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A REVIEW ON THE CORRELATION OF *PANDU ROGA* IN AYURVEDA W.S.R. TO IRON DEFICIENCY ANEMIA

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ABSTRACT

The most common nutritional disease worldwide is iron deficiency anemia. The Indian subcontinent has a high prevalence of anemia due to inadequate nutritional consumption, limited iron supply, and chronic blood loss from malaria and hookworm infestation. The prevalence of iron deficiency anemia (IDA), a common nutritional condition, is extremely high in India. According to Ayurvedic texts, iron deficiency anemia develops as a result of a decrease in *Rasa Dhatu*, which makes it ineffective to manufacture *Rakta Dhatu*. It also occurs when there is an imbalance in iron storage and a decrease in iron consumption. For the removal of vitiated *Doshas*, emetic and purgative medications can be used to give *Pandu Roga* patients *Tikshna Shodhana* of the body. For the treatment of iron deficiency anemia, several Ayurvedic herbal and Herbo mineral preparations are included in Ayurvedic texts; numerous investigations have proven that Ayurvedic formulations are safe and efficient against IDA.

KEYWORDS: The prevalence of iron deficiency anemia (IDA), a common nutritional condition, is extremely high in India.

INTRODUCTION

Iron-deficiency anemia (IDA), the most prevalent kind of anemia, overall is brought on by either iron loss or inadequate dietary intake and absorption of iron.[1] Approximately **32%** of the global population is affected by anemia, with iron deficiency being the most common cause, accounting for about **50%** of all anemia cases.[2] The prevalence of anemia is particularly high among children under five years old, reaching about 39.7% globally. This is often due to dietary iron deficiency and rapid growth rates. IDA is a major public health concern worldwide, with the world health organization (WHO) estimating that 8% of preschool children, 12% of pregnant woman, and 15% of nonpregnant woman of reproductive age in Australia have anemia, with IDA being a major causes.[3] The prevalence of anaemia among six groups as per the National Family Health Survey 5 (2019-21), is 25.0 percent in men (15-49 years) and 57.0 percent in women (15-49 years). Ayurvedic classics, sign and symptoms of *Pandu Roga* are very much similar to IDA. It develops due to depletion of *Rasa Dhatu* which in turn becomes ineffective the production of *Rakta Dhatu*. Ayurveda described *Pandu* as *Pitta Pradhana Vyadhi* associated with Rasa and Rakta Dhatu. Dhatus nourishment mainly affects disease due to *Pitta Prakopaka Ahara*.[4] *Pandu Roga* is one of the *Varnopalakshita Roga* mentioned in Ayurveda characterized by the changes in the skin colour to white (*Shweta*), yellowish (*Peeta*), greenish (*Harita*) etc.[5] Acharya Charak and Vagbhatta accepted *Pandu Roga* as a disease of *Rasavaha Strotas*, while according to Sushruta it is of *Raktavaha Srotas*.[6] *Pandu Roga* is characterized by the paleness of the body which may be due to reduced blood flow and oxygen or by a decreased number of red blood cells and anemia is one of the most common causes of paleness, so *Pandu Roga* can be correlated with Anemia.[7]

In Ayurveda concept of *Pandu* is abundantly and mentioned in various literature. The knowledge of this

concept is very beneficial to treat different disorders where *Pandu* is a symptom and disease itself. This article presents the Ayurvedic concept of *Pandu Roga* (Anemia). Hence, in this article attempt has been made to review various available *Samhita*, *Samgraha grantha* to find out the different descriptions about *Pandu* and bring all of them in a single place.

AIM AND OBJECTIVES

To review the concept of *Pandu Roga* W.S.R of Iron Deficiency anemia from different Ayurvedic literature.

MATERIAL AND METHOD

Material has been collected from ancient Ayurvedic texts, Research Journals, and electronic databases.

REVIEW OF LITERATURE

VYUTPATTI

The word *Pandu* is derived from *'Padi Nashane' Dhatu* by adding *"Ku Pratyaya"* to it, the meaning of which is always taken in the sense of *Nashana* and as *Pandu* has been kept under the group which is classified and named according to the change in colour.[8]

NIRUKTI OF *PANDU*[10]

1. According to Shabdarnava Kosh *'Pandustu Peetbhagardh Ketaki Dhulisannibham'* means *Pandu* is like the colour of pollen grains of Ketaki flower which is whitish yellow.[9]
2. *'Pandutwenuplakshito Rogah Pandu Rogah'* means the disease which resembles *Pandu* Varna is known as *Pandu*.

DEFINITION OF *PANDU*[11]

Sarveshu Chaiteshvih Pandubhavo Yatoadhikoatah Khalu Pandurogah. (Su.Ut. 44/4)

It is called *Pandu Roga* because of the predominance of paleness all over the body.

SYNONYMS: According to Shushrut *Kamala, Panki, Laghrak, Alas* and *Kumbhahwa* are the synonyms of *Pandu*.[12]

In Rigveda and Atharvaveda *Pandu* has been described by the name of *Vilohita, Halima* and *Haribha*.[13]

TYPES OF *PANDU ROGA*

Acharya Charak described the disease under five categories namely *Vataja, Pittaja, Kaphaja, Sannipataja* and *Mridabhakshanajanya*[14] and Acharya Susrutha has accepted only four types of *Pandu* excluding *Mridabhakshanjanya Pandu*[15], they are: 1. *Vataj Pandu* 2. *Pittaj Pandu* 3. *Kaphaj Pandu* 4. *Sanipataj Pandu* Acharya Harita mentioned eight types of *Pandu* in Harita Samhita and described *Kamla, Kumbhakamla, Halimaka* as their Synonyms.

SAMANYA NIDANA (CAUSATIVE FACTORS)[16,17]

The etiological factors of *Pandu Roga* mentioned in Charka, Sushruta and other Samhitas can be broadly classified into 3 groups. (Charka Chikitsa 16/8; Sushruta Uttarsthan 44/3)

1. *Aharaj Nidana*. 2. *Viharaj Nidana*. 3. *Mansik Nidana*. 4. Other diseases i.e., *Nidanarthaka Roga.*

1) *Aharaj Nidana*: Food or diet plays an important role in the normal development and maintenance of different *Dhatus* as well as in the vitiation of *Dosha*.

- Excess intake of *kshaar* (alkaline), *amla* (sour), *lavan* (salt), *ushna* (hot) and *teekshna* (penetrating) Ahaar.
- The food/Ahara which is *virudhha* (incompatibles) and *asatmya* (unwholesome)
- Intake of Nishpav, Masha, Pinyak and Til Tail in excess.
- Excess consumption of wine (Madya), eating mud (Mrida) and Mridu Ahaar.

2) *Viharaj Nidana*

- Excessive Diwaswapan, Vyayama and Maithun.
- *Pratikarma Vaishamya* (faulty administration of Panchakarma) and *Ritu Vaishamya* (faulty management of seasonal regimen).
- Suppression of natural urge (*Vega Dharan*).

3) Mansik Nidana

- Mansik *nidana* i.e., anxiety, fear, anger, and grief have a major role in the manifestation of *Pandu*.

4) Other /Secondary/*Nidanarthaka* causes

In Ayurvedic literature there is an indication of a correlation between various diseases and *Pandu Roga* either as a symptom or as Upadrava. So, all these can be causes of *Pandu* i.e., *Nidanarthaka Roga* of *Pandu*. E.g., *Raktatipravartana, Raktaarsha, Raktarbuda, Asrigdara* or *Raktapradara, Rajyakshama, Punaravartaka Jwara* etc. which can directly or indirectly vitiate *Vata-Pitta Dosha* singly or in combination and manifest as *Pandu Roga.*

PURVARUPA (PREMONITORY SYMPTOMS)

According to Acharya Charak.[18]

Hridyaspandanam (Palpitation), *Rokshyam* (dryness of the skin), *Swedabhavah* (absence of sweating), *Shramsatatha* (fatigue).

According to Acharya Sushruta[19]

Twaksphotnam (cracking of skin), *Shthevan* (salivation), *Gatrasada* (sense of lassitude in the limbs), *Mridbhakshanam* (liking for mud intake), *Prekshankootsothhah* (swelling over eye socket), *Vid-Mutra Pitata* (yellow colour of stool-urine), *Avipaka* (Indigestion) these are mentioned by Sushruta.

RUPA (SYMPTOMS)

Acharya Charak has mentioned the *Samanya* and *Vishesh rupa* of *Pandu Roga* in chapter 16 of *Chikitsa Sthaan* according to the *Dosha* involvement which is mentioned below.

Samanya Rupa.[20]

• Loss of *Indriye Bala, Tej, Veerya* and *Oja*.

• Loss of *Bala, Varna and Agni* (power of digestion).

• *Karnashveda* (tinnitus), *Durbalya* (general weakness), *Annadwesha* (aversion towards food), *Shrama* (fatigue), *Bhramanipidita* (giddiness), *Gatrashula* (body ache), *Jwara* (fever), *Shwasa* (breathlessness), *Gaurva* (heaviness), *Aruchi* (anorexia).

• *Akshikutashoth* (swelling over orbit), *Shirnaloma* (hair fall), *Hataprabha* (body complexion become greenish).

• *Kopana* (dislikes cold things), *Nidralu* (feeling of drowsiness), *Alpawaka* (avoid speaking), *Shtheevan* (spitting frequently)

• *Pindikodweshthana* (calf muscle pain), *Katiuru Paad Ruka* (pain and weakness in the lumbar, thighs and feet), *Arohaneayasa* (patient feels exhausted on climbing).

VISHISHTA RUPA

Acharya Charka had classified *Pandu Roga* into 5 types; based on these types *Vishesh Rupas* are described.[21,22]

1. *Vataj Pandu*: - *Krishna-Panduta* (black and pale-yellow discolouration), *Rukshata* (roughness), *Aruna-Angatam* (Reddishness of the body), *Angmarda* (body ache), *Ruja* (pain), *Toda* (Pricking type of pain), *Kampa* (tremor), *Parshvashiroruja* (pain in chest-head), *Varchashosh* (dryness of stool), *Aashyavairasya* (distaste in mouth), *Shopha* (edema over body parts), *Aanah* (constipation), *Bala-Kshaya* (weakness).

2. *Pittaja Pandu:- Pita-Haritabhata* (complexion become either yellow or green), *Jwara, Daha* (burning sensation), *Trishna* (excessive thirst), *Murchha* (fainting), *Pipasa, Pitamutrashakruta* (yellowish discolouration of urine and stool), *Sweda* (profuse sweating), *Sheetakamta* (increase desire to take cold things), *Katukasayta* (feeling pungent taste in mouth), *Ushnaamlanupashyata* (uneasiness for hot and sour things), *Vidahe vidagadhe Anne* (feeling of burning sensation during indigestion of food), *Daurgandhya* (foul smell of body), *Daurbalya* (weakness), *Bhinnvarcha* (diarrhea).

3. *Kaphaja Pandu*:-*Gaurava* (heaviness), *Tandra* (Drowsiness), *Chhardi, Shvetavbhasta* (whitish complexion), *Praseka* (excessive salivation), *Lomoharsha* (Horripilation), *Murchha* (Fainting), *Bhrama* (giddiness), *Klama* (mental fatigue), *Sada* (looseness of body parts), *Kasa, Shwasa* (dyspnoea), *Alasya* (laziness), *Aruchi* (anorexia), *Vaka-swaragraha* (obstruction of speech and voice), *Shukla Mutra-Akshivarchasa* (whitish discolouration of urine, eye and stool), *Katurukshoshna Kamta* (feeling to take pungent, hot and dry things), *Shwayathu, Madhurasyata* (sweetishness in mouth).

4. *Tridoshaja Pandu*: - Sign and symptoms of all the three vitiated *Doshas* are present, and this is extremely intolerable because of developing complications.

5. *Mridbhakshanajanya Pandu*: - *Bala-Varna-Agni Nash* (loss of strength, complexion, and power of digestion metabolism), *Ganda-Akshikuta-BhruPad-Nabhi-Mehan Shotha* (oedema on cheek, eye socket, eyebrow, feet, umbilical region, genital parts), *Krimi Koshta* (Appearance of intestinal worm), *Atisaryet Mala Sasruka Kapha* (diarrhoea associated with blood and mucus).

SAMPRAPTI[23]

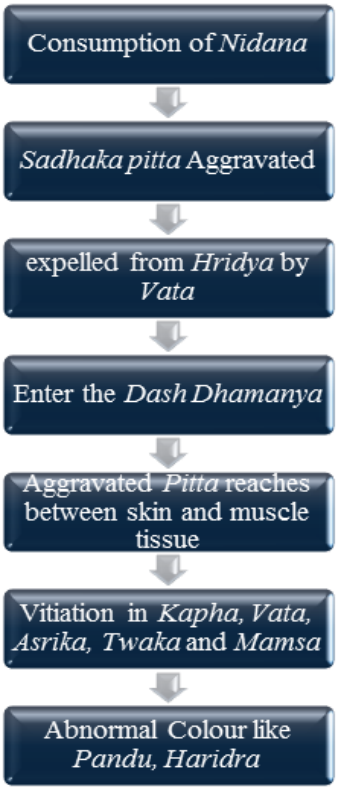

FIG. 1: *Samprapti* of *Pandu Roga*.

SAMPRAPTI GHATAKA[24]

- *Dosha – Pitta Pradhan Tridoshaja*
- *Pitta - Sadhaka, Ranjaka and Bhrajaka*
- *Kapha – Avalambaka, Kledaka*
- *Vyana- Vyan Vayu*
- *Dushya - Twaka, Rasa, Rakta, Mamsa and Meda.*
- *Strotas – Rasavaha, Raktavaha*
- *Stroto Dushti - Sanga and Vimarga Gamanam.*
- *Agni - Jatharagni and Dhatvagni.*
- *Agni Dushti - Mandagni*
- *Udbhavasthaan – Amashaya*
- *Adhishthana - Twaka Mamsa Abhyantara*
- *Vyaktasthaan – Twaka*
- *Sancharasthaan – Twaka & Mamsa*
- *Svabhav – Chirkari*

Pathophysiology of IDA[25]

- IDA is a hypochromic-microcytic anemia – red blood cells (RBCs) are abnormally small with low levels of hemoglobin (Hgb).
- Despite the cause, IDA occurs when the body's iron demand exceeds that of its supply.
- Two types: iron store depletion vs. metabolic/functional.
- Inflammatory response of body in response to infection may also contribute to an acute form of IDA.
- How quickly IDA develops depends on cause, but develops in three stages.

Iron Store Depletion.

1. Inadequate dietary intake
1. Diets low in meat, fish, beans, or iron-fortified foods – commonly seen with vegetarians or individuals living in poverty.
2. Mechanism – low iron stores leads to demand > supply.
2. Excessive blood loss.
1. Hemorrhage, menorrhagia (heavy menstrual bleeding).
2. Mechanism – depleting iron stores faster than replacing combined while increasing body's demand for iron.

Metabolic/Functional

1. Insufficient iron delivery to bone marrow.
1. Iron stores adequate to meet body's need.
2. Mechanism – delivery to bone marrow to be utilized in the production of RBCs is impaired.
2. Impaired use of iron within bone marrow.
1. Iron stores adequate to meet body's need.
2. Mechanism – even when delivered, there is impaired use of iron in the bone marrow to produce RBCs.

Inflammatory Response

- Iron regulates immune effector mechanisms – cytokine activity, nitric oxide formation, and T-cell proliferation.
- Acquired IDA may be body's response to a pathogen – many pathogens require iron to survive.

Stages of Development

1. Body's iron stores are depleted, RBC production proceeds normally with hemoglobin content remaining normal.
2. Reduction in iron transport to bone marrow, causing iron-deficient RBC production (hemoglobin content of RBC is reduced).
3. Small, hemoglobin-deficient cells enter circulation, replacing normal RBC.

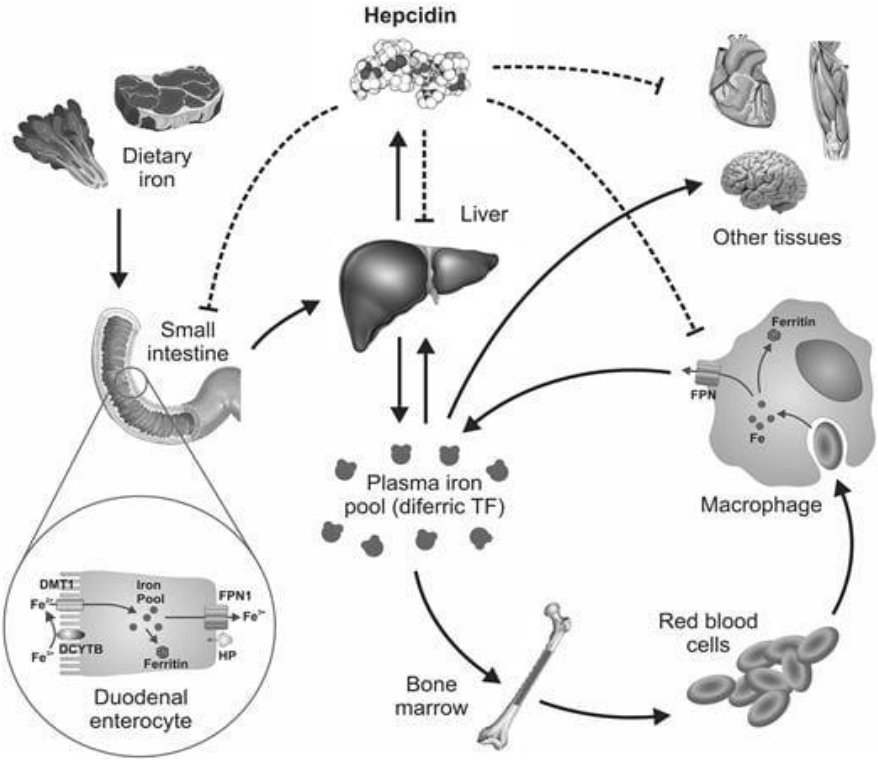

FIG.2: Pathophysiology of Iron Deficiency Anemia.

Symptomatic comparison of *Pandu Roga* and IDA

Table no. 1: Symptomatic comparison of *Pandu Roga* and IDA.

Pandu Roga	**IDA**
Shrama	Extreme tiredness
Shwasa	shortness of breath
Durbalya	Weakness
Kopana	Cold hands and feet
Pindikodweshthana	Restless legs syndrome
Pandu Varna	Pale skin

DISCUSSION

Pandu Roga is *Pitta pradhana vyadhi*, *Pitta* is responsible for the normal colour of the body but when it gets vitiated, *Panduta* (Pallor) occurs. Though *Pitta* is *Pradhana Dosha* in *Pandu Roga*, *Vata Dosha* also plays a crucial role in the manifestation of *Pandu Roga*, mainly *Vyana Vayu* has a relation with *Samprapti* of *Pandu Roga*. *Pandu* is a *Rasvaha Srotas Vyadhi* from which a lot of people suffer. In Samhitas most of the Acharyas have described five types of *Pandu Roga*, i.e., *Vatika*, *Paittika*, *Kaphaja*, *Tridoshaja* and

Mridabhakshhanajanya Pandu. The daily faulty routine activity related to mental or physical, faulty dietary habits like *Mridikabhakshana*, taking food deficient in quality and quantity, *Nidanarthaka Roga* is some etiological agents of *Pandu Roga*. Acharya Charaka mentioned three premonitory Symptoms of *Pandu Roga* i.e., *Hridyaspandanam*, *Rokshyam* and *Shram* which indicate its future presence. Also, in Charak Samhita *Samanya* and *Visheshrupa* of *Pandu Roga* is mentioned. *Pandu* is *Sadhya Roga* but in later stages, due to chronicity, it develops some complications. Hence, it is necessary to treat it in the early stage. According to Acharya Charak in *Sadhya Pandu Roga* medicated *Teekshna Vaman* and *Virechan* should be done. For the diagnosis and effective treatment, a physician must have complete knowledge of *Pandu Roga* by different Samhitas.

CONCLUSION

Now a day, numbers of patients suffering from *Pandu Vyadhi* are seen due to modern lifestyle, improper dietary habits in routine and the use of modern medicines. *Pandu* is a *Varnopalakshita* and *Pitta Pradhana Vyadhi* which is responsible for the normal colour of the body. *Pandu* can be correlated with Anemia. In Ayurvedic literature vast description of *Pandu Roga* and Chikitsa is given. To treat a *Pandu Rogi*, a physician must have complete knowledge of different aspects of *Pandu* like *Nidana*, *Roopa*, *Poorvaroopa*, *Samprapti*, and several *Chikitsa Yoga*, *Sadhyaasadhyta*, *Arishtalakshan* etc. from all Samithas, *Nighantu*, and other literature.

In our ancient scriptures, *Pandu* has been described, which can be correlated with iron deficiency anemia in today's times. Iron deficiency anemia cannot be correlated with any single type of *Pandu*. This proves that all diseases have been described in detail in our ancient scriptures.

REFERENCES

1. Dave U, Thakar A. Effect of Dhatriyarishta in the Management of *Pandu Roga*(Iron Deficiency Anaemia). Int. J AyurbPharma Research, 2014; 2: 84-91.
2. Prevalence of Iron Deficiency Anemia and Reference Range of Complete Blood Count, Reticulocyte Parameters in Infants Aged 9–11 Months.
3. Iron Deficiency Anemia (IDA) remains a significant global health issue, affecting various populations, particularly women and children.
4. Agnivesh, Kashinath Shastri, Gorakhnath Chaturvedi, Vol. II, Re-edition, Chap. 16/4, Varanasi; Chaukhambha Bharati Academy, 2004; 487.
5. Ambika Datta Sastry, Sushrutha samhita, Uttara tantra, 7th Edition, Chaukambha Sanskrit Samsthan, Varanasi, 1990; 286p.
6. Pandey Ajay Kumar, Textbook Of kaya chikitsa, Vol 2, Chapter 2, Chaukhambha Publications, New Delhi, First Edition, 2019; P-167.
7. Urvi R Dave, Anup Thakar. A clinical study of *Pandu*roga w.s.r to iron deficiency anaemia and its management with dhatriyarihta and *Pandu*ghna Vati.www.iamj.in - volume3; Issue7; ISSN: 2320 5091; July-2015, 1917pg.
8. Pandey Ajay Kumar, Textbook Of kaya chikitsa, Vol 2, Chapter 2, Chaukhmbha Publications, New Delhi, First Edition, 2019; P-167.
9. Taranath Tarkavachaspati. “Shabdasthome Mahanidhi”. Veedanyantra Press, Calcutta, 1976.
10. Pandey Ajay Kumar, Textbook Of kaya chikitsa, Vol 2, Chapter 2, Chaukhmbha Publications, New Delhi, First Edition, 2019; P-168.
11. Shastri Ambikadatta, susruta samhita, ayurveda tatvasandipika Hindi commentary, Vol. II, Chp. 44/15, Chaukhambha Sanskrit sansthan, Varanasi; reprint edition, 2014; p-365.
12. Shastri Ambikadatta, susruta samhita, ayurveda tatvasandipika Hindi commentary, Vol. II, Chp. 44/15, Chaukhambha Sanskrit sansthan, Varanasi; reprint edition, 2014; p-365.
13. Rani Khushboo, Gujjarwar Vidula, Gujjarwar Shriniwas; Acta Scientific Nutritional Health, "Mridabhakshanjanya *Pandu* Review Article; 3; 4; 2019; P-66- 69.
14. Shastri SN. “*Pandu*roga Chikitsa adhyayah”. In Carak Samhita 1st edition. Varanasi, IN: Chaukhamba Bharati Acadamy, 2013; 2: 486.
15. Shastri, A. D. “*Pandu*rogpratishedhoupkram Varnan”. In Susruta Samhita Part II 1st edition. Varanasi, IN: Chaukhamba Sanskrit Sansthan, 2013; 365.
16. Agnivesh, Charaka, Dradhabala, Pt. Kashinatha Shastri and G. Pandeya; Charaka Samhita, Vidhyotini Hindi commentary, Chikitsa Sthana,16/7-9, Chaukhamba Sanskrit Sansthan, 6th edition, 2000; p.415.
17. Shastri Ambikadatta, susruta samhita, ayurvedatatvasandipika Hindi commentary, Vol. II, Chp. 44/3, Chaukhambha Sanskrit sansthan, Varanasi; reprint edition, 2014; p-364.
18. Agnivesh, Charaka, Dradhabala, Pt. Kashinatha Shastri and G. Pandeya; Charaka Samhita, Vidhyotini Hindi commentary, Chikitsa Sthana,16/12, Chaukhamba Sanskrit Sansthan,6th edition, 2000; p.416.
19. Sushruta, A. Shastri, Sushruta Samhita, Ayurvedtatva Sandipika Hindi commentary, Uttartantra 44/5, Chakhambha Bharti Academy, Varanasi, Reprint, 2013; p.366.
20. Agnivesh, Charaka, Dradhabala, Pt. Kashinatha Shastri and G. Pandeya; Charaka Samhita, Vidhyotini Hindi commentary, Chikitsa Sthana,16/13-16, Chaukhamba Sanskrit Sansthan,6th edition, 2000; p.416.
21. Agnivesh, Charaka, Dradhabala, Pt. Kashinatha Shastri and G. Pandeya; Charaka Samhita,

Vidhyotini Hindi commentary, Chikitsa Sthana,16/3, Chaukhamba Sanskrit Sansthan, 6th edition, 2000; p.414.

22. Agnivesh, Charaka, Dradhabala, Pt. Kashinatha Shastri and G. Pandeya; Charaka Samhita, Vidhyotini Hindi commentary, Chikitsa Sthana,16/19-22, Chaukhamba Sanskrit Sansthan, 6th edition, 2000; p.417- 418.
23. Agnivesh, Charaka, Dradhabala, Pt. Kashinatha Shastri and G. Pandeya; Charaka Samhita, Vidhyotini Hindi commentary, Chikitsa Sthana,16/9-11, Chaukhamba Sanskrit Sansthan, 6th edition, 2000; p.415.
24. Byadgi S. Parameswarappa, Textbook of Vikrti Vijnana & Roga Vijnana, Vol.2, Chapter 1/17, Chaukhmbha Publications, New Delhi, Reprint Edition, 2019; P-64.
25. McCance, K. L, & Rote, N. S. (2019). Alterations of erythrocyte, platelet, and hemostatic function. In V. L. Brashers & N. S. Rote (Eds.), *Pathophysiology: the biologic bases for disea se in adults and children* (926-962). St. Louis, MO: Elsevier.