



# PHYSIOLOGICAL CHANGES IN SICKLE CELL ANAEMIA PATIENTS – AN AYURVEDIC REVIEW

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## **Abstract:**

We know the pathology and the symptoms of Sickle Cell Anaemia according to modern science very well but its physiological changes are also important specially by ayurvedic point of view, if we try to figure out the physiological changes that is *kriyatmaka* effect of Sickle Cell anaemia on patients, it will be easier to find a way of treatment.

Unlike many other diseases SCA is a disease which is not mentioned directly in Ayurveda. There is no such reference in ayurvedic classics to which Sickle Cell Anaemia can be directly correlated. There are many researches going on related to SCA. Even in ayurveda we find many Attempts for the treatment of Sickle Cell Anaemia, probable *samprapti* of of Sickle Cell Anaemia, study of *Rakta dhatu* in those particular patients and so on. It will also be useful if we study the disorders in ayurvedic view such as its affected dosha-dushya, the dhatus affected, the *Ahara, Nidra, Bala*, and all such ayurvedic technologies used generally to study and treat the patient.

**KEYWORDS**-Sickle cell Anaemia, *Rakta Dhatu, Pandu,*

## **I. INTRODUCTION**

Our body is referred to as '*Sharir*' according to ayurved. Study of *Sharir* i.e., our body includes mainly *Sharir kriya* and *Sharir Rachana*. Among which *Sharirkriya* is physiology of the body. In this we study the normal physiological activities in the bodily constituents and its relation with any disease when something goes wrong in the body. '*Sharir*' mainly consist of 'dosha', 'dhatu', 'mala' these entities controls, builds and maintains the entire body. Any physiological and pathological changes in dosha, dhatu, mala leads to defect or disease in the body. Apart from dosha, dhatu, mala there are other such factors such as *Agni, Nidra, Bala* etc. due to which physiological changes are seen in the body. *Prakruti, Sara, Koshtha* are also responsible for any *kriyatmaka* effect in the body. Before treating or studying the pathology of the disease we need to study the physiological changes occurring due to disease. Here we observed changes in above dosha, dhatu, and mala of the patients having sickle cell anaemia disorder, which is nothing but physiological changes in ayurvedic view.

SCD is a genetic disease, so according to ayurveda it is related to *Beejadoshha* i.e., abnormality in sperm or ovum. The *Beeja* dosha leads to defect in *Raktavaha strotasa* of the body as a result of which blood cells do not have normal characteristics. Although Sickle Cell Anaemia disease has not been mentioned in Ayurveda, Sahaj Pandu disease has been described which has similar signs and symptoms.<sup>1</sup>This disease pandu shows same characteristics in terms of pathogenesis, diagnosis and clinical features with Sickle Cell Anaemia. To accommodate inheritable nature of SCA, 'Sahaj' word has been added to Pandu. Thus, we can see like Sahaj Pandu Roga, Sickle Cell Anaemia is also inheritable disorders.<sup>1</sup>

## **RATIONALE:**

As SCD is a genetic disorder, modern medicine does not have thorough treatment to cure or to eradicate the disease. There are many researches are going on in Ayurveda as well for the same. But, Unless the exact Nidanapanchaka and dosha dushya etc. is not known. SCD cannot be treated completely even in terms of Ayurveda. Therefore, to contribute the work of studying the disease in ayurvedic prespective and find proper way of treating the disease this attempt of presenting the physiological changes (*kriyatmaka* effects) in SCD is made.

While doing research in ayurveda an attempt should be made to study the new disease in ayurvedic perspective though it is not always necessary to give a specific name to all disease. By merely studying the causes and pathophysiology of disease one should be able to provide treatment module as per ayurveda.

Many diseases such as SCD are not mentioned in basic ayurvedic texts which suggest that their disease may not have been in existence at that time and appeared later. Change in nature and environment with passage of time are chief contributors in new emergence of new diseases.

**Aim:** To study physiological changes in sickle cell anaemia by ayurvedic view.

**Objective:**

- 1) To study Sickle Cell Anaemia.
- 2) To study kriyatmaka effect in Sickle Cell Anaemia.

## 1. MATERIAL AND METHODS:

Study of SCD from Various sources such as Samhita, articles, and dissertations.

Study of basic physiology in ayurveda from various texts and classics is done.

Correlating the factors of 'Sharir' physiologically by observations in SCD.

### 1.1. Review of Literature:

SCA a monogenic autosomal recessive disorder, is found in high frequency in tropical regions, particularly Sub-Saharan Africa, in India mostly seen among tribal and scheduled caste populations, the middle east and north America. However, due to migration of populations there has been a dramatic increase in recent decades in the number of patients in European countries and in the United States of America. In 2018 it resulted in 1,76,000 deaths due to sickle cell disease up from 1,13,000 deaths in 1990 (Global Burden of Disease 2013).<sup>2</sup>

The sickling of red blood cells results in various acute and chronic complications of the disease such as anemia, vaso-occlusive crisis, aplastic crisis, haemolytic crisis, acute chest syndrome avascular necrosis of the bone joints along with other complications such as infection and stroke leading to high mortality. Sickle Cell Anemia is the condition which arises from a genetic defect that alters the structure of hemoglobin, the oxygen-carrying protein, found in red blood cells. Sickle cell anemia is a severe haemolytic anemia occurring in persons with abnormal kind of haemoglobin 'S'. SCA is a hemoglobinopathy which is a result of mutation in Beta chain of Hb molecule when sixth amino acid 'Glutamic acid' is replaced by 'Valine'. Red cells with this type of haemoglobin become sickle shaped when deoxygenated causing changes in blood viscosity and cell membrane. Furthermore, because of their sickle shape they tend to get stuck in blood vessels and can cut off blood supply to an organ or altogether. It causes shortening of breath, fatigue and delayed growth and development in children. Whenever there is increase in demand for oxygen in the body, the sickling process gets accelerated. The sickle red cells get entangled with each other and may cause obstruction. When blood flows through micro capillaries, the obstruction may stop further blood supply developing ischemic condition and causes tremendous pain at that site.<sup>3</sup> Swelling is the commonest symptom followed by fever and pain in abdomen. Giddiness, chest pain, joint pain and jaundice is seen with malena.

Though the sickle cell disease was not known in ancient times; there was a system to diagnose unsaid (anukta) diseases in Ayurveda in terms of dosha prakopa awastha. Since the etiology, pathophysiology, and manifestations of symptoms of the said disease is now known; its correlation with the ayurvedic diagnostic system could be done.<sup>4</sup> Few studies of this type were done in past. The SCA is usually correlated with pandu vyadhi in Ayurveda.<sup>5</sup> Correlation with udar vyadhi is also seen.<sup>6</sup>

SCD is a genetic disease, so according to Ayurveda it is related to bija dosh i.e abnormality in sperm or ovum. The beeja dosha leads to a defect in Raktavaha strotas of the body as a result of which blood cells do not have normal characteristics. Thus, study and sanskaar of rutu, kshetra, ambu and beeja of the patients also may help treat the disease.

*Rutu kaala*- the period of conception; *Kshetra- garbhashaya*, fallopian tubes, ovaries etc.; *Ambu*- nourishment to the foetus through *aharasa*.<sup>7</sup> This is not seen making much difference as SCA is said to be caused due to genetic effect so mainly the *Beeja dosha* must be considered here. So, *Beeja*- the role of father's *beeja* i.e spermatozoa is most significant for the fertilization of ovum and growth of embryo. Any change or defect of the above leads to serious genetic anomaly.

*Doshas*- those which vitiate other substances after getting vitiated themselves produce disease; give rise to a specific temperament by birth."

*Vaata* is most important among the *tridoshas*. "*Shonit praan vahati*..."<sup>8</sup> This refers to oxygen carrying capacity of blood. It is seen that the *praana* is been carried by of blood. This *praana* gets disturbed due to decrease in Hb% hence, causing less oxygen supply to the tissues and heart.

*Udan vayu – bala, urja, varna, smruti* are the functions of *udaan vayu*. All of these are seen to be vitiated in cases of SCA.

*Samaan vayu- agni sandhukshana* (stimulation of stomach and intestines to secrete digestive juices) is done by *samaan vayu*. As we see almost all the sufferers of SCA have signs of jaundice in them, it proves that the secretions of digestive juices (bile) is not regulated. Thus, function of *samaan vayu* is not been carried properly.

*Vyan vayu- rasa- rakta samvahan* (circulation) is carried out by *vyaan vayu* in the whole body. But in cases of SCA we see *rukshata, panduta, hrudrava, hrudspandana*, etc. thus, *vyaan vayu* is also vitiated.

*Pitta* is another *dosha* and has 5 types.

The kala which holds pachak pitta is pittadhara kala - this seems to be disturbed. According to modern science all the digestive juices secreted by pancreas, small intestine, stomach, liver, can be considered as pachak pitta. As seen earlier secretions of digestive juices are disturbed.

*Ranjaka pitta* - as the sthana of ranjak pitta the liver and spleen is affected its karma- ranjakam rasa ranjanat is hampered.

*Sadhak pitta*- the sthan of sadhak pitta is hruday. We see many complaints related to heart such as chest pain, palpitations, chest tightening etc. in SCA. This is due to vitiation of sadhak pitta.

*Alochak pitta*- responsible for roopa graham. Present in netra. Recent study shows retinopathy in patients of sickle cell.

*Bhraajak pitta* - gives complexion to skin- peeta, shweta, pandur twak, nisteja, ruksha twak shows disturbed bhrajak pitta.

Kapha- normal constituents which contribute the mass of the body are called Kapha. Tissue fluids and all the nutrients present in it can be taken as kapha.

The action of this kapha depends upon the annarasa of hridaya and from here itself with its ambukarma (nourishing property) it supports and nourishes all the remaining kapha sthanas.

Sleshaka kapha-This kapha is present in sandhi and maintains the lubrication and integrity of the sandhi. In patients of SCA we see pain, cracking sounds from joints while movements like flexion extension etc. This is due to decrease in lubrication of joints (shleshaka kapha).

As the symptoms and affected entities such as rakta, rakta sthanas, asthi, respiration are more related to vata and pitta dosha, patients suffering from SCA have their vata and pitta dosha more vitiated than kapha dosha.

Dhatu- those which nourish and support the body, f nourishes next dhatu. Seven Dhatu are mentioned in Ayurveda as follows- Rasa, Rakta, Mamsa, Meda, Asthi, 5 Majja, Shukra.

Looking at the signs and symptoms if we correlate them to ayurvedic lakshanas we see these are the signs showing vitiation of all the 7 dhatus. The signs either show increase, decrease or hampered karma of the dhatus. For example - anemia (panduta), palpitation, etc shows rasa dhatu is hampered; shortened lifespan shows hampered jeevan karma of rakta dhatu, lowered strength proves vitiation of mamsa dhatu; meda dhatu gives snighdhatva and does asthi poshan- both these are absent. Very soon the sufferers of SCA lead to avascular necrosis of joints and degenerative changes in bone thus proving degeneration of asthi dhatu. As the production of blood also is affected the bone marrow which is nothing but majja dhatu is affected. There is not a huge issue of conception in these patients but the progeny is not healthy enough and is seen to carry the sickle cell trait. Therefore, we can see even the shukra dhatu is not healthy.

Mala- those which pollute other structures being themselves waste products of food, purifies the body after getting itself excreted. Patients with SCA have all sorts of mala in ruksha form and in inappropriate quantity. This happens due to decreased poshan.

Agni- the conversion of food substances at different levels in various ways till they ultimately become tissues of the body is brought about by Agni. It means, without agni there is no tissue building and hence no life. When the jatharagni becomes defective in action, the dhatwagnis also will become defective and result in abnormal growth of dhatu. Rasa kshaya leads to anuloma kshaya and shukra kshaya leads to pratiloma kshaya. In SCA amongst all agni mainly dhatwagni is defected.

The angapratyanga which is nothing but the organs getting damaged in SCA are the yakrut (liver), pleeha (spleen), hridaya (heart), phuphusa (lungs), twak (skin).

The asthi i.e the bones are also seen affected very soon. They are seen to be necrosed, fractured or early osteoporotic changes are seen.

Shukra dhatu does not have much negative effect except for the genetic thing. The reproduction is quite satisfactory in these patients.

All the related dhatuvaha strotasa, annavaha strotas, pranvaha strotasa are hampered.

Oja is the essence of all 7 dhatus. As the dhatus are not healthy oja is also vitiated.

As these are suffering since birth their manoswashya is depleted. These patients are found to be salva hina,

Ayurved is grounded on the metaphysics of the '5 great elements viz prithvi-earth, tej- fire; aap-water; vaayu air; aakaash-ether according to *Charakacharya*.<sup>9</sup> All of which compose the universe, including the human body. Here all these 5 elements of rakta dhatu are seen to be disturbed."

### Discussion:

Though it is a fatal disease according to modern science, an ayurvedic approach towards this disease in Dhadgao taluka of Nandurbar district is providing to be better one. This approach covers the spread of sickle cell gene in society and help patients from presenting them to land up in crisis of sickle cell disease. Thus, review of ayurvedic approach towards SCD will be an important step.

Tridoshaja pandu (anemia), awayava vikruti (all symptoms rapidly develop in organs), yakrutodar (enlarged liver), plihodar (enlarged spleen), dhatushushkata (tissue degeneration), hridvyaas (cardiomegaly), asthi sandhi vikruti/majja vikruti (bone and bone marrow disorder). This way we can correlate the symptoms according to Ayurveda.

The integrity of body depends on 7 dhatus, especially Rakta Dhatu since 'jeeven' karma is specifically related to Rakta Dhatu. And here in SCD mainly the Rakta Dhatu is hampered.

A comprehensive treatment for SCD sufferers is needed to correct and prevent further deformation of bodily components (dosha and dhatu) could be a solution to bridge the gap in present treatment. Thus, the review on physiological effects of SCA in ayurvedic prospectus is taken.

**Result:**

We see kriyatmak effects caused in almost all the types of dosh, dhatu and mala and other kriyatmak bhaay. But mainly the vaata dosh and pitta dosh is more affected. As well as the dhatus viz, rasa, rakta, mamsa, asthi and majja seem to have physiological disturbances in the body.

**Conclusion:**

Even if not directly correlated to any disease or disorder given in Ayurveda, SCD can be studied well this way in ayurvedic view and further treated. Treatment of these kriyatmak effects will help improve quality of life much better. Sickle cell anemia must be studied by ayurvedic view to develop some specific treatment atleast to improve the quality of life of the suffering patients.

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**CONFLICTS OF INTEREST:**

The authors declare no conflict of interest regarding the publication of this article.

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