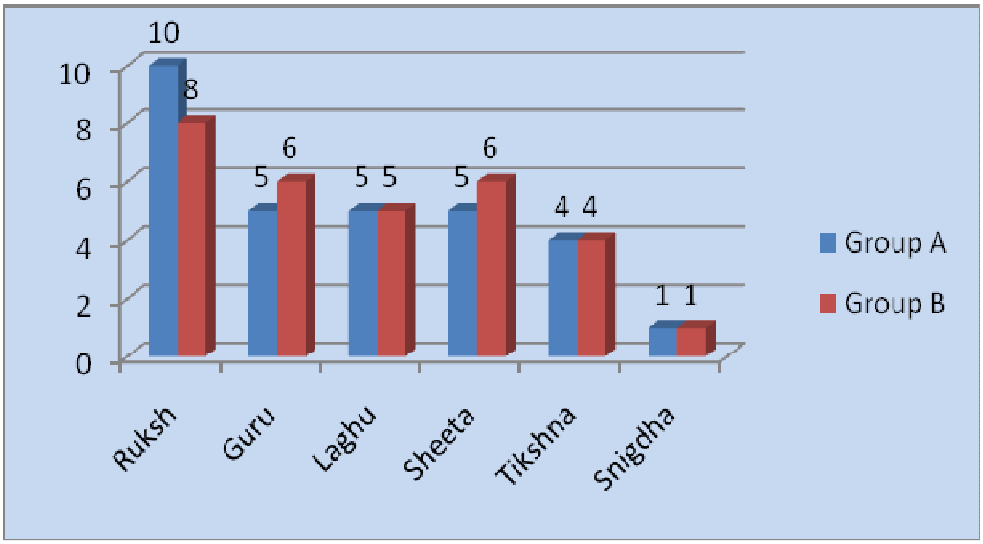
TABLE NO. 21

SUPPLEMENTARY DIET WISE DISTRIBUTION OF 30 PATIENTS

Supplementary Diet	Group A	(%)	Group B	(%)
Tea	18	60	20	66.66
Milk	12	40	10	33.33
Others	00	00	00	00.00

In the present clinical study, intake of tea was found in 18(60%) patients and milk was found in 12 (40%) patients in group A. But in group B tea was found in 20 (66.66%) patients and milk was found in 10 (33.33%) patients.

Gun Predominance



Beverages

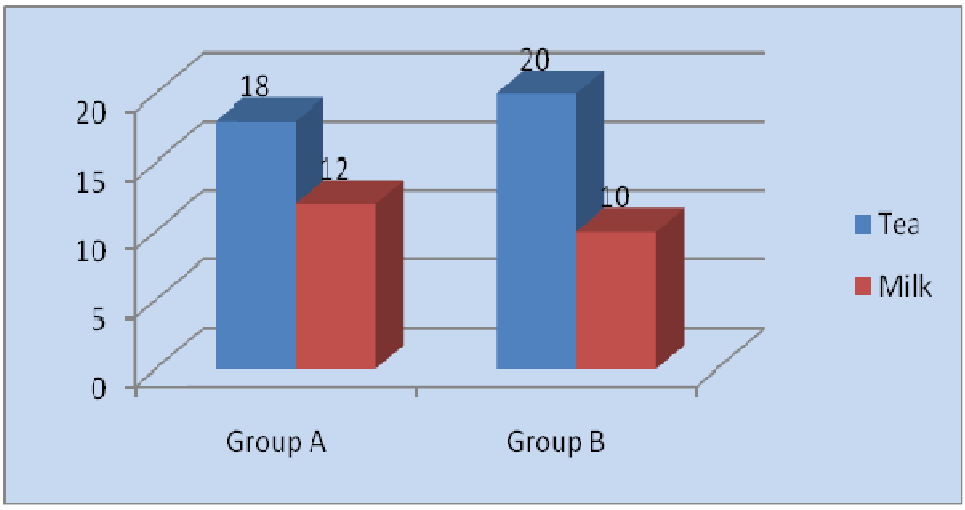


TABLE NO. 22

PLAYING ACTIVITIES WISE

DISTRIBUTION OF 30 PATIENTS

Playing activities	Group A	(%)	Group B	(%)
More outdoor	12	40	11	36.66
More Indoor	15	50	17	56.66
Equal	03	10	02	06.66

In the present study, in group A 12 (40 %) patients were found to be more interested in outdoor playing activities, 15(50 %) patients were found interested in indoor activity while 03(10%) were found interested equally in both indoor and outdoor playing activities. group B 11 (36.66 %) patients were found interested more in outdoor playing activities, 17(56.66 %) patients were found interested in indoor activity while 02(6.66%) were found interested equally in both indoor and outdoor playing activities.

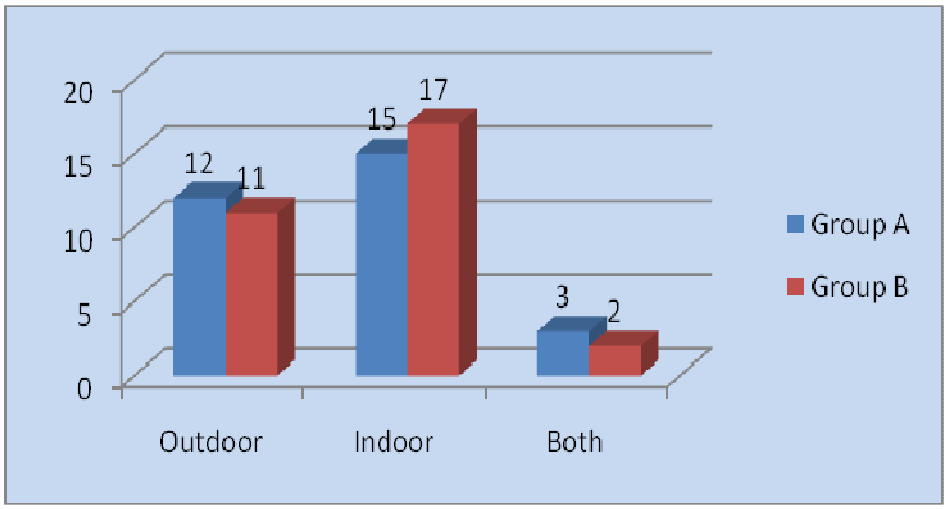
TABLE NO. 23

SLEEP PATTERN WISE DISTRIBUTION OF 30 PATIENTS

Sleep	Group A	(%)	Group B	(%)
Sound	21	70	22	73.33
Disturbed	05	16.66	06	20.00
Irregular	04	13.33	02	06.66

Out of 30 patients, in group A 21 (70 %) patients had sound sleep, 05 (16.66 %) patients had irregular sleep while 04 (13.33 %) had disturbed sleep. While in group B 22 (73.33 %) patients had sound sleep, 06 (20.00 %) patients had irregular sleep while 02 (06.66 %) had disturbed sleep.

Playing Activity



Sleep

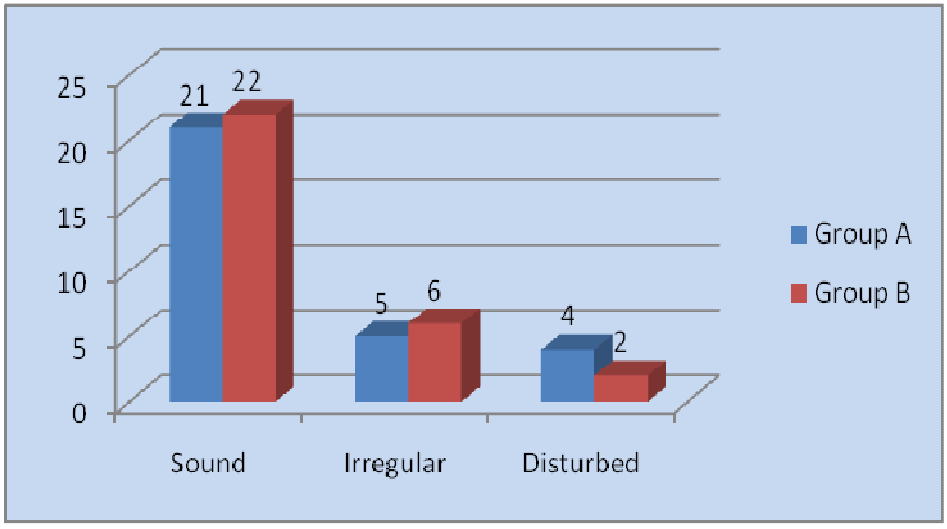


TABLE NO. 24

MENTAL STATUS WISE
DISTRIBUTION OF 30 PATIENTS

Mental status	Group A	(%)	Group B	(%)
Tension	02	06.66	01	03.33
Jovial	05	16.66	03	10.00
Anger	09	30.00	11	36.66
Irritation	08	26.66	07	23.33
Jealous	02	06.66	02	06.66
Fear	04	13.33	06	20.00

In the present study predominance of Tension, Jovial, Anger, Irritation, Jealous and Fear were found present in 02 (6.66%), 05 (16.66%), 09 (30.00%), 18(26.66%), 02(6.66%), and 04(13.33%) patients respectively in group A. while in group B predominance were found in 01(3.33%), 03(10.00%), 11(36.66%), 07(23.33%), 02(6.66%) and 06(20.00%) respectively.

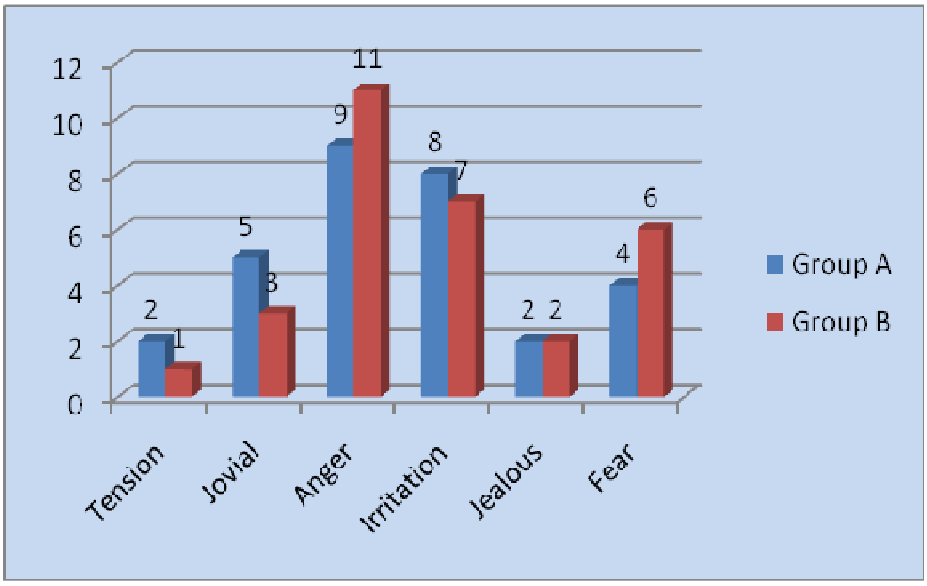
TABLE NO. 25

DOSHA PRAKRITI WISE DISTRIBUTION OF 30 PATIENTS

Prakriti	Group A	(%)	Group B	(%)
Vatapitta	18	60	17	56.66
Vatakapha	09	30	09	30.00
Pittakapha	03	10	04	13.33

The Dosha Prakriti of 18(60%) patients was found Vatapitta predominance, 09 (30%) patients with Vatkapha and 03(10%) had Pittakapha type of dosha Prakriti in group A. while in group B 17(56.66%) patients were found with Vatapitta predominance, 09 (30.00%) patients with Vatkapha and 04(13.33%) had Pittakapha type of dosha Prakriti.

Mental Status



Prakriti

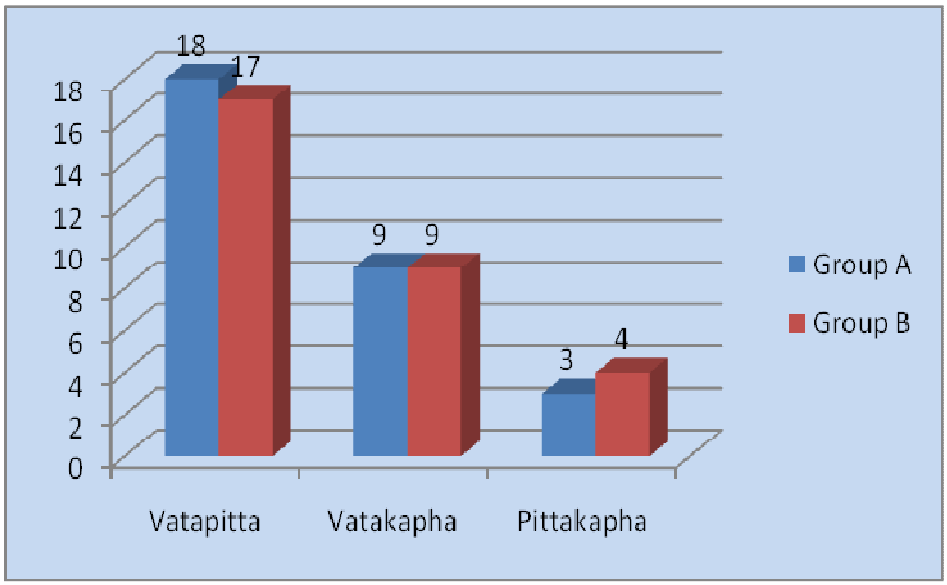


TABLE NO. 26

SARA WISE DISTRIBUTION OF 30 PATIENTS

Sara	Group A	(%)	Group B	(%)
Pravara	03	10.00	03	10.00
Madhyama	04	13.33	05	16.66
Avara	23	76.66	22	73.33

Most of the patients included in this study had Avara Sara i.e. 23 (76.66%) while 04 (13.33%) patients had Madhyama Sara and 03(10%) had Pravar Sara in group A. Patients having Avara Sara were 22 (73.33%) while 05 (16.66%) patients had Madhyama Sara and 03(10%) had Pravar Sara in group B.

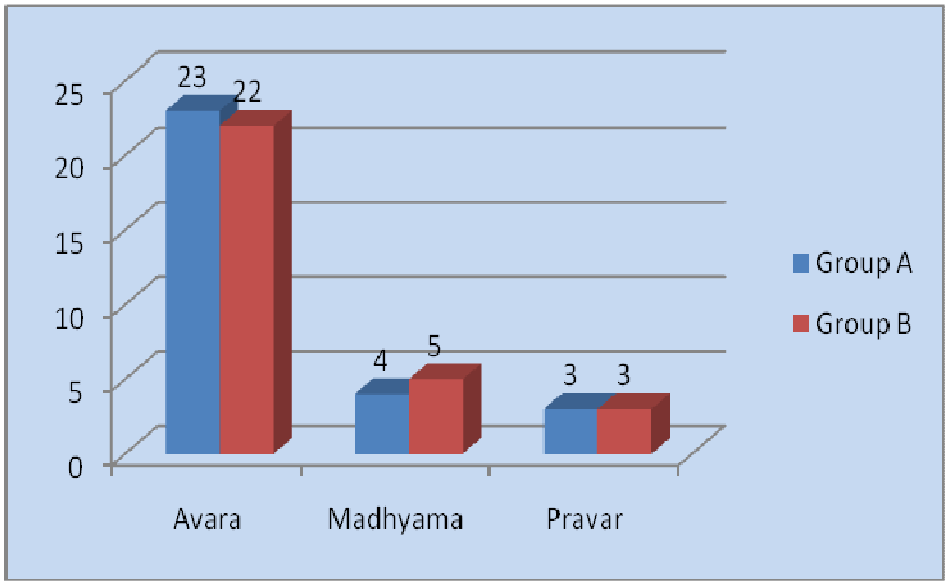
TABLE NO. 27

SAMHANANA WISE DISTRIBUTION OF 30 PATIENTS

Samhanana	Group A	(%)	Group B	(%)
Pravara	04	13.33	04	13.33
Madhyama	18	60.00	16	53.33
Avara	08	26.66	10	33.33

Most of the patients included in this study were found to be with Madhyam Samhanana i.e. 18 (60%) while 08 (26.66%) had Avar Samhanan and 04(13.33%) had Pravar Samhanana in group A. And patients included in this study were found to be with Madhyam Samhanana were 16 (53.33%) while 10 (33.33%) had Avar Samhanan and 04(13.33%) having Pravar Samhanana in group B.

Saara



Samhanan

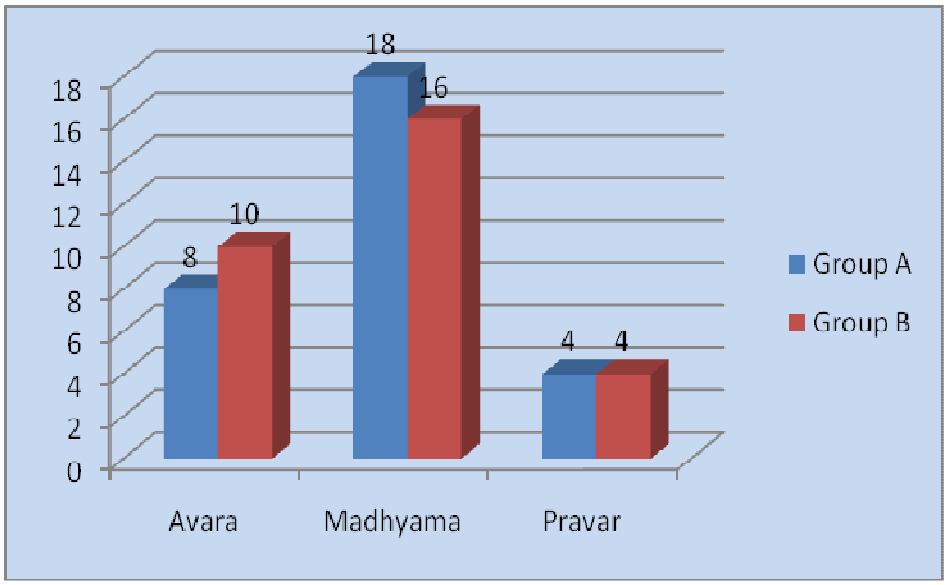


TABLE NO. 28

OBSERVATION OF PRAMANA

(ANTHROPOMETRIC EXAMINATION) IN 30 PATIENTS

[a] WEIGHT WISE DISTRIBUTION OF 30 PATIENTS:

Weight	Group A	(%)	Group B	(%)
Up to 10 kg	03	10.00	04	13.33
> 10 to 20 kg	14	46.66	10	33.33
> 20 to 30 kg	08	26.66	08	26.66
> 30 kg	05	16.66	08	26.66

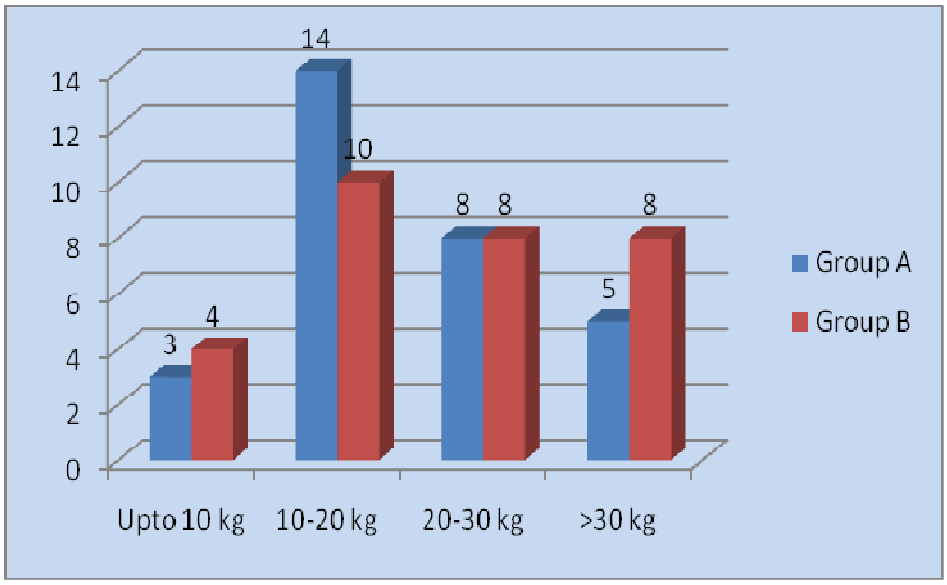
In this present research work, up to 10 kg body weight was found in 03 (10%) patients, >10kg to 20 kg body weight was found in 14 (46.66%) patients, > 20kg to 30kg body weight was found in 08 (26.66%) patients and more than 30kg body weight was found in 05 (16.66%) patients in group A. While in group B , up to 10 kg body weight was found in 04 (13.33%) patients, >10kg to 20 kg body weight was found in 10 (33.33%) patients, > 20kg to 30kg body weight was found in 08 (26.66%) patients and more than 30kg body weight was found in 08 (26.66%) patients.

[b] HEIGHT WISE DISTRIBUTION OF 30 PATIENTS

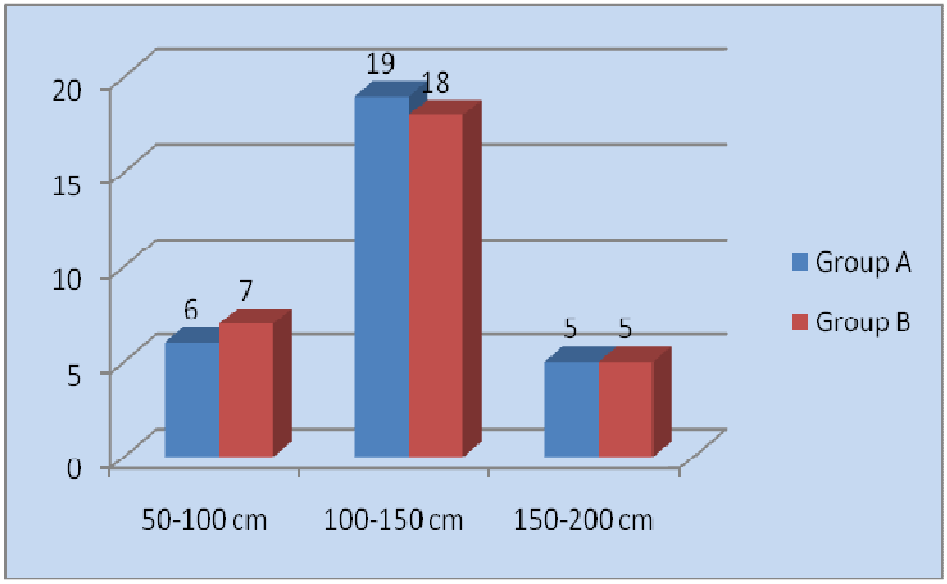
Height	Group A	(%)	Group B	(%)
50 to 100 cm	06	20.00	07	23.33
>100 to 150 cm	19	63.33	18	60.00
>150 to 200 cm	05	16.66	05	16.66

In this present clinical Trial in group A height of 06 (20%) patients were within 50 cm to 100 cm, 19(63.33%) patients were found within more than 100cm to 150cm and 05 (16.66%) patients were found within the range of more than 150 cm to 200cm. while in group B height of 07 (23.33%) patients was within 50 cm to 100 cm, 18(60.00%) patients were found within more than 100cm to 150cm and 05 (16.66%) patients were found within the range of more than 150 cm to 200cm.

Weight



Height



[c] HEAD CIRCUMFERENCE (HC) WISE DISTRIBUTION OF 30 PATIENTS:

Head circumference	Group A	(%)	Group B	(%)
40 to 50 cm	25	83.33	24	80.00
>50 cm	05	16.66	06	20.00

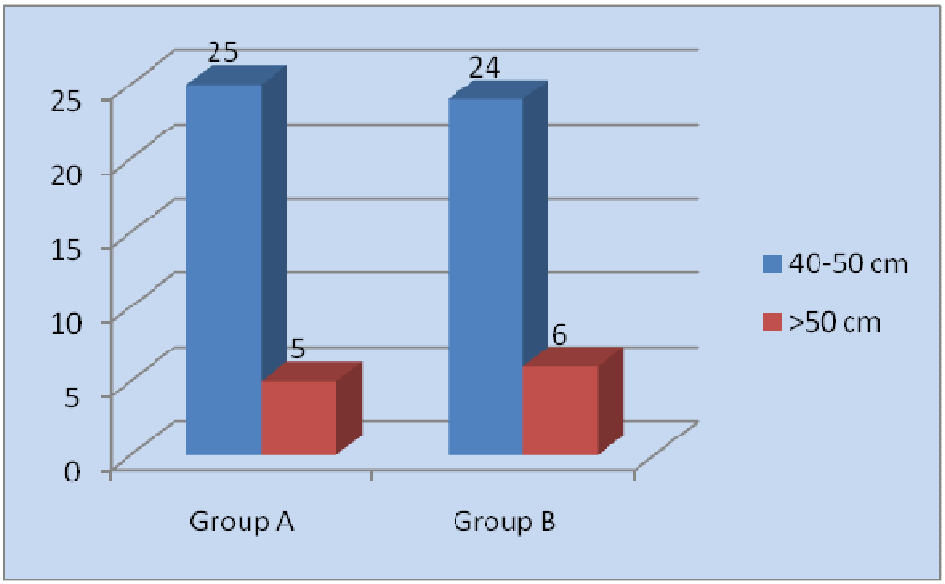
In this present clinical study, Head circumferences of 25 (83.33%) patients were found within the range of 40cm to50 cm and 05 (16.66%) patients were found more than 50cm in group A. While in group B Head circumferences of 24 (80.00%) patients were found within the range of 40cm to 50 cm and 06 (20.00%) patients were found more than 50cm.

[d] CHEST CIRCUMFERENCE (CC) WISE DISTRIBUTION OF 30 PATIENTS:

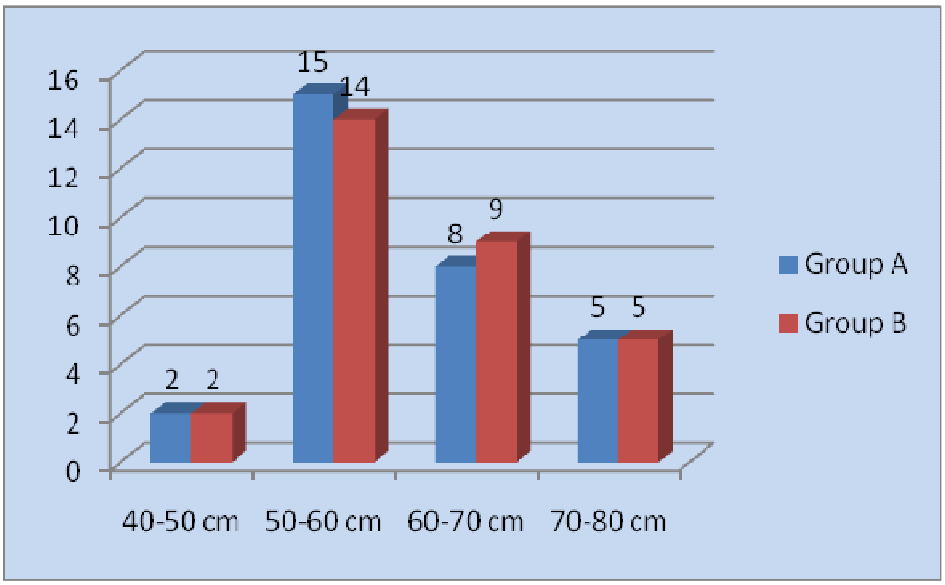
Chest circumference	Group A	(%)	Group B	(%)
40 to 50 cm	02	06.66	02	06.66
>50 to 60 cm	15	50.00	14	46.66
>60 to 70 cm	08	26.66	09	30.00
>70 to 80 cm	05	16.66	05	16.66

In this present clinical trial, in group A, Chest Circumference of 02 (6.66%) patients were within 40 cm to 50 cm, 15 (50%) patients were found within more than 50cm to 60cm, 08 (26.66%) patients were found within the range of more than 60 cm to 70cm and the range more than 70cm to 80cm was found in another 05 (16.66%) patients. While in group B Chest Circumference of 02 (6.66%) patients were within 40 cm to 50 cm, 14 (46.66%) patients were found within more than 50cm to 60cm, 09 (30.00%) patients were found within the range of more than 60 cm to 70cm and the range more than 70cm to 80cm was found in another 05 (16.66%) patients.

Head Circumference



Chest Circumference



[e] ABDOMINAL CIRCUMFERENCE WISE DISTRIBUTION OF 30 PATIENTS:

Abdominal Circumference	Group A	(%)	Group B	(%)
40 to 50 cm	02	6.66	04	13.33
> 50 to 60 cm	23	76.66	22	73.33
> 60 to 70 cm	05	16.66	04	13.33

In present clinical study, 40cm to 50cm Abdominal circumference was found in 02 (6.66%) patients, > 50 cm to 60 cm Abdominal circumference was found in 23 (76.66%) patients and >60 cm to 70cm Abdominal circumference was found in 05 (16.66%) patients in group A. 40cm to 50cm Abdominal circumference was found in 04 (13.33%) patients, > 50 cm to 60 cm Abdominal circumference was found in 22 (73.33%) patients and >60 cm to 70cm Abdominal circumference was found in 04 (13.33%) patients in group B.

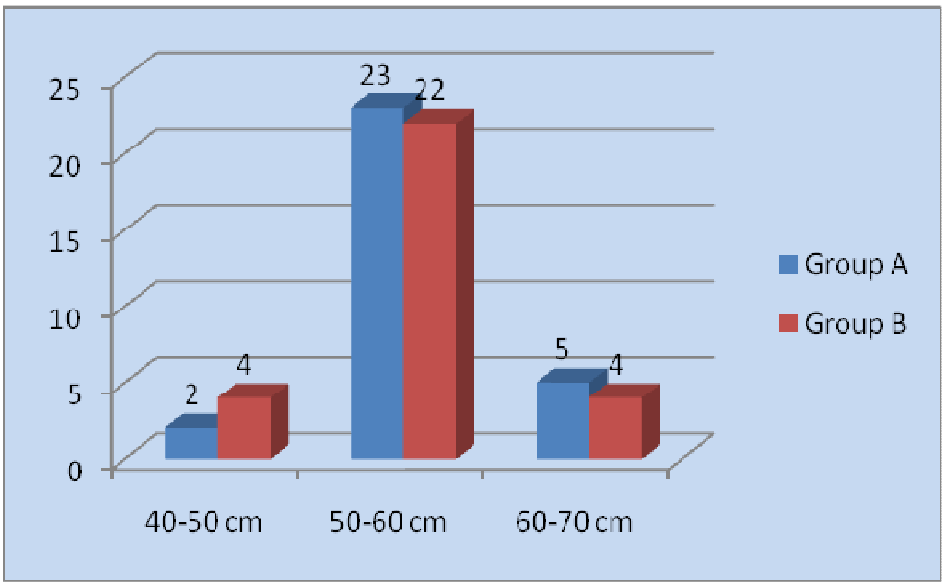
TABLE NO. 29

OBSERVATION OF SATMYA IN 30 PATIENTS

Satmya	Group A	(%)	Group B	(%)
Pravara	00	00	01	03.33
Madhyama	12	40	12	40.00
Avara	18	60	17	56.66

In the present clinical study Avara Satmya was found in 18(60%) patients, and 12(40 %) patients had Madhyama Satmya in group A. And Avara Satmya was found in 17(56.66%) patients, 12(40.00 %) patients had Madhyama Satmya and 01(3.33%) patient had Pravara Satmya in group B.

Abdominal Circumference



Satmya

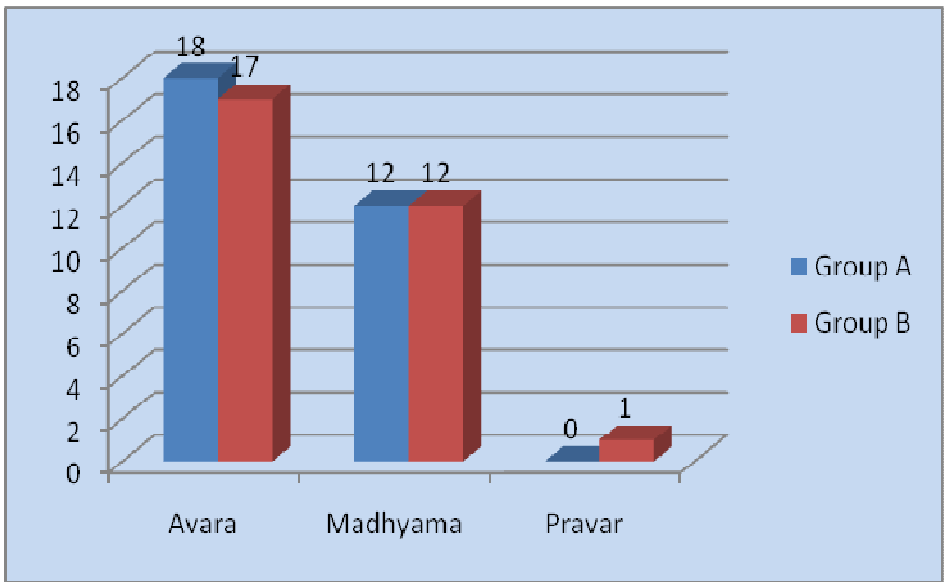


TABLE NO. 30

OBSERVATION OF SATVA IN 30 PATIENTS

Satva	Group A	(%)	Group B	(%)
Pravara	02	06.66	02	06.66
Madhyama	20	66.66	20	66.66
Avara	08	26.66	08	26.66

In the Present research work, 08 (26.66 %) patients were having Avara *Satva*, 20(66.66%) patients Madhyama Satva and 02(6.66%) were having Pravara Satva in both group A and group B.

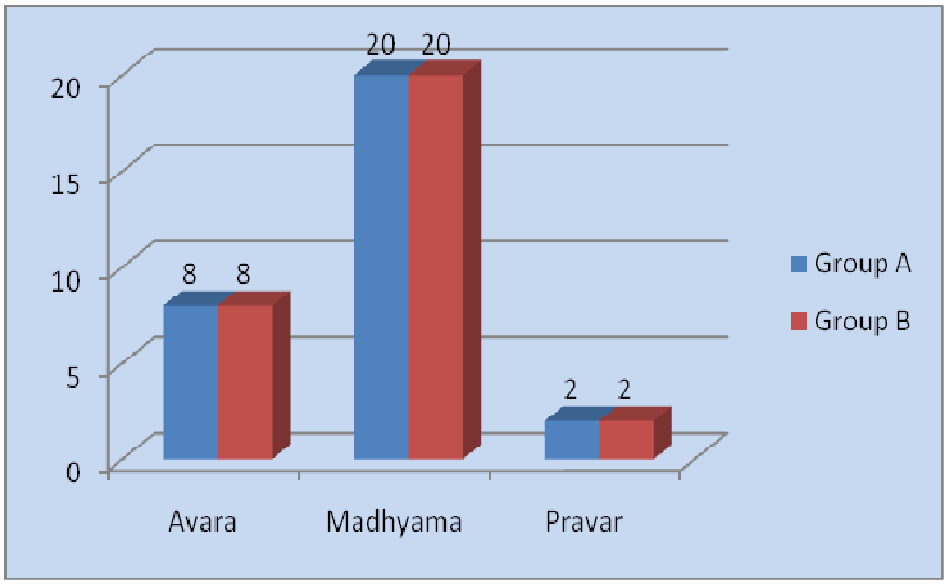
TABLE NO. 31

ABHYAVARANASHAKTI WISE DISTRIBUTION OF 30 PATIENTS

Abhyavaranashakti	Group A	(%)	Group B	(%)
Pravara	00	00.00	00	00.00
Madhyama	07	23.33	06	20.00
Avara	23	76.66	24	80.00

In the present Study 23(76.66%) of patients had Avara Abhyavaranashakti while 07(23.33%) patients had Madhyama Abhyavaranashakti in group A. While in group B 24(80.00%) of patients had Avara Abhyavaranashakti while 06(20.00%) patients had Madhyama Abhyavaranashakti

Satva



Abhyavaharan Shakti

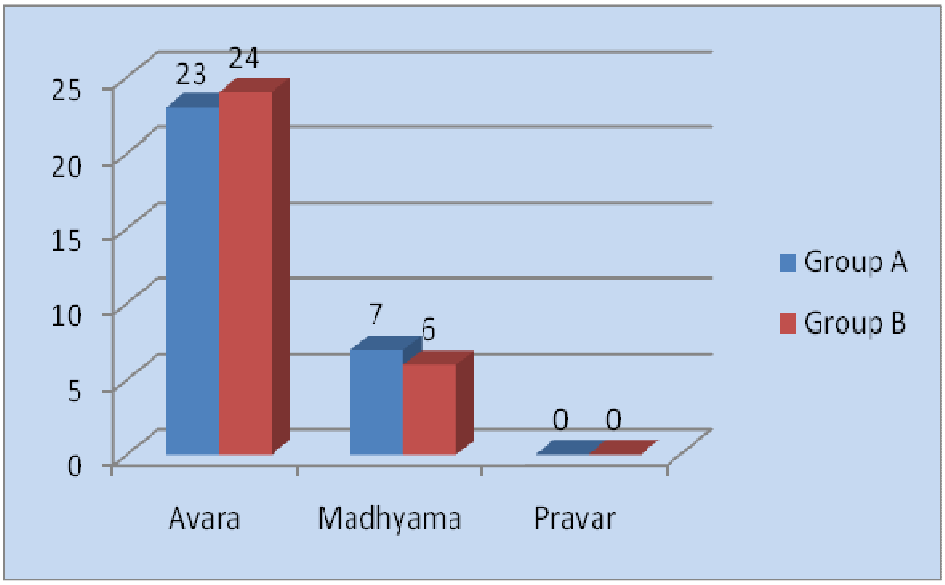


TABLE NO. 32

JARANASHAKTI WISE DISTRIBUTION OF 30 PATIENTS

Jaranashakti	Group A	(%)	Group B	(%)
Pravara	00	00	00	00.00
Madhyama	08	26.66	07	23.33
Avara	22	73.33	23	76.66

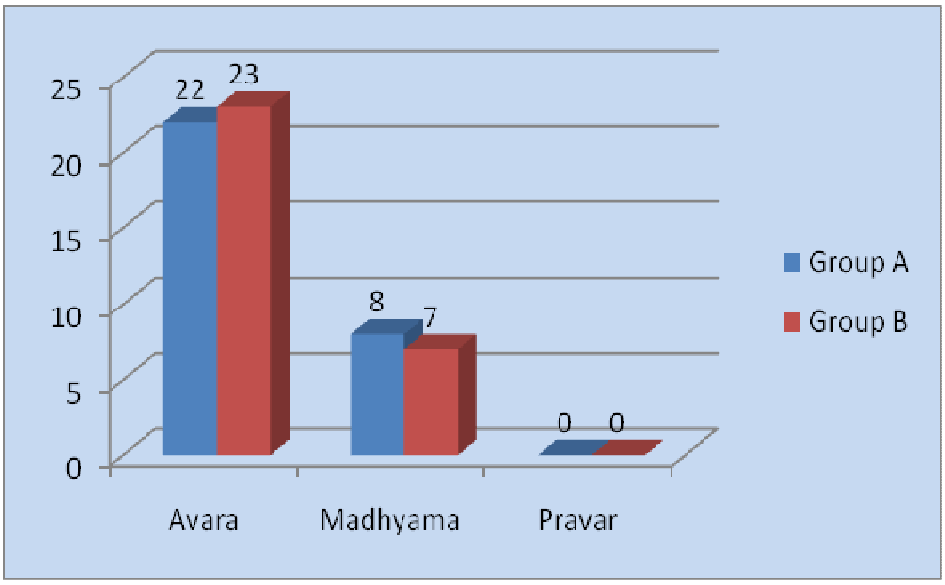
It has been observed 22(73.33%) of patients had Avara Jaranashakti while 08(26.66%) of patients had Madhyama Jaranashakti in group A. While in group B observed 23(76.66%) of patients had Avara Jaranashakti while 07(23.33%) of patients had Madhyama Jaranashakti

TABLE NO. 33
VYAYAMASHAKTI (PLAYING ACTIVITY) WISE
DISTRIBUTION OF 30 PATIENTS

Vyayamashakti	Group A	(%)	Group B	(%)
Pravara	00	00.00	00	00.00
Madhyama	07	23.33	06	20.00
Avara	23	76.66	24	80.00

In this clinical study, it was found that 23 (76.66%) Patients had Avara Vyayam ashakti while 07(23.33%) patients had Madhyama Vyayama Shakti in group A. While in group B 24 (80.00%) Patients had Avara Vyayam ashakti while 06(20.00%) patients had Madhyama Vyayama Shakti

Jaran Shakti



Vyayam Shakti

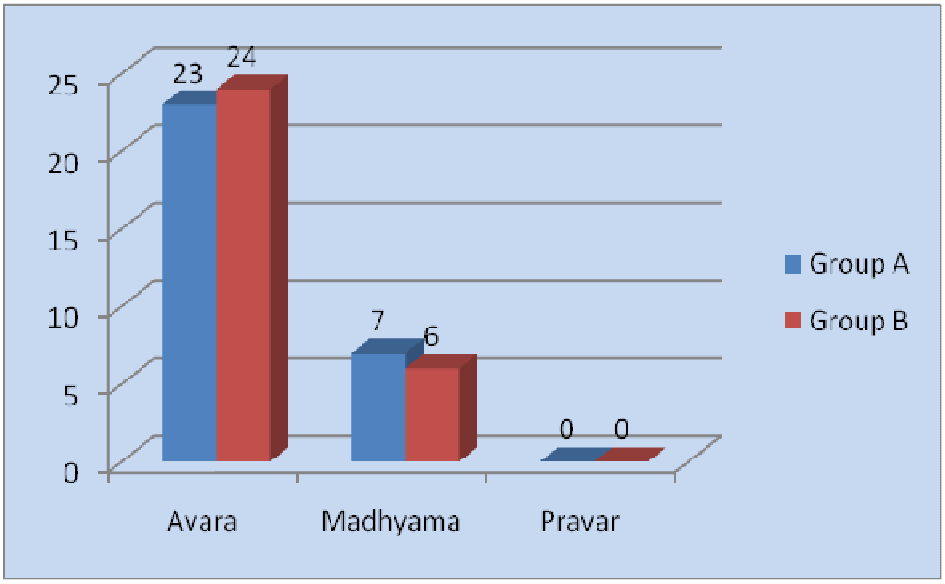


TABLE NO. 34

OBSERVATION OF AHAR TYPE IN 30 PATIENTS

Vaya	**Group A**	***(%)***	***Group B***	***(%)***
Kshira-Annada	09	30.00	09	30.00
Annada	21	70.00	21	70.00

In the present clinical study maximum, 21(70%) of patients were in Annada Avastha and 09 (30%) patients had Kshira–Annada Avastha in both group A and group B

TABLE NO. 35

CHIEF COMPLAINTS WISE DISTRIBUTION OF 30 PATIENTS

Chief complaints		**Group A**	**(%)**	**Group B**	**(%)**
1.	Panduta	30	100.00	30	100.00
2.	Daurbalya	30	100.00	30	100.00
3.	Krishna nakhtva	24	80.00	20	66.66
4.	Krishna netratva	19	63.33	20	66.66
5.	Bhrama	15	50.00	16	53.33
6.	Swasa(Ayasaj)	29	96.66	30	100.00
7.	Shunakshikuta	27	90.00	27	90.00
8.	Shishirdwesha	23	76.66	25	83.33

Out of 30 patients, Panduta and Daurbalya were found in 30(100%) patients, while 29(96.66%) Ayasaj Shwash, 27(90%) Shunakshikuta, 24(80%) Krishna nakhtva, 23(76.66%) Shishirdwesh, 19(63.33%) Krishna netrata and 15(50%) Bhrama were found in group A. While in group B Panduta, Daurbalya and Avasai Swash were found in 30(100.00%), while Shunakshikuta, 27(90.00%), Shishirdwesh, 25(83.33%), Krishna nakhtva and Krishna netrata in 20(66.66%) and 16(53.33%) Bhrama were found.

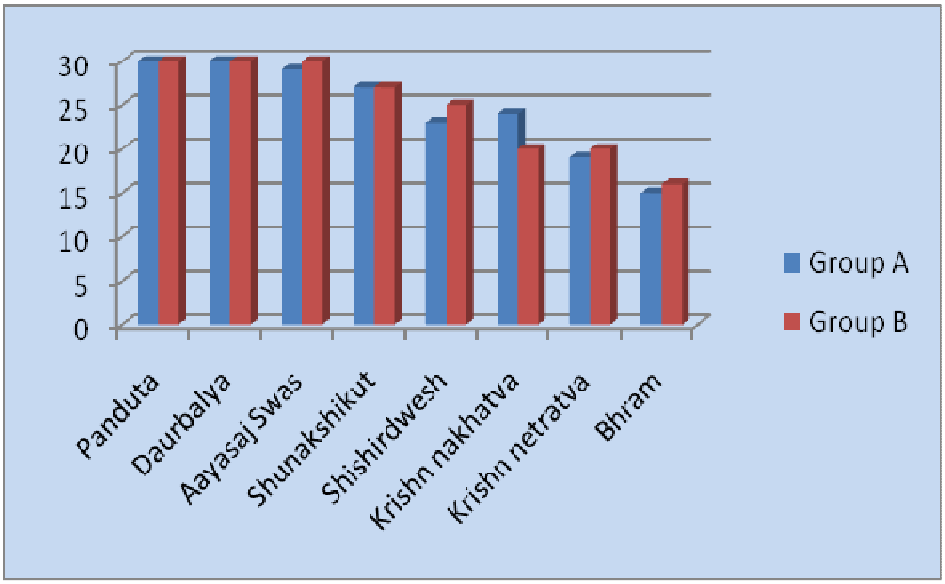
TABLE NO. 36

SROTODUSHTI WISE DISTRIBUTION OF 30 PATIENTS

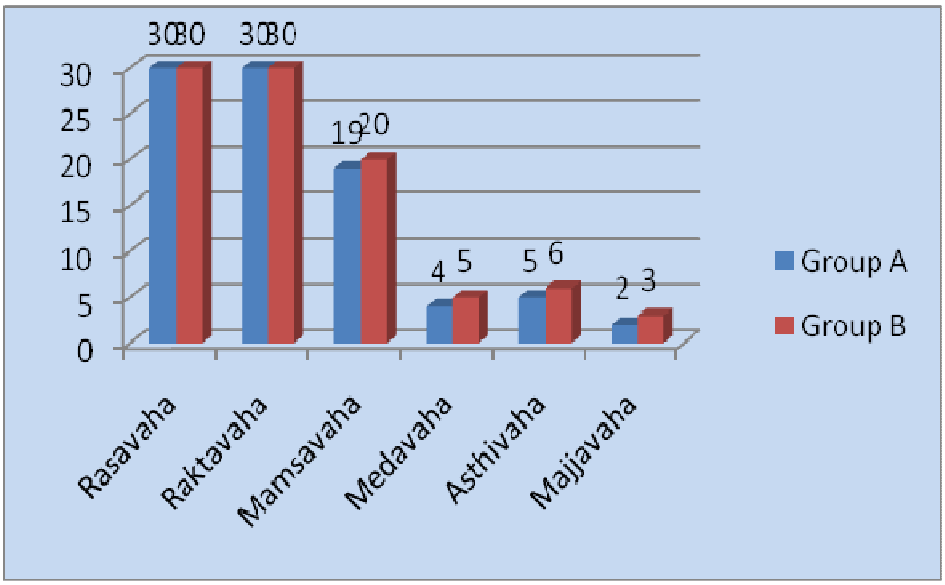
Srotas	Group A	(%)	Group B	(%)
Rasavaha	30	100	30	100.00
Raktaavaha	30	100	30	100.00
Mamsavaha	19	63.33	20	66.66
Medavaha	04	13.33	05	16.66
Asthivaha	05	16.66	06	20.00
Majjavaha	02	6.66	03	10.00

In this present clinical study, 30(100%) patients having Dushti of Rasavah and Raktaavaha Srotas, 19(63.3%) patients had Mamsavaha Srotodushti while 05(16.66%) had Asthivah, 04(13.33%) had Medovah and 02(6.66%) had Majjavah srotodushti were found in group A. While in group B 30(100%) patients having Dushti of Rasavah and Raktaavaha Srotas, 20(66.66%) patients had Mamsavaha Srotodushti while 06(20.00%) had Asthivah, 05(16.66%) had Medovah and 03(10.00%) had Majjavah srotodushti.

Chief Complaints



Shrotas



RESULTS

RESULTS

Paired 't' Test : Group A

Investigation (n= 30)	Mean		Mean Difference	% change	S.D.±	S.E. ±	't '	p
	B.T.	A.T.						
HB	7.47	9.92	2.45	32.81	0.97	0.18	13.86	<0.001
WBC	6455.00	7103.33	648.33	10.04	328.98	59.96	10.81	<0.001
Neutrophils	71.27	75.67	4.40	6.17	2.76	0.50	8.73	<0.001
Lymphocyte	20.63	23.90	3.27	15.83	1.66	0.30	10.78	<0.001
Eosinophil	1.67	3.20	1.53	92	0.78	0.14	10.82	<0.001
Monophil	3.67	4.67	1.0	27.27	0.91	0.17	6.02	<0.001
Basophil	0.10	0.33	0.23	233.33	0.50	0.09	2.54	<0.01
ESR	11.70	9.63	2.07	17.66	2.41	0.44	4.70	<0.001

Paired 't' Test : Group B

Investigation (n= 30)	Mean		Mean Difference	% change	S.D.±	S.E. ±	't '	p
	B.T.	A.T.						
HB	7.57	10.30	2.43	30.93	0.85	0.15	15.71	<0.001
WBC	6033.33	6850.0	816.67	13.54	441.07	80.53	10.14	<0.001
Neutrophils	71.60	75.43	3.83	5.35	3.10	0.57	6.78	<0.001
Lymphocyte	20.80	23.47	2.67	12.82	1.18	0.22	12.33	<0.001
Eosinophil	2.13	3.90	1.77	82.81	0.77	0.14	12.50	<0.001
Monophil	3.53	4.57	1.03	29.25	0.89	0.16	6.36	<0.001
Basophil	0.07	0.27	0.20	300	0.41	0.07	2.69	<0.01
ESR	11.73	10.10	1.63	13.92	2.20	0.40	4.06	<0.001

Unpaired 't' Test :

Investigation	Mean Difference Group A	Mean Difference Group B	S.D.±	S.E.±	't '	p
HB	2.45	2.43	0.910	0.235	0.071	<0.1
WBC	648.33	816.67	388.83	100.40	-1.68	<0.1
Neutrophils	4.40	3.83	2.93	0.76	0.75	<0.1
Lymphocyte	3.27	2.67	1.442	0.372	1.61	<0.1
Eosinophil	1.53	1.77	0.78	0.20	-1.17	<0.1
Monophil	1.0	1.03	0.90	0.23	-0.14	<0.1
Basophil	0.23	0.20	0.46	0.12	0.28	<0.1
ESR	2.07	1.63	2.31	0.60	0.73	<0.1

Overall Result :

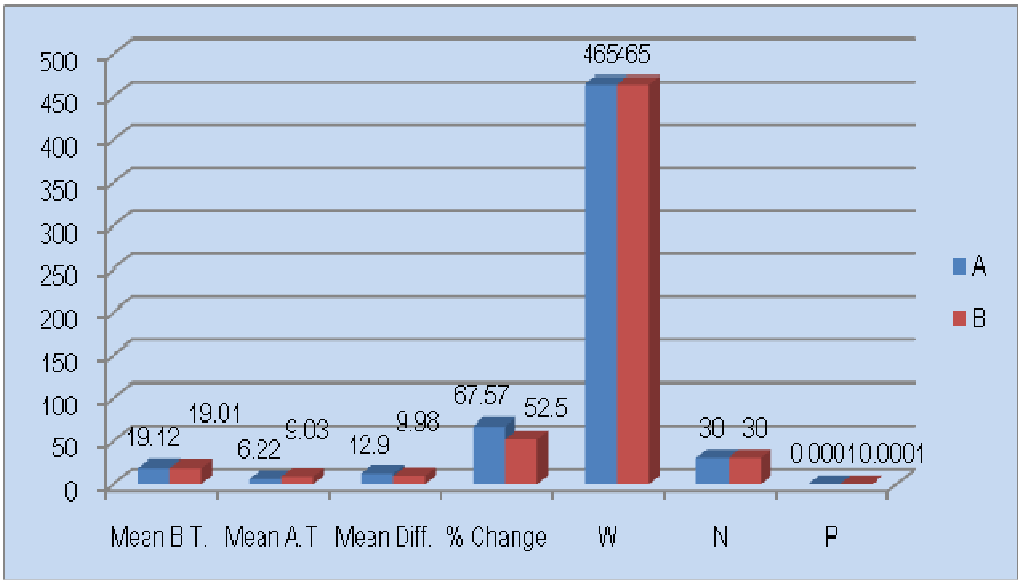
Result	Group A	Group B
Maximum Improvement (>75%)	8	0
Moderate Improvement (50 to 75%)	20	17
Mild Improvement (25 to 50%)	2	13
No Improvement (<25%)	0	0
Total	30	30

Overall Results (Wilcoxons matched unpaired test)

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	19.12	6.22	12.90	67.57	465	30	<0.0001
B(n=30)	19.01	9.03	9.98	52.50	465	30	<0.0001

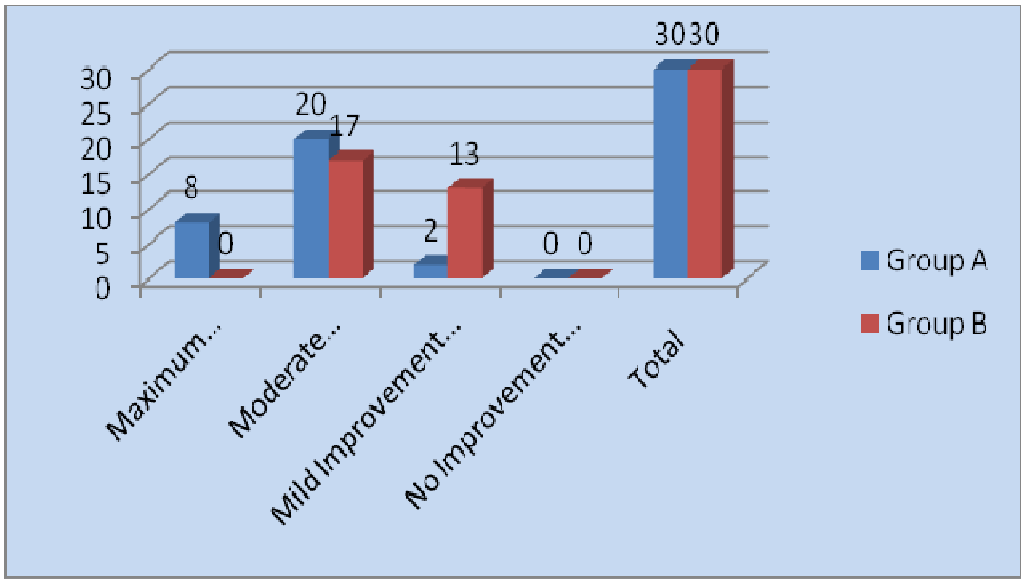
Overall Results :

(Wilcoxons matched Unpaired Test)



Results

(Improvement Level)



On comparing the effects of therapies by Wilcoxons matched unpaired test it was found that there is extremly significant difference (p <0.0001) in the effect of therapies in group A & B.

Cardinal symptoms:

1. Panduta Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	3.1	1.07	2.03	65.59↓	435	29	<0.01
B(n=30)	2.93	1.3	1.63	55.68	378	27	<0.01

Chi square - Panduta

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	11	19	30	1.313	>0.05
B	06	24	30		
Total	17	43	60		

On comparing the effects of therapies by chi square test it was found that there is no significant difference (p >0.05) in the effect of therapies in group A & B on Panduta.

2. Daurbalya Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.96	1.36	1.6	53.93↓	276	24	<0.01
B(n=30)	2.83	1.53	1.3	45.88	300	24	<0.01

Daurbalya Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	12	18	30	3.28	<0.05
B	20	10	30		
Total	32	28	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Daurbalya.

3. Bhram Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	3.1	1.13	1.96	63.44	406	28	<0.01
B(n=30)	3.03	1.26	1.7	58.24	435	29	<0.01

Bhram Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	6	24	30	8.40	<0.05
B	18	12	30		
Total	24	36	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Bhram.

4. Krishn nakhatva Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	3.13	1.23	1.9	60.64	378	27	<0.01
B(n=30)	2.93	1.3	1.63	55.68	325	25	<0.01

Krishn nakhatva Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	9	21	30	4.31	<0.05
B	18	12	30		
Total	27	33	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Krishn nakhatva.

5. Krishn netratva Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.93	1.03	1.9	64.77	325	25	<0.01
B(n=30)	2.93	0.93	2.0	68.18	465	30	<0.01

Krishn netratva Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	11	19	30	4.27	<0.05
B	20	10	30		
Total	31	29	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Krishn netratva.

6. Swas (Ayasaj) Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.46	0.6	1.86	75.68	406	28	<0.01
B(n=30)	2.5	1.33	1.16	46.67	231	21	<0.01

Swas (Ayasaj) Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	11	19	30	3.26	<0.05
B	19	11	30		
Total	30	30	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Swas (Ayasaj).

7. Shunakshikutata Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.4	0.8	1.6	66.67	367	27	<0.01
B(n=30)	2.66	1.03	1.63	61.25	435	29	<0.01

Shunakshikutata Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	10	20	30	5.40	<0.05
B	20	10	30		
Total	30	30	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Shunakshikutata.

8. Shishirdwesh Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.76	1.03	1.73	62.65	378	27	<0.01
B(n=30)	2.5	1.06	1.43	57.33	276	23	<0.01

Shishirdwesh Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	7	23	30	6.85	<0.05
B	18	12	30		
Total	25	35	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Shishirdwesh.

Associated symptoms:

1. Jwar Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.63	0.83	1.8	68.35	406	28	<0.01
B(n=30)	2.83	1.03	1.8	63.53	406	28	<0.01

Jwar Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	12	18	30	3.28	<0.05
B	20	10	30		
Total	32	28	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Jwar.

2. Gaurav Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.53	0.76	1.76	69.74	406	28	<0.01
B(n=30)	2.36	0.8	1.56	66.20	465	30	<0.01

Gaurav Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	11	19	30	4.27	<0.05
B	13	17	30		
Total	24	36	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Gaurav.

3. Nidraluta Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.8	0.7	2.1	75	465	30	<0.01
B(n=30)	2.9	0.86	2.03	70.11	435	29	<0.01

Nidraluta Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	13	17	30	4.38	<0.05
B	22	8	30		
Total	35	25	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference (p <0.05) in the effect of therapies in group A & B on Nidraluta.

4. Hriddravatva Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.43	0.7	1.73	71.23	406	28	<0.01
B(n=30)	2.36	0.66	1.7	71.83	465	30	<0.01

Hriddravatva Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	14	16	30	0.274	>0.05
B	11	19	30		
Total	25	35	60		

On comparing the effects of therapies by chi square test it was found that there is no significant difference (p >0.05) in the effect of therapies in group A & B on Hriddravatva

5. Chhardi Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.4	0.83	1.56	65.28	351	26	<0.01
B(n=30)	2.9	0.83	2.06	71.26	465	30	<0.01

Chhardi Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	10	20	30	4.27	<0.05
B	19	11	30		
Total	29	31	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Chhardi.

6. Tamhpravesh Wilcoxons matched paired test

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	2.5	1	1.5	60	351	26	<0.01
B(n=30)	2.33	0.93	1.4	60	351	26	<0.01

Tamhpravesh Chi square

Groups	N.S.I.	S.I.	Row Total	Chi ^{2}	'P'
A	12	18	30	4.31	<0.05
B	21	9	30		
Total	33	27	60		

On comparing the effects of therapies by chi square test it was found that there is significant difference ($p < 0.05$) in the effect of therapies in group A & B on Tamhpravesh.

Overall Results (Wilcoxons matched unpaired test)

Groups	Mean B.T.	Mean A.T	Mean Diff.	% change	'W'	'N'	'P'
A(n=30)	19.12	6.22	12.90	67.57	465	30	<0.0001
B(n=30)	19.01	9.03	9.98	52.50	465	30	<0.0001

On comparing the effects of therapies by Wilcoxons matched unpairs test it was found that there is extremly significant difference ($p < 0.0001$) in the effect of therapies in group A & B.

DISCUSSION

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Thalassemia is the most common genetic disorder resulting from abnormality of Globin chain. It is the worldwide problem of today's era and until now there is no solution in any medical science. It is a challenging disorder for the scientists. The nature of the disease is genetic. Regarding this, lot of literature is available in the modern science but Ayurveda has no answer for this disease. To add a new concept to the disease Thalassemia (Anukta Vyadhi In Ayurveda), an attempt has been made in this study. To understand the disease, the concept of Beeja, Beejabhaga and Beejabhagavayava should be clear because of its genetic nature. Therefore, the plan of discussion is designed in the chronology of various aspects dealt while describing the studies.

CONCEPTUAL DISCUSSION :

CONCEPT OF BEEJA *:*

Human embryo is an outcome of fertilization of Shukra (Sperm) and Shonita (Ovum).These germinal seeds are made of Vayu, Agni, Jala and Prithvi. The Panchamahabhutaas are taken in the form of Shad- Rasas, which after proper processes of digestion and metabolism are converted as Shukra and Shonita as an ultimate outcome of Ahara. (Ch.Su.24/31&Ch.Sha.2/4). In case of their disproportion or disequilibrium, the formed seed also will be defective, causing malformation, or producing genetic susceptibility for disease in the embryo (Garbha), thus the particularly inflicted part of the seed (Shukra-Shonita) shall be responsible for particular disease Upatapta Beejajanaka Beejabhagaata (Chakrapani Dutta).

Every structure and also the function of human body are fully represented in a seed. So, whichever part of seed is deformed, the same defect will be transferred to embryo.(Ch.Sha.3/17*).*The references of these Beejadushtijanaya Vikara in Ayurvedic classics found in Kustha, Prameha and Arsha Vyadhi.(Ch.Ni.5/6,Su.Ni.5/28 &Ch.Chi.6/57)

Regarding the Kulaja Vikaraas, Chakrapani Dutta further explains that Kulajaiti pitru-Pitaamaha Aadi Kaaranodbhutaahaa(Chakrapani Dutta).

Likewise, Jaatapramehi, the Sahaja-Arsha (Congenital haemorrhoids) is also stated to be caused from the Beeja Dosha, or sinful acts in previous life. (Cha.Chi.14/5). In which the part of Beeja responsible for Guda (anus or rectum) is affected. When there is no such damage to Beejabhaga, there will not be Sahaja Arsha in the anus. This Sahaja Arsha variety is enumerated separately to denote the significance of the cause- the Beeja Dosha. Thus, the concept of genetic diseases was established very clearly in the ancient time and the disease mentioned in the classics, based on at that time and environment. While change is the constant rule of life, newer diseases come due to environment, psychological and physiological changes but we try to understand them on the principles of Ayurveda.

AYURVEDIC ETIOPATHOGENESIS OF THALASSEMIA :

Methodology of understanding a disease process and desigining the treatment has been nicely explained in Charaka Samhita. On the basis of Charaka's dictum, present study has tried to reveal the etiopathogenesis of Thalassemia.

Prakopana of Thalassemia is by means of the Mithyaaharavihara and Asatmyaindriyartha Samyoga of parents. Which will lead to Dushti of Doshas and Dhatus. The vitiated Beejabhagavayava of Rakta Dhatu already presents in the offspring but after manifestation of disease, excess intake of Pitta Prakopaka Ahara leads to Dushti of TriDosha but mainly Dushti of Pitta. Rakta is Panchabhautika in nature. Visrata due to Prithvi Mahabhuta, Dravata due to Jala Mahabhuta, Raga due to Agni Mahabhuta and Spandana due to Vayu Mahabhuta, lastly Laghuta due to Akasha Mahabhuta are present in the Rakta .After taking Pittavardhaka Ahara Ushma, Guna of Pitta increases and Raga (Pittoshma) also affected the same as principle of Sarvada Sarva Bhavanam Samanyam vriddhi Karanam. Raga (Pittosma) is the Guṇa which can not exist independently in the body and the substances on which it depends is the Rasa. So as per Ayurveda, one can define that when Raga (RBCs + Hb) is added to Rasa (plasma), Rakta is formed. Raktaja Vyadhis are Tridoshaja, but among the TriDoshas, mainly Pitta is predominant, in Rakta Dushti as maximum Nidanas for Rakta Dushti are Pitta Prakopajanya and the Pitta and Rakta have similar properties and site, so as Pitta gets vitiated, Rakta also becomes vitiated itself.

Clinically it is found that almost all the children like the Pittaprakopaka Ahara. This may be due to the principle, that the person desires the same diet of which he/she has deficiency in the body. (Su.Su.15/24).Practically,it is seen that the symptoms of Shonita kshaya given in the classics (Amlasheetaprarthana) demand by the patients. (Su.Su.14/37, 38)

Moolakarana or the essential cause for Thalassemia is the defect in the Globin chain. Defected α and β genes are the responsible factors of this disease. The causative factors of disease given in the classics are mainly three types Asatmendriyartha Samyoga, Pragyaparadha or Parinama. (Ch.Su.11/43) The defect in the Globin chain may be due to these factors. The causes of Vikrita Santana mention in the classics are Beeja, Atmakarma, Ashaya (Garbhashaya) and Kala (Time factor) and Matuha Ahara Vihara.(Ch.Sha. 2/29).These hidden factors must be affecting the genetic structure of the human body. The causative factor of this genetic abnormality is mutation according to the modern science but the reason behind these mutations is not known till date. This disease is found in some specific communities, which are mentioned in the classics. The reason mentioned is predominance of Consanguineous marriages in some communities but the answer is not explained till date. Our hidden concept explains that Acharyas are very familiar to the genetic problems in the society that is why they mentioned Atulyagotriya Vivaha in Ch.Sha.2.

On focusing the relationship between Sahaja karana and Doshas, Dushyas, Agni etc (intrinsic factors) we can draw the complete picture, how they contribute to the creation of disease. Kayagni is responsible for the Vriddhi and Kshaya of Dhatwagnis. All the Dhatwagnis are in turn responsible for the Vriddhi and Kshaya of further Dhatus. Rasagni being responsible for producing mature Raktadhatu, if not properly metabolized may result in immature Rakta Dhatu formation. In this sequence, all the Dhatus are affected. Naturally the essence of all Dhatus, Ojas, will also be exposed to the ups and downs of each Dhatus. Depletion of Ojas along with Dhatu Saithilya makes the body vulnerable to a spectrum of diseases. Diseases make their appearance according to the site of Srotodusti.

Adhistthana of Thalassemia is the Raktavahasrotas which is clear through this study. Raktavahasrotomoola (Yakrita and Pleeha) described in the classics getting

affected in this disease can be practically seen. Formation of Rakta occur in the Yakrita and Pleeha quoted in the Ayurveda (Su.Su.14/4) whereas, the modern science also accepts that spleen is the major part of reticuloendothelial system and it is proved by the state of hypersplenism in patients of Thalassemia

All the diagnostic methods of Thalassemia can be divided into Anumana and Pratyaksha Pariksha for establishment of disease.

Upadrava of a disease can be major or minor. In this disease Upadravas determine the life of diseased. Death of patients is always due to iron overload and attack of secondary infections and transfusion transmitted diseases i.e. Upadravas.

Upadravas indicating the Sadhyasadhyata disposes the severity of disease. In Thalassemia, these factors may be responsible for Sadhyasadhyata of disease.

1. Numerous Lakshanas of severe nature
2. Severe loss of Bala and Mamsa
3. Tri-Doshas and Sapta Dhatus are affected
4. Doshagati being Tiryaka
5. Vyadhimarga being Madhyama and Kostthagata
6. Major organs being target of disease
7. Diminished response to medicines

Due to these characters, Vyadhi becomes almost Pratyakheya in nature. Asadhya nature of genetic disease is already mentioned in Ayurvedic classics in reference to Kulaja Vikara (Ch.Chi.6/57) and Sahaja Arsha (A.H.7/7) and this disease can be managed by only Nidana Parivarjana (Carrier screening), Pathyabhyasa and by the Rasayana drugs which protect them from the complications.

THALASSEMIA VIS A VIS PANDU /KAMALA/HALEEMAKA *:*

Pandu is a well-known and well-established disease in Ayurveda while Thalassemia is new in the field of Ayurvedic science. The question arises, that is this

disease available in the text or not. For that this is an attempt to put some points in favour or opposition of these diseases after the clinical assessment.

- In Ayurvedic literature, the disease nomenclature is based on Ruja, Varna, Samutthana, Sthana, and Samsthana. (Ch.Su.18/42). Keeping this view in mind, on the basis of Varna, the term Pandu is used for the disease. The Pandu Varna is derived from the 'Padi-Nashne' Dhatu by adding 'Ku' Pratyaya in it. (Shabdakalpadruma-Part-3, Page No.104). Its meaning is always taken in the sense of 'Nashana'. Therefore, 'Nashana' will be of Varna or colour that is further approved by Acharya Charaka by the word 'Vaivarna' or change in the normal colour of skin. This Vivarnata seen in the patients of Thalassemia, the reason it is similar to the Samprapti of Pandu.

- In the Samprapti of Pandu Acharya Charaka explained that when the Pitta located in its normal abode of heart is expelled by the vitiation of Vayu it gets entry in to the Dasha Dhamani and it is mobilized throughout the body. If it gets localized in between the Twak and Mamsa and vitiates subsequently, it causes a variety of colours in the skin such as Pandu, Haridra, Harita etc. Sushruta also mentioned that Pandu Bhava is caused by vitiation of Twaka through the vitiation of Rakta in one who indulges in Ahita Ahara-Vihara (Su.Utt.44/7). In the etiopathogenesis of Thalassemia, modern science gives the reason of change in skin colour as follows:

In Thalassemia due to defective Globin chain synthesis, normal RBCs are not formed and those which are formed have very less survival rate. The RBCs destruction occurs in the spleen (Major organ of Reticulo-Endothelial system).Due to regular destruction of these RBCs hyperplasia of Reticuloendothelial cells occurs. The major function of RBCs is to transport the Hemoglobin. Repeated destruction and regular blood transfusion in the patients of Thalassemia leads to increase in the concentration of free iron. The transportation of iron occurs through the transferrin protein and the storage (Tissue iron) iron occurs in the form of ferritin. Ferritin is the large holding vessels of iron. When it becomes full, it is converted into hemosiderin. The colour of hemosiderin is **yellowish – brown** that contains ferric oxide. Hence, the Vivarnata in the Thalassemic patients is found due to excess of free iron.

- Charaka and Sushruta have clearly mentioned that the vitiation of all the three Doshas causes Rakta Dushti and thereby Twak becomes pale in colour. According to Harita Samhita, there is decrease in the blood volume. Charaka has used the word 'Alparakta' for this condition. The above description clearly indicates that Pandu Roga develops as a result of either quantitative or qualitative changes in composition of other Dhatus too (Ch. Chi.16/5, 6, 11, 9-Comm. of Chakrapani). That is why we can say that Thalassemia is a qualitative type of Rakta Vikriti.

- The clinical features of Pandu, which are not due to lack of Rakta but along with it, other Dhatu and Doshas, are also involved up to certain extent. Therefore, along with Rakta other Dhatus and Doshas also show characteristic symptoms of their deficiency. The symptoms can be seen in the patients of Thalassemia. On the basis of Dosha, Dushya and Srotas it is found that all the symptoms having Vata-Pitta Dosha Pradhanya TriDosha, Rasa , and Rakta Dhatu mainly with the SaptaDhatu, and Rasa vaha, Raktavaha Srotas along with other Srotas.

- In Charaka Chi.16 /132, 133 the symptoms described in Haleemaka Vyadhi seem to be very close to Thalassemia. Which are as follows:

  - **Haritashyavapeetakaha**: this Varna seems to be yellowish-brown colour in Thalassemia due to excess iron deposition beneath the skin.

  - **Balautsaha kshaya, Tandra, Mandagni, Mridujwara, Angamarda, Shwasa, Trishana and Aruchi:** Clinically percentage of these symptoms is found maximum in the Thalassemic patients.

  - **Vata-Pitta Dushti:** All the symptoms and Doshaja Prakriti of patients is found to be Vata-Pitta Pradhana which proves this concept..

  - **Mahavyadhi:** This term denotes the severity of the disease. Thalassemia is today's worldwide problem and no cure has been found until now. That proves the terminology "Mahavyadhi".

- Although in favour of Thalassemia, Samprapti of Kamala (Ch.Su.16/34) seems to be nearer but on the basis of clinical assessment their symptoms are not found very much similar.

In Kashyapa Samhita, one chapter named Pleeha-Haleemaka Chikitsadhaya, gives rise to a question in the mind that is there any relationship in between Pleeha and Haleemaka. However, due to incomplete chapter, no reference is available, while in reference to Thalassemia the enlargement of spleen along with symptoms of Haleemaka are seen during study, which gives rise to this query, but answer is unknown.

CLINICAL DISCUSSION :

General observation of patients:

Age: In this clinical trial, maximum, i.e. 09(30%) of the patients belonged to an age group of 1 to 5 years. It may be due to the reason that most of the Thalassemic patients(Thalassemia major) are diagnosed within the age group of 1 year and parents of these patients seek medical help to prevent the complications and prolong the longevity of their children. (Table no.2)

Sex: In the present study, maximum number of patients i.e. 24 (80%) were male and 06 (20%) were female. Data shows, there is no gender prevalence in Thalassemia. It can occur in both. (Table no. 3)

Religion: Out of total 30 patients maximum number of patients 24(80%) were Hindu while 05(16.66%) were Muslims. It might be due to predominance of Hindus in the area but this disease is also predominant in Muslims, may be due to the Consanguineous marriage practices in their community. (Table 4).

Caste: In the present study, the incidence of Thalassemia was maximum i.e. 05(16.66%) present in Lohana and Muslim community in comparison to others. This data shows similitude with the references available in the text that Thalassemia is more common in Gujaratis mostly in Parmar,Lohana, and Brahmin group of people. (Table no. 5)

Education: 17(56.66%) patients in this study were found to be educated but the percentage of uneducated i.e. 13 (43.33) patients are more closer to the educated, it may be due to the awareness about education.(Table 6)

Socioeconomic status: Majority of patients i.e. 16(53.33%) were belonging to lower middle class socio-economic status and only 08(26.66%) patients were from middle class. Thus it can be said that people of lower middle socio-economic group are mostly affected due to unawareness about the disease, and lack of carrier screening before marriage. (Table no. 7).

Age of diagnosis: It is observed that maximum i.e.18 (60%) patients were diagnosed within the age of 1 to 5 yrs. It may be because clinical manifestation of Thalassemia major starts within the age of first year of life. (Table no.8)

No. of blood transfusion before starting the treatment: Before starting the Trial therapy no. of blood transfusion was found >100 times in 14(46.66%) patients. This may be due to rapid breakdown of RBCs occuring in thalassemia and this creates severe anemia which can only be compensated by blood transfusion. (Table no.9)

Medical history (Taking iron chelators): Out of 30 patients majority i.e.25 (83.33%) patients are taking iron chelators, It may be because these drugs are useful iron chelators and though most of the patients are from lower middle economy status, they are aware about the complications of iron over loading. (Table no.10)

Surgical history (Spleenectomy status): While considering the surgical history of the patients it was observed that in maximum patients i.e.27 (90%) Spleenectomy was not done. It might be because most of the patients were under regular blood transfusions, iron chelators etc. So complicated condition like huge Spleenomegaly was not found. (Table no.11)

Consanguineous marriage: In the present study, out of 30 patients only 24(80%) patients having Consanguineous marriages history. Consanguineous marriage is the predominant causative factor of Thalassemia which is very common in some communities e.g. Muslims, Sindhis etc. (Table no.12)

Birth history: In the present study 28 (93.33%) patients had full term normal vaginal delivery history. No reference is present in the modern literature also, to indicate the relevance of mode of delivery in Thalassemia, It may be because type of delivery plays no role in this disease and the table also support the literary data. (Table no.13)

Order of birth: In the present study, it is observed that, 18 (60%), patients were first order birth. This may be suggesting that probability of Thalassemia is more in first child. Though this type of data is not mentioned anywhere. It is a hypothesis. (Table no.14)

Immunization: During the study, it was observed that majority i.e. 21 (70%) patients had received immunization at the improper to age, because of un awareness and lower middle economy status (Table no.15)

Status of spleenomegaly: According to available modern references, spleenomegaly results from extramedullary hematopoiesis. In present clinical trial, total 21 patients were having spleenomegaly. Because of continuous breaking of premature RBCs, spleenomegaly may seen(Table no. 16)

Personal history: In the present study, the patients having the habit of vegetarian diet were 21(70%) and only 09(30%) were having the mixed diet. It may be because majority of the patients belonging to Hindu religion in which non-vegetarian diet is restricted, especially in Gujarat. (Table no.18)

Predominance of Rasa in diet: It has been found in the present study that Madhur Ras 11(36.66%), Amla Ras 09(30%) and *Katu Rasa* 09(33.33%) were found to be predominant in diet. Most probably Katu and Amla Ras are responsible for Rakt dusti. Here some how Madhur Ras is predominant. Pandu is a santarpanotth vikar and here disease may possible by santarpan.(Table no. 19)

Predominance of Guna in diet: In the present study, involvement of Rasa. Acharya Sushruta quoted that the person desires the food / diet according to deficiency of Dosha, Dhatu, Mala and Oja (Su.Su.15/34). In the present study, Guru and Snigdha Guna were found predominant which suggests that concept of Sushruta was right, Because both the Guna s are also present in Rakta. (Table no.20)

Supplementary diet: Tea is commonest supplementary drink all over India. Here it was found that intake of tea in small children fascinated, which is generally supported by doctors mostly due to its iron chelating property. (Table no.21)

Playing activity: In the present study most of the i.e. 12(40%) patients like outdoor activities more. Because children generally prefer outdoor games. But here a significant percentage were found preferring indoor games, which may be due to continuous ill health, general debility and protectiveness of parents to avoid any complication. (Table no.22)

Sleep pattern: Maximum patients i.e.21 (70%) were found to be having sound sleep and the percentage of disturb and irregular sleep was very less. (Table no.23)

Mental status: It has been observed during the study, that irritative and angry nature of patients was found predominant i.e.08(26.66%) & 09(30%).It may be due to prolong ill health, different types of restriction, isolation and vitiation of Pitta Dosha. (Table no.24)

Dosha Prakriti: In this study Vata-Pitta Prakriti was found predominant i.e.18 (60%). Though Thalassemia is not mentioned in Ayurvedic classics, to evaluate the Samprapti, one special proforma was designed and thus Vata-Pitta predominance was observed. That may be due to Rakta Dushti. (Table no.25)

Sara and Samhanana: According to Ayurvedic classics stabilities of Dhatus occurs at the age of 30 yrs. Therefore, unstability of Dhatus as well as Dhatu kshayatmaka nature of disease may be the cause of Avara Sara and Madhyama Samhanana. (Table no.26 & 27)

Pramana: According to modern science Thalassemic children have stunted growth which is also seen during the pramantaha pareeksha in present clinical trial. (Table no.28 a-e)

Satmya: In Charaka Vimana Sthana it is clearly mentioned that Avaramek Rasam. Amla and Katu Rasa predominance in the present clinical trial prove this concept, that Thalassemic children have Avara Satmya. (Table no.29)

Satva: Emotional makeup of maximum Thalassemic children was found Madhyama it may be due to hazardous nature of the disease, continuous treatment, social isolation etc. (Table no.30)

Abhyavaranashakti and Jaranashakti: Reference regarding all the disease caused by Mandagni is clearly mentioned in Ayurvedic classics (**Sarve Rogadapi mandagnou**). (Table no.31 & 32)

Vyayamashakti: In the present study, 23(76.66%) patients had Avara Vyayamashakti while 07(23.33%) patients had Madhyama Vyayamashakti. It may be due to the feeling of fatigue as a result of chronic anemia. (Table no.33)

Vaya: In the clinical study, maximum i.e. 21(70%) of patients were in Annada Avastha and only 09(30%) patients had Kshira-Annada Avastha. It may be because most of the patients were registered beyond two yrs of age group, to avoid any complication. (Table no.34)

Srotas: In the present study, involvement of Rasa , Rakta and Medavaha Srotas were found with predominance of Raktavaha SrotoDushti. This disease affected mainly Rakta Dhatu. According to modern references, normal Hb formation is hampered in Thalassemia. (Table no. 36)

Liver and spleen are responsible for blood formation up to 6 month of uterine life .While in the diseased state these are responsible for destruction of RBCs. In Ayurveda, Yakrit and Pleeha are known as Raktavaha Srotomoola (Ch.Vi.5/10) and this concept is proved by this clinical trial.

EFFECT OF THERAPY :

On the basis of data obtained from before and after treatment for the course of 4 weeks,in 30 patients in group A and 30 patients in Group B, the effect of therapy on different parameters has been calculated which is discussed here.

EFFECT ON CHIEF COMPLAINTS :

Panduta: In Group A**,** the mean score of panduta was 3.1 before treatment which reduced up to 1.07 after treatment with 65.59% relief, which was statistically highly significant ($p<0.01$). While In Control Group i.e. Group B, The mean score was 2.93 before treatment, after observation it was found 1.3 with 55.68% relief, which was also statistically significant ($p<0.01$). The result obtained with the chi-square test in Group A vs. Group B was insignificant ($p>0.05$)

This is clear from the above discussion that Group A has reduced the panduta in the patients of Thalassemia. Panduta is produced due to decrease in the number of red blood cells. Raktabasti replenishes the red blood cells and therefore, this may one be the reason that the better relief has been found.

Daurbalya: The percentage of improvement in daurbalya was found 53.93% in Group A, while in Group B it was 45.88%. The mean score of daurbalya was 2.96 before treatment in Group A and 1.36 after treatment and in Group B, mean score was 2.83 before observation and it was present 1.53 after the completion of course. Both the values was statistically found significant ($p<0.01$). The statistical analysis of both the groups with the help of chi-square test revealed that Group A vs. Group B was significant with $p <0.01$

Thus, Group A provided percentage wise better relief in symptom daurbalya than Group B. Daurbalya is mainly due to reduced perfusion of the tissues due to decreased number of red blood cells. Raktabasti replenishes the red blood cells thereby increasing perfusion to tissues and relieving daurbalya.

Bhrama: It was reported that initial mean score of bhrama in the Group A was 3.1 and after treatment it reduced up to 1.13 thus 63.44% relief was statistically significant ($p<0.01$). The initial mean score of bhrama was 3.03 before treatment in Group B, which reduced up to 1.26 after treatment with 58.24% relief, which was statistically significant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was highly significant($p<0.001$).

Relief provided by Group A was better than Group B because of increased supply of oxygen to the brain due to red blood cells supplemented by raktabasti.

Krishnanakhatva: The mean score of krishnanakhatva was 3.13 before treatment in Group A, which reduced up to 1.23 after treatment with 60.64% relief, which was statistically significant ($p<0.01$) whereas the mean score of krishnakhatva was 2.93 before treatment in Group B, which was observed 1.3 after completion of course with 55.68% relief only, which was also statistically significant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was significant($p<0.05$).

It may be due to increased number of red blood cells due to raktabasti which relieves cyanosis caused by decreased peripheral circulation.

Krishnanetratva: In Group A, mean score of krishnanetratva before treatment was 2.93 which was reduced to 1.03 after treatment with 64.77% relief and it was statistically insignificant ($p<0.01$), whereas in Group B, the mean score of krishnanetratva before treatment was 2.93 which was reduced to 0.93 after treatment with 68.18% relief and it was statistically significant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was significant($p<0.05$).

Same principle as in krishnanakhatva applies here also. Improvement of peripheral circulsation due to raktabasti causes the improvement in the symptom.

Swas(Ayasaj): It was reported that initial mean score of ayasaj swas in the Group A was 2.46 and after treatment it reduced up to 0.6 with 75.68% relief was statistically significant ($p<0.01$). The initial mean score of ayasaj swas was 2.5 before observation in Group B, which was reported 1.33 after the duration of observation with the percentage of 46.67 which shows tht statistically it was significant ($p>0.01$).Statistical analysis with the help of chi-square test show significant ($p<0.05$) result.

Relief provided in ayasaj swas in group A may be due to increased perfusion due to increased amount of hemoglobin due to supplemented RBCs.

Shunakshikuta: In Group A, the mean score of Shunakshikuta was 2.4 before treatment and after the completion of the course it was reduced up to 0.8. This 66.67%

relief was statistically significant ($p<0.01$). In Group B, the mean score of Spleenomegaly was 2.66 before doing observation and after the completion of the course it was found 1.03 and thus 61.25% relief was statistically significant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was highly significant($p<0.05$).

Shunakshikuta is mainly due to hemoglobin deficiency. Raktabasti efficiently replenishes hemoglobin,thus relieving this symptom.

Shishirdwesh: The mean score of shishirdwesh was 2.76 before treatment in Group A, which reduced up to 1.03 after treatment with 62.65% relief, which was statistically significant ($p<0.01$) whereas the mean score was 2.5 before starting observation in Group B, which was observed 1.06 after completion of course with 57.33% relief only, which was also statistically insignificant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was highly significant($p>0.005$).

Shishirdwesh is relieved significantly by raktabasti as it causes a rise in hemoglobin,the fall in which is the the reason for the chills.

EFFECT ON ASSOCIATED SYMPTOMS:

Jwar: In Group A, the mean score of jwar was 2.63 before treatment and after the completion of the course; it was reduced up to 0.83. This 68.35% relief was statistically significant ($p<0.01$). In Group B, the mean score of Aruchi was 2.83 before treatment and after the completion of the course it was reduced up to 1.03 and this 63.53% relief was statistically significant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was significant($p<0.05$).

Jwar is due to Ras and Rakt dhatu dusti as anemia or reduced red blood cell count,which is corrected by raktabasti and hence,marked improvement csn be seen in this symptom.

Gaurav: Before treatments mean score of gaurav of Group A patients was 2.53. After treatment, it was same 0.76 which show result was significant ($p<0.01$.) with 69.74% relief. While In Group B (Control Group) it has been observed that mean score.

Before starting observation was 2.36 and after completion of course it was reduced 0.8 which was significant ($p<0.01$) with 66.20% relief. The result obtained by the chi-square test found that Group A Vs. Group B was significant($p<0.05$).

Raktabasti decreases weakness and thus reduces gaurav.

Nidraluta: In Group A, the mean score of nidraluta was 2.8 before treatment and after the completion of the course; it was reduced up to 0.7. This 75% relief was statistically significant ($p<0.01$). In Group B, the mean score of Alasya was 2.9 before starting observation and after the completion of the course 0.86 was found with 70.11% relief. It was statistically significant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was significant ($p<0.05$).

Relief provided by Group A was better than Group B, because raktabasti is highly effective in supplementing RBCs which increases perfusion to the brain and increases alertness.

Hriddravatva: The mean score o hriddravatva was 2.43 before treatment in Group A, which reduced up to 0.7 after treatment with 71.23% relief, which was statistically significant ($p<0.01$) whereas the mean score was 2.36 before starting observation in Group B, which was observed 0.66 after completion of course with 71.83% relief only, which was statistically significant ($p<0.01$). The result obtained by the chi-square test found that Group A Vs. Group B was not significant($p>0.05$).

Palpitations occur in patients with thalessemia due to increased heart rate as a result of low perfusion due to decreased number of RBCs. Raktabasti replenished RBCs,thus relieving hriddravatva.

Chhardi: In Group A, the mean score of chhardi was 2.4 before treatment and after the completion of the course; it was reduced up to 0.83. This 65.28% relief was statistically significant ($p<0.01$). In Group B, the mean score was 2.9 before starting observation and after the completion of the course and 0.83 was found after treatment with 71.26% relief. The result obtained by the chi-square test found that Group A Vs. Group B was significant($p<0.05$).

Chhardi is mainly due to increased gastric reflexes due to spleenomegaly. Raktabasti is also useful in relieving spleenomegaly,thereby reducing chhardi.

Tamahpravesh: In Group A, the mean score of tamahpravesh was 2.5 before treatment and after the completion of the course; it was reduced up to 1.00. This 60% relief was significant ($p<0.05$). In Group B, the mean score was 2.33 before starting observation and after the completion of the course, it was 0.93 which was significant ($p<0.01$) with 60% relief. The result obtained by the chi-square test found that Group A Vs. Group B was significant($p>0.05$).

Relief provided by Group A was better than Group B. due to better oxygen availability to the brain due to increased number of RBCs,incidence of tamahpravesh has significantly reduced in group A.

Effect on Hematological and Bio-chemical parameters:

The data of hematological and biochemical parameters shows difference in the values before and after treatment in both the groups. There is statistically significant change in the pre and post values for Hb%, TLC, DLC and ESR. Therefore analysis of the data obtained indicate that the treatment does not produce any undesirable effect and gives significant improvement.

Overall effect of therapy:

After going through the effect of therapy on different parameters, if we see the overall effect of the therapy, it is found that in the Group A 8 patients improved markedly, 20 patients improved moderately and only 2 patients showed mild improvement after 60 days of treatment while in Group B no patients improved markedly, 17 patients improved moderately and only 13 patients showed mild improvement.

Ajarakta replaces hemoglobin as wel as RBCs. Rakt dhatu vriddhi by Ajarakta reported.

Basti is useful to penitrate the Ajarakta and correct the deformity.

Treatment given in Group A was effective in comparison to Group B .Here the treatment was given to only 30 patients. On the basis of the result of such a small sample it is very difficult to draw a final conclusion in this regard. This work is just a beginning in the field of Ayurveda. Further study on this dtreatment is invited which will be beneficial to this burning problem.

SUMMARY
AND
CONCLUSION

SUMMARY

Introduction

Over 250 million persons are affected by Thalassemia and allied disorders in the world. Over 1,00,000 Thalassemia Major are born annually around the world. It is estimated that throughout the world there is a "Thalassemia Belt" that includes countries around Mediterranean sea like Italy, Greece, Cyprus, Sardinia and passes through West and Central Asian countries like Turkey, Saudi Arabia, Iran, Afghanistan, Pakistan, India and South East Asian countries like Indonesia, Myanmar & Thailand. Migrants/descendants from these areas to other parts of world are also at high risk of carrying β Thalassemia trait.

In India the combined carrier rate of β Thalassemia, HbE & Sickle Cell Anemia is 3.9%. i.e.3 crore Indians are Thalassemic carriers and 8000 to 10,000 Thalassemia major are born every year in our country. The prevalence for β Thalassemia carrier state varies 0-17% in different ethnic groups. It is very high among certain communities like Punjabis, Sindhis, Gujaratis, Bengalis, Parsis and Lohanas. However, it has been found up to 15% in Punjabis & Sindhis who have migrated from West Pakistan.

So keeping all these views in mind and cost effective therapy, great hopes are being laid on the Ayurvedic science, which will help to prevent the complication and hazardous effects and act as an adjuvant therapy in Thalassemia.

Among the eight different branches of Ayurveda, Kaumarabhritya has been considered as the most important speciality according to Maharshi Kashyapa (Ka.Vi.Sis/10), which covers each aspect of child health care. The field of Kaumarabhritya described in the Kashyapa Samhita started from Garbhini up to Dhatri (Ka. chi. Dhatrichikitsadhayaya).Hence it shows the potential of Ayurveda that it prevents the diseases of children since conception. In our classics, word to word correlation of Thalassemia can not be found, but we can understand the disease by careful study of its clinical presentation and investigations.

The present study is an attempt to analyze the efficacy of Raktabasti(Ch. Si. 61) in the management of Thalassemia in comparison to a control group managed by

routine modern therapy. The drug has been chosen keeping in view its Blood supplement as well as life saver action.

- **AIMS & OBJECTIVES**

The main aim of study is…

To evaluate the efficacy of Raktbasti treatment in Thalessemia Major.

- **Conceptual Study-**

Thalassemia is a heterogeneous group of genetic disorders of Hb synthesis characterized by a lack or decreased synthesis of globin chain. Globin is the protein part of Hemoglobin. Like all proteins, the "blueprint" for hemoglobin exists in DNA (the material that makes up genes). Normally, an individual has four genes that code for the α protein, or α chain. Two other genes code for the β chain. (Two additional genes code for the gamma chain in the fetus). The α chain and the β chain are made in precisely equal amounts, despite the differing number of genes. The protein chains join in developing red blood cells, and remain together for the life of the red cells.With the exception of the very first weeks of embryogenesis, one of the globin chains is always α. A number of variables influence the nature of the non-α chain in the hemoglobin molecule. The fetus has a distinct non-α chain called gamma. After birth, a different non-α globin chain, called β, pairs with the α chain. The combination of two α chains and two non-α chains produces a complete hemoglobin molecule (four chains per molecule).

The combination of two α chains and two gamma chains form "fetal" hemoglobin, termed "hemoglobin F". With the exception of the first 10 to 12 weeks after conception, fetal hemoglobin is the primary hemoglobin in the developing fetus. The combination of two α chains and two β chains form "adult" hemoglobin, also called "hemoglobin A". Although hemoglobin A is called "adult", it becomes the predominant within about 18 to 24 weeks of birth.

The pairing of one α chain and one non- α chain produces a hemoglobin dimer (two chains). The hemoglobin dimer does not efficiently deliver oxygen,

however. Two dimers combine to form a hemoglobin tetramer, which is the functional form of hemoglobin. Complex biophysical characteristics of the hemoglobin tetramer permit the exquisite control of oxygen uptake in the lungs and release in the tissues that is necessary to sustain life. The genes that encode the α globin chains are on chromosome 16 (Figure 2) those that encode the non-α globin chains are on chromosome 11. Multiple individual genes are expressed at each site. Pseudogenes are also present at each location. The α complex is called the "α globin locus", while the non-α complex is called the "β globin locus". The expression of the α and non-α genes is closely balanced by an unknown mechanism. Balanced gene expression is required for normal red cell function. Disruption of the balance produces a disorder called Thalassemia.

Ayurvedic aspect-

ACCORDING TO ACHARYA CHARAKA :

- Defect in the Beeja (causative factor of Thalassemia)
- Atmakarma (Action of Atma)
- Ashaya (It may be Garbhashaya *)*
- Kala Dosha (Time factor, it may be reproductive period or menstrual period)
- Matusta Aharavihara.(Teratogenicity)

ACCORDING TO ACHARYA SUSHRUTA :

- Nastikata of parents
- Asubha karma in previous life
- Vatapittadi Prakopa

We can say that Garbhotapattikara Bhavas (Ch. Sha. 3) are genetic predisposing factors. They play a major role in the genetic abnormality. These can be understood in the following manner:

- Matruja Bhava : XX chromosome
- Pitruja Bhava : XY chromosome
- Atmaja Bhava : Inherited psychic factors
- Rasaja Bhava : Nutritional supplementation
- Satmyaja Bhava : Diet during pregnancy and regimen.(Need for formation of healthy Sperm and Ovum)
- Satwaja Bhava : Psychic condition of the mother during Garbhavakranti and Garbhini period.(Regulate Hormonal axis)

Drug Review

All the Ayurvedic texts have also described about the role of Rakt dhatu in life. Maharshi Sushrut mentioned that Rakt is Jivan (Su. Ut. 14/44) and Life is possible only when Rakt dhatu is in proper quantity and quality in the body.

In various blood loss conditions like Raktpitta, Raktatisar, Pandu and jivadan - Rakt is the only treatment.Maharshi charak also mentioned that Rakt is giving Bal, Varna, Ayush, Sukh etc.(Ch. Su. 24/4).

Rationale of Aja Rakt basti :-

The therapeutic use of different types of animal blood like Mrug(Deer), Go (Cow), Mahish (Buffalo) and Aja (Goat) are described in Charak Samhita Siddhi sthan chapter -6/82,83.

Here we used Aja Rakta (Goat blood). Goat is the healthiest animal on earth. No other infections or viruses are detected in the goat blood. So it is very safe for use in human body. Goat blood is also available freely and in required quantity from Government or Municipal Slaughter house.

DRUG DOSAGES :

For this study we used goat blood in 250ml dose by ano rectal route.

COLLECTION OF GOAT BLOOD :

Goat blood was collected from the Slaughter house of Ahmedabad Municipal Corporation.

RAKTABASTI PROCEDURE :

Collected and stored blood was administered by ano rectal route. Goat blood was filled up in well sterilized glass bottle. A special blood transfusion set was attached with bottle.Total dose of Ajarakta was administered within 30 minutes through anorectal route to the patients.

There are seven major types of blood group in goat blood. They are A, B, C, D, M, R and X. In goat blood there is no evidence & findings of HIV, Hepatitis, Malaria, Syphilis, Cytomegalovirus(CMV), Epstein-Barr virus(EBV), & other harmful virus and bacteria. Recent study shows that CAEV(Caperin Arthritis Encephalitis) antibodies nutrilise HIV. This can be potential immuno prophylaxis for HIV in Human.

CLINICAL STUDY :

SELECTION OF PATIENTS:

The study was conducted in Govt. Akhandanand Ayurved College. Patients attending the O.P.D. and I.P.D. of the hospital, fulfilling the criteria of selection were incorporated in the study irrespective of age, sex, caste etc.

Inclusive Criteria:

Patients having Hb 5 gm % to 10 gm % were selected having general symptoms of the Thalassemia. In proforma the cardinal symptoms and associated symptoms of the patients were defined.

Exclusive Criteria:

Any other types of Anemia except Thalassemia Major were excluded.

Diagnostic Criteria:

Diagnosis was made on the basis of Vatik, Paitik and Kaphaj clinical signs and symptoms as mentioned in Ayurvedic texts and the sign and symptoms of Thalassemia major described in modern texts. A detail proforma was prepared for the purpose.

- **CRITERIA FOR SELECTION OF PATIENTS:**

1. On the basis of clinical signs and symptoms and pathological investigations.

2. Patients having Hb 5 gm% to 10gm% will be selected.

DURATION OF TRIAL:

Raktabasti was given on alternate day for four weeks. Follow up study was done weekly for 3 months as per various parameters of the performa. So the complete study carried out for four months.

STUDY DESIGN:

The patients were selected randomly and divided into two Groups, namely Trial & Control Group, and examined clinically along with laboratory investigations.

(1) Trial Group: (Group A)

30 Patients were registered in this group, out of which all the Patients completed the course. The Patients were administered Raktabasti in scheduled dose.

Dose : 250 ml Goat blood by each enema. Raktabasti was given on alternate day for four weeks. Follow up study was done weekly for 3 mont

(2) Control Group: (Group B):

30 Patients were registered in this Group with modern medical treatment for four weeks and follow up study made for three months.

PATHYA-APATHYA:

Patients were advised to take low iron diet with maximum intake of chelating drinks like tea, coffee etc.

- **CRITERIA OF ASSESSMENT:**

By observing clinical improvement in Vatik, Paitik, and Kaphaj sign & symptoms among the Tridoshaj Panduroga as well as Thalassemia Major, assessment of the symptoms like Panduta, Krishna nakhtva, Swas, Sunakshikutata, Jwar, Daurbalya and Hrid dravatva which are mentioned in proforma were assessed with standard gradation system (Scale).

Necessary qualitative and quantitative test were applied to the observed data. Laboratory investigations with improvement of 1.0 Hb gm% were assessed and evaluated before and after treatment.

[1] **Maximum Improvement**: More than 75% improvement of clinical signs and symptoms.

[2] **Moderate Improvement**: More than 50% to 75% improvement of the above mentioned clinical sign and symptoms.

[3] **Mild Improvement**: More than 25% to 50% improvement of the above mentioned clinical sign and symptoms.

[4] **No Improvement**: Equal or Less than 25% improvement of clinical sign and symptoms.

- **GENERAL OBSERVATIONS :**

1. The total number of registered patients in the study were 30 in each group. Among which all the patients had completed the course.

2. In the present clinical Study 09 (30 %), patients were from age Group of 1 to 5 years. 09 (30 %) patients were from 6 to 10 years. 08 (26.66 %) patients were from age Group of 11 to 15 years and 04 (13.33 %) patients were from 16-20 years in group A. While in group B 12 (40.00 %), patients were from age

Group of 1 to 5 years. 05 (16.66 %) patients were from 6 to 10 years. 08 (26.66 %) patients were from age Group of 11 to 15 years and 05 (16.66 %) patients were from 16-20 years.

3. In this study, out of 30 patients, 24 (80 %) were Male while 06 (20 %) were Female in group A. While in group B, 22(73.33%) were male and 08(26.66%) were female.

4. In this study 24 (80 %) patients registered were found to be from Hindu religion while 05 (16.66 %) Patients were found Muslims and 01 (3.33 %) were found Sikh in group A. While in group B it was 24(80.00%) patients were Hindu and 06(20.00%) patients were found Muslims.

5. 09(30 %) patients were found to be diagnosed before the age of 1 year, 18 (60 %) patients were found to be diagnosed within the age of 1 year to 5 year, 03 (10 %) patients were found to be diagnosed after the age of 5 year in group A. But in group B, 10(33.33 %) patients were found to be diagnosed before the age of 1 year, 14 (46.66 %) patients were found to be diagnosed within the age of 1 year to 5 year, 06 (20.00 %) patients were found to be diagnosed after the age of 5 year.

6. In this present research work, before starting of the Raktabasti 07(23.33 %) patients were found to be blood transfused >25 to50 times, 09(30 %) patients were found to be blood transfused >50 to 100 times, 14(46.66 %) patients were found to be blood transfused >100 to 200 times in group A. While in group B there is 05(16.66 %) patients were found to be blood transfused upto 25 times, 04(13.33 %) patients were found to be blood transfused >25 to50 times, 10(33.33 %) patients were found to be blood transfused >50 to 100 times, 11(36.66 %) patients were found to be blood transfused >100 to 200 times.

7. 25 (83.33%) patients found under iron chelating therapy, in rest of the patients 05(16.66%) that history was absent in group A. But in group B 26 (86.66%) patients found under iron chelating therapy, in rest of the patients 004(13.33%) that history was absent.

8. In the present clinical study in group A 03 (10 %) patients were found with the history of Spleenectomy, in rest of the patients 27(90 %) that history was absent. While in group B, 04 (13.33 %) patients were found with the history of Spleenectomy, in rest of the patients 26(86.66 %) that history was absent.

9. Here we can see that maximum patients in group A those are 24 (80.00%) belong to the non consanguineous married parents and only in 06(20.00%), patients belong to the parents having positive consanguineous marriage history. While in group B, 23 (76.66%) belong to the non consanguineous married parents and only in 07(23.33%), patients belong to the parents having positive consanguineous marriage history.

10. In the present research work spleenomegaly was not found in 09 (30 %) patients, spleen was palpable up to 2cm in 11(36.66%), up to 4cm in 06 (20%) and more than 4cm in 04 (13.33%) patients in group A. spleenomegaly was not found in 07 (23.33%) patients, spleen was palpable up to 2cm in 12(40.00%), up to 4cm in 08 (26.66%) and more than 4cm in 03 (10.00%) patients in group B.
11. In the present research work hepatomegaly was not found in 24 (80%) Patients, liver was palpable up to 2cm in 04 (13.33%) Patients and up to 4cm in 02 (6.66%) Patients in group A. But in group B hepatomegaly was not found in 25 (83.33%) Patients, liver was palpable up to 2cm in 04 (13.33%) Patients and up to 4cm in 01 (3.33%) Patients.
12. In this study in both group a and group b 21(70%) patients were having vegetarian and 09 (30%) patients were having mixed diet.

13. In the present study in group A 12 (40 %) patients were found interested more in outdoor playing activities, 15(50 %) patients were found interested in indoor activity while 03(10%) were found interested in equal means both indoor and outdoor playing activities. group B 11 (36.66 %) patients were found interested more in outdoor playing activities, 17(56.66 %) patients were found interested in indoor activity while 02(6.66%) were found interested in equal means both indoor and outdoor playing activities.

14. In the present study predominance of Tension, Jovial, Anger, Irritation, Jealous and Fear were found present in 02 (6.66%), 05 (16.66%), 09 (30.00%), 18(26.66%), 02(6.66%), and 04(13.33%) patients respectively in group A. while in group B predominance were found in 01(3.33%), 03(10.00%), 11(36.66%), 07(23.33%), 02(6.66%) and 06(20.00%) respectively.

15. The Dosha Prakriti of 18(60%) patients were found Vatapitta predominance, 09 (30%) patients with Vatkapha and 03(10%) had Pittakapha type of dosha Prakriti in group A. while in group B 17(56.66%) patients were found Vatapitta predominance, 09 (30.00%) patients with Vatkapha and 04(13.33%) had Pittakapha type of dosha Prakriti.

16. Most of the patients included in this study had *Avara Sara* i.e. 23 (76.66%) while 04 (13.33%) patients had *Madhyama Sara* and 03(10%) had Pravar Sara in group A. patients had *Avara Sara* 22 (73.33%) while 05 (16.66%) patients had *Madhyama Sara* and 03(10%) had Pravar Sara in group B.

17. Most of the patients included in this study were found to be with Madhyam Samhanana i.e. 18 (60%) while 08 (26.66%) had Avar Samhanan and 04(13.33%) having Pravar Samhanana in group A. And patients included in this study were found to be with Madhyam Samhanana i.e. 16 (53.33%) while 10 (33.33%) had Avar Samhanan and 04(13.33%) having Pravar Samhanana in group B.

18. In this present research work, up to 10 kg body weight was found in 03 (10%) patients, >10kg to 20 kg body weight was found in 14 (46.66%) patients, > 20kg to 30kg body weight was found in 08 (26.66%) patients and more than 30kg body weight was found in 05 (16.66%) patients in group A. While in group B , up to 10 kg body weight was found in 04 (13.33%) patients, >10kg to 20 kg body weight was found in 10 (33.33%) patients, > 20kg to 30kg body weight was found in 08 (26.66%) patients and more than 30kg body weight was found in 08 (26.66%) patients.

19. In this present clinical Trial in group A height of 06 (20%) patients were within 50 cm to 100 cm, 19(63.33%) patients were found within more than

100cm to 150cm and 05 (16.66%) patients were found within the range of more than 150 cm to 200cm. while in group B height of 07 (23.33%) patients were within 50 cm to 100 cm, 18(60.00%) patients were found within more than 100cm to 150cm and 05 (16.66%) patients were found within the range of more than 150 cm to 200cm.

20. In this present clinical study, Head circumferences of 25 (83.33%) patients were found within the range of 40cm to50 cm and 05 (16.66%) patients were found more than 50cm in group A. While in group B Head circumferences of 24 (80.00%) patients were found within the range of 40cm to 50 cm and 06 (20.00%) patients were found more than 50 cm.

21. In the present clinical study Avara Satmya was found with 18(60%) patients, and 12(40 %) patients had Madhyama Satmya in group A. And Avara Satmya was found with 17(56.66%) patients, and 12(40.00 %) patients had Madhyama Satmya and 01(3.33%) patient had Pravara Satmya in group B.

22. 08 (26.66 %) patients were having Avara *Satva*, 20(66.66%) patients Madhyama Satva and 02(6.66%) having Pravara Satva in both group A and group B.

23. In the present Study 23(76.66%) of patients had Avara Abhyavaranashakti while 07(23.33%) patients had Madhyama in group A. While in group B 24(80.00%) of patients had Avara while 06(20.00%) patients had Madhyama Abhyavaranashakti

24. It has been observed that 22(73.33%) of patients had Avara Jaranashakti while 08(26.66%) of patients had Madhyama in group A. While in group B 23(76.66%) of patients had Avara while 07(23.33%) of patients had Madhyama Jaranashakti

25. 23 (76.66%) Patients had Avara Vyayam ashakti while 07(23.33%) patients had Madhyama in group A. While in group B 24 (80.00%) Patients had Avara while 06(20.00%) patients had Madhyama Vyayama Shakti

26. 21(70%) of patients were in Annada Avastha and 09 (30%) patients had Kshira–Annada Avastha in both group A and group B

27. Out of 30 patients, Panduta and Daurbalya were found in 30(100%) patients, while 29(96.66%) Ayasaj Shwash, 27(90%) Shunakshikuta, 24(80%) Krishna nakhtva, 23(76.66%) Shishirdwesh, 19(63.33%) Krishna netrata and 15(50%) Bhrama were found in group A. While in group B Panduta, Daurbalya and Avasai Swash were found in 30(100.00%), while Shunakshikuta, 27(90.00%), Shishirdwesh, 25(83.33%), Krishna nakhtva and Krishna netrata in 20(66.66%) and 16(53.33%) Bhrama were found.

28. 30(100%) patients having Dushti of Rasavah and Raktaavaha Srotas, 19(63.3%) patients had Mamsavaha Srotodushti while 05(16.66%) had Asthivah, 04(13.33%) had Medovah and 02(6.66%) had Majjavah srotodushti was found in group A. While on group B 30(100%) patients having Dushti of Rasavah and Raktaavaha Srotas, 20(66.66%) patients had Mamsavaha Srotodushti while 06(20.00%) had Asthivah, 05(16.66%) had Medovah and 03(10.00%) had Majjavah srotodushti was found.

CONCLUSION

Conclusion is the determination established by investigating in various ways and deducting by means of various reasons. So based on the study sample after completion of the study, following conclusions can be drawn-

1. On comparing the results of both the groups, it was found that there wasn't significant difference in the effect of therapies in group A & B on Panduta and Hriddravatva.
2. However,there was significant difference in the effect of the therapies on Daurbalya,therapy in group A being more effective of the two.
3. Therapy in group A was found to be highly significantly effective on Bhram and Shishirdwesh.
4. Also, there was significant difference between the effect of therapies on Krishn nakhatva.
5. Significant difference between the effect of the two therapies was seen on Krishn netratva.
6. Effect of treatment in group A was significantly more than that in group B on Swas (Ayasaj).
7. There was a significant difference in the effect of both the therapies on Shunakshikuta.
8. In subjective criteria 67.57% improvement was seen in group A,whereas 52.5% improvement was seen in group B.
9. Significant difference was found between the two therapies based on the results of the objective criteria.
10. Maximum improvement was seen in 8 patients in group A and in no patients in group B. Moderate improvement was seen in 20 patients in group A and in 17 patients in group B. Mild improvement was seen in 2 patients of group A and 13 patients in group B. Whereas,there were no patients in both groups without any improvement.

SCOPE FOR FURTHER STUDY :

During the entire study, significant improvement in clinical symptoms of Thalassemia patients has been seen. There is wide scope of further development on this subject and this study can prove to be a firm base to further research.

The present study was conducted with limited time and facilities leaving many queries unanswered after the completion of this study.

The less number of patients observed for this study does not permit one to make strong confirmations.

This study was conducted in small group of patients (30-30) because of various limitations. A study of a larger group of patients that combines the inferences obtained from lab investigations with clinical parameters will help to comprehend the character of the disease better and also to make the exact assessment of the trial drug.

The use of other combinations of Punarnava, Rohitak and Sharpunkh for iron chealation may be helpful for the study. As per line of treatment of Majja dhatu vikriti, use of Majjsiddh Ghrit can also be useful to produce mature RBCs. In future, studies concerning Thalassemia and its treatment shall certainly enhance our knowledge and thereby our ability to bring about a positive impact on the quality of life of the patients and this should be substantial contribution in the field of Ayurveda.

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Tilak Maharashtra Vidyapeeth

"Efficacy of Raktbasti in the management of Tridoshaj Panduroga W.S.R. to Thalassemia Major"

Dr. Atul M. Bhavsar (M.D.)

Case History Form

PARTICULARS OF PATIENT :-

Name of Patient :
Age : O.P.D. No. :
Sex : I.P.D. No. :
Religion : Cast : Ward No. :
Education : UE/Below S.S.C/S.S.C/H.S.C/G/PG D.O.A. :
Occupation : D.O.D. :
Marital status : M/UM/D/W
Socio-eco status : P/LM/M/UM/R Height : Weight :
Circumference : Head: Chest : Abdomen :
Address :

DIAGNOSIS :
Age of Diagnosis :

RESULT:

Cured
Marked improvement
Moderate improvement
Mild improvement
No improvement

CARDINAL COMPLAINTS(with duration)

1. Panduta
2. Daurbalya
3. Krishn nakhatva
4. Krishn netrata
5. Bhrama
6. Shwasa (Ayasaj)
7. Shunakshikuta
8. Shishirdwesha

ASSOCIATED COMPLAINTS

1. Jwara
2. Gaurav
3. Nidralutva
4. Hrid-drava
5. Chhardi
6. Tampravesh

HISTORY OF PRESENT ILLNESS

Duration :
Time of onset :
Detected 1st time :
Severity : Mild/Moderate/Severe

IMMUNIZATION :

HISTORY OF PAST ILLNESS

Medical :

Surgical :

FAMILY HISTORY

Family	Alive	Dead due to	Healthy	Unhealthy due to
Father				
Mother:				
Sister				
Brother				
H/W				
Son				
Daughter				
Others : If Specific				

PERSONAL HISTORY:

1. AHARA

Veg / Nonveg / Mixed
Habits: Samshana / Vishamashana / Adhyashana / Anashana
Appetite: Anorexia / Less / Moderate / Excessive
Ras pradhana: M / A / L / K / T /KS
Guna pradhana: G / L / S / R / T / M
Abhyavaharan shakti : Jaran shakti :
Water intake : Every morning / Before during or after lunch& dinner Matla / Refrigerator / Aquaguard / Other

2. VIHARAJA:

Exercise: Regular / irregular / Occasional / Only routine work
Vyayam shakti :

3. NIDRA

	Duration	Regularity	Swapna	Quality
Day	Hrs	Rr/Ir	Y/N	Good/disturbed
Night	Hrs	Rr/Ir	Y/N	Good/disturbed

4. BOWEL:

- Regular/Irregular
- Frequency times/day
- Sanghat: Normal/Drava/Kathina
- Smell : Foul/Not foul
- Complete evacuation/Incomplete evacuation
- Sam/Nirama
- Koshtha:Krura/Madhyam/Mrudu
- Varna: Shweta/Haridra/Rakta/Samyaka

5. MICTURATION:

Prakrita/Sadaha/Sakrichha/Vaivarna/Picchila
Varna: Shweta/Haridra/Rakta/Samyaka
Pramana:Prabhuta/Hina/Samyaka
Frequency: times/day: times/night

6. ADDICTION:

Smoking/Tobacco chewing /Alcohol/Nicotines/Supari/Pan/
Gutkha/Sleeping pills/Tea/Coffee/Others if any
Since times/day

7. SWEAT

8. EMOTIONAL MAKE UP:

Anxiety/Depression/Tension/Anger/Alertness/Sluggishness/Jolly

9. OCCUPATIONAL HISTORY:

Nature of work : Sedentary/Active/Heavy
Duty hours : Day/Night/Shifting
Working times : hrs. in a day

10. GYNAECOLOGICAL HISTORY (If)

Age of menarche yrs.
Age of menopause yrs.
Cycle:Regular/Irregular
Bleeding days: day/month
Flow: Scanty/Moderate/Heavy
History of leucorrhoea

12. SURGICAL INTERVENTION

13. BLOOD TRANSFUSION (Before Treatment) :

14. TRAUMA

15. BIRTH HISTORY :

GENERAL EXAMINATION

- Nadi
- Mala
- Mutra
- Jihva
- Shabda
- Sparsha
- Drishti
- Aakruti
- Nakha
- Twaka
- Kesha
- Danta

ATURABALA PARIKSHA

1. PRAKRITI
Sharir:V/P/K/VP/VK/PK/VPK
Manasa:SR/ST/RT/SRT

2. SARATAH
P/M/A

3. SAMHANANATAH
P/M/A

4. SATVATAH
P/M/A

5. SATMYATAH
Sarva ras/Eka ras/Vyamishra ras

6. PRAMANTAH
P/M/A Ht: Wt:

7. AHARA SHAKTI

Abhyabharanshakti: P/M/A
Jarana shakti: P/M/A
Agni: Sama/vishama/manda/tikshna

8. VYAYAMA SHAKTI

P/M/A

9. VAYA

Bala/Yuva/Vridha

10. DESHA

Jata:A/J/S
Samvriddha:A/J/S
Vyadhita:A/J/S

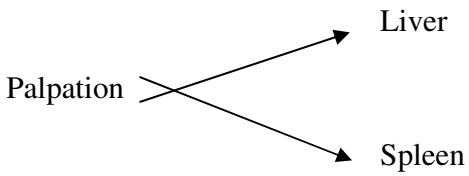
SYSTEMIC EXAMINATION:

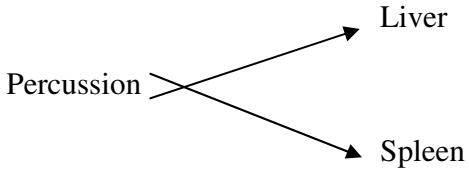
Respiratory system:

Resp.rate /min
Inspection
Palpation
Percussion
Auscultation

Digestive system:

Inspection





Auscultation

Circulatory system:

Heart rate: /min

B.P. mm/Hg

Pulse rate /min Rhythm:

Inspection :

Palpation : Shifting of apexbeat ⟶ Yes/No

Percussion :

Auscultation :

Urogenital system:

Nervous system :

Locomotor system :

Previous Treatment :

ROGABALA PARIKSHA

NIDANA :-

	VATAJA	PITTAJA	KAPHAJA
AAHARA	Sheeta/katu/tikta/ruksha/ kashaya	Amla/lavana/katu/ushna/ tikshna	Guru/snighdha/ Sheeta/Madhur
VIHARA	Vyayama/vegdharana/ ab highata/aatapa/shoka	Aatapa/bhrama/krodha	Vyayama varjana/diwaswapas

NIDANARTHKARA ROGA:
Jwara/Raktapitta/Raktapradara/Aarsha/Krimi/Any other

PURVAROOPA:

1. Hridspandan
2. Swedabhava
3. Shrama
4. Rauksha

ROOPA

VATA

1. Krishnapandutwama
2. Angamarda
3. Kampa
4. Aasyavairasya
5. Shopha

PITTA

1. Pittatva
2. Jwara
3. Daha
4. Trishna
5. Swedana
6. Katukasyata
7. Tampravesh

KAPHA

1. Gaurav
2. Chhardi
3. Shwetavabhasata
4. Lomharsh
5. Shwash
6. Alasya
7. Aruchi
8. Madhurasyata
9. Murcha
10. Kasa
11. Bhrama

INVESTIGATION

BLOOD	**B.T.**	**A.T.**
Hb		
T.L.C.		
D.L.C.		
N		
L		
E		
M		
B		
E.S.R.		

R. B. Cs Morphology Study :

- Platelet Count.
- Total Iron Buinding Capacity.
- Thalassaemic Trait.

COMPLAINTS	A.T.	1st wk	2nd wk	3rd wk	4th wk
1. Panduta					
2. Daurbalya					
3. Bhrama					
4. Krishnakhtva					
5. Krishnnetratva					
6. Shwasa(Ayasaj)					
7. Shunakshikuta					
8. Shishirdwesha					

ASSOCIATED COMPLAINTS	A.T.	1st wk	2nd wk	3rd wk	4th wk
1. Jwara					
2. Gaurav					
3. Nidralutva					
4. Hriddrava					
5. Chhardi					
6. Tampravesh					

8. CRITERIA FOR ASSESSMENT:

Grade 4 - Severe

Grade 3 - Marked

Grade 2 - Moderate

Grade 1 - Mild

Grade 0 - Not Seen/Complete Relief