

# An Ayurvedic Management of Sickle Cell Anemia in Children: A case study

## Case Report

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### Abstract

**Introduction:-** Sickle cell anemia is a term for a group of genetic diseases characterized by the production of hemoglobin (Hb) "S". This is the result of replacing the base pair thymine at the 6th position of the  $\beta$ -globin gene on chromosome 11 with adenine and replacing valine with glutamic acid. A single amino acid substitution is the reason for the profound changes in the stability and solubility of the hemoglobin "S" molecule. Due to its chronic nature and painful crisis, children's quality of life is difficult. From now on, there is no final treatment other than a successful bone marrow transplant. Its symptoms and the nature of the disease can be compared with *Pandu*. If a drug improves the quality of life and maintains the health of the patient, then the drug and efforts will be beneficial to society. **Material and Methods:-** A 9-year-old male patient was diagnosed with sickle cell anemia. Symptoms include joint and limb pain, anorexia, fatigue, loss of appetite, and weight loss. approached the OPD, department of *Kaumarbhritya*, Parul Institute of *Ayurved*, Vadodara. **Observations and Results:-**The patient is taking modern medicine (1 mg folic acid once a day). The Childs parents also wanted to take *Ayurvedic* medicine, so they came here for 2 months of *Ayurvedic* medicine treatment, during which he did not have a pain crisis. Weight improved From 16 kg to 18 kg. The quality of life of a patient is also improved. **Conclusion:-**Therefore, the purpose of this case study is to study the pathophysiology and treatment of sickle cell anemia from an *Ayurvedic* perspective and to study the possible mechanism of action of the drug.

**Key Words:** Sickle cell anemia, *Bijadustijanya*, *Pandu*, *Dadimadi Avaleha*.

### Introduction

Sickle cell anemia is an autosomal recessive genetic disease of red blood cells. It is also called a "molecular" disease because it is the result of amino acid mutations in the hemoglobin molecule(1). This is the result of replacing adenine with base pair 6 of the  $\beta$ -globin gene on chromosome 11 and replacing valine with glutamate. The substitution of amino acids will cause profound changes in the molecular stability and solubility of hemoglobin. Slight changes were also observed in the non-coding nucleotide sequence of the gene. Polymorphic variants are called haplotypes. Four haplotypes were found. The Indian-Arab haplotype is found in eastern Saudi Arabia and the Indian subcontinent. Bantu haplotype is common in Africa, Mediterranean countries, North and South American countries. The term SCD encompasses several different genotypes; the most common are homozygous sickle cell anemia (SS), heterozygous (AS), and sickle thalassemia (S $\beta$ 0), and the less common forms are SD, Punjab disease, SO Arab disease(3). They usually start

when they are 5 to 6 months old. Various health problems may occur, such as pain episodes, anemia, bacterial infections, swelling of hands and feet, and strokes. Sickle cell crisis is divided into three categories: painful crisis, sequestration crisis, vascular occlusive crisis, and aplastic crisis(4). Although there is a lack of literature on sickle cell anemia in ancient *Ayurvedic* literature, this disease called *Pandu* shows some similarities in the clinical features of sickle cell anemia. *Pandu Roga* has been explained in all the classics of *Ayurveda*. *Panduta* being a prominent sign of the disease is termed as *Pandu Roga*. *Panduta* (paleness) is an important diagnostic feature of *Pandu roga*. The most common symptoms are pale, irritability, weakness, malaise, headache, etc. *Pandu Roga* is caused by intake of unwholesome food (hot, sour, salty, oily food articles), unwholesome activities like (day sleep, suppression of natural urges and physical activity when food is digesting). In *Charak Samihita Dadimadi Ghrita* is advised in treatment of *Pandu*(2)

### Case History

A 9-year-old male, Hindu patient was diagnosed with sickle cell anemia with symptoms of pallor++, joint and limb pain, anorexia, loss of appetite, fatigue, and weight loss, and approached to OPD of *Kaumarbhritya* at the Parul *Ayurved* Institute, Vadodara. The father's education extends to intermediate, and the mother's education extends to high school. The socio-economic status is lower middle class.

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### History of present illness

Patient has pain in joints and limbs, anorexia, loss of appetite, fatigue, and weight loss. On examination pallor++ was found.

### History of past illness

Nothing significant.

### Birth history

No major medical intervention was required during prenatal, natal, and postnatal periods. immunization was done as per the national schedule.

### Personal history

- **Aharaja-** vegetarian and quantity and appetite was poor.
- **Viharaja-** The patient could not play outdoor games due fatigue. Sleep was 6-8 hrs/night.
- **Examination-** vitals were within normal range. No, abnormality was found in the cardiovascular system, respiratory system and per abdomen examination. Weight was 16 kg and height was 109cm.
- **Ashtavidha pariksha-** Nadi(pulse) was normal. Mala(stool)- Sama, constipated and consistency was semi solid and Mutra(urine) normal in frequency and no any associated complaints. Jihva(tongue) was Sama(coated) due to improper digestion and papillae found atrophied. Shabda(speech) was normal. Sparsha(touch) was Ruksha. Drik(eyes) are normal with slight pallor in conjunctiva but the sclera is normal(no icterus). Akriti (appearance)was lean and thin due to loss of appetite.
- **Dasvidha pariksha-** Prakriti was Vattaja-Pittaja, Sara, Samhanana, Satva, and Pramana was Avar, Satmya was Madhyam and Aahar Shakti and Vyayama Shakti was also Avar.
- **Investigations-** complete blood count(CBC) of patients reveals haemoglobin of 9.3g/dL, MCV 75.5fl, PCV 26.7% MCH 26.3Pg MCHC 34.1gm/dl, RBC count 3.54millions/microL, WBC count 10310/cmm, Platelet count 559,000/cmm. Sickle solubility test is positive. Blood group is A+.

### Treatment protocol

- **Total duration-** 60 days.
- **Drug-** Dadimadi avaleha
- **Dose** – 25 gm BD Before food , Anupana- luke warm water.

**Table-1 contents of Dadimadi avaleha**

Sr. No.	Drug	Latin name	Quantity
1	Dadima	<i>Punica granatum Linn.</i>	8 Part
2	Pippali	<i>Piper longum Linn.</i>	1 Part
3	Dhanayaka	<i>Coriandrum sativum Linn.</i>	4 Part
4	Shunthi	<i>Zingiber officinale Rosc.</i>	2 Part
5	Chitraka	<i>Plumbago zeylanica Linn.</i>	2 Part
6	Ghee	Cow's Ghee	QS
7	Sharkara	Sugar	60% w/v

### Results and discussion

#### Grading:

- **Pallor:** 0- no pallor, 1- pallor of conjunctiva, 2- pallor of conjunctiva, nails, tongue, 3- pallor of conjunctiva, nails, tongue, skin 4- pallor of conjunctiva, nails, tongue, palm and soles.
- **Pain in limb:** 0- no pain, 1- pain in only one extremity, 2- pain in both extremities, 3- involvement of almost all bones.
- **Anorexia:** 0- no anorexia, 1- taking a normal diet without any interest, 2- taking the food without interest and unable to complete it all the time, 3- no interest in taking food, resisting or crying while feeding.
- **Loss of appetite:** 0- taking food in good quantity twice/thrice, 1- taking food in normal quantity twice a day, 2- taking food in moderate quantity twice a day, 3- taking food in less quantity twice a day, 4- taking food in less quantity once a day, 5- not at all taking food.
- **Fatigue:** 0-normal active child, 1-playing and activities reduced, 2-feeling tiredness while playing, 3- easy fatigability while playing.

#### Quality of life Assessment (WHO QOL parameters)

##### A. General Assessment

1. How satisfied are you with your health?
  - 1= Very dissatisfied
  - 2= Dissatisfied
  - 3= Neither satisfied nor dissatisfied
  - 4= Satisfied
  - 5= Very satisfied
2. How would you rate your quality of life?
  - 1 = Very
  - 2 = poor
  - 3 = Neither poor nor good
  - 4 = Good
  - 5 = Very good
3. How satisfied are you with your sleep?
  - 1= Very dissatisfied
  - 2= Dissatisfied
  - 3= Neither satisfied nor dissatisfied
  - 4= Satisfied
  - 5= Very satisfied

##### B. Physical Assessment

4. How satisfied are you with the way your body looks
  - 1= Very dissatisfied
  - 2= Dissatisfied
  - 3= Neither satisfied nor dissatisfied
  - 4= Satisfied
  - 5= Very satisfied
5. Do you have enough energy for everyday life?
  - 1=Not at all
  - 2=A little
  - 3=Moderately
  - 4=Mostly
  - 5=Completely

6. How satisfied are you with your ability to perform your daily living activities?

- 1= Very dissatisfied
- 2= Dissatisfied
- 3= Neither satisfied nor dissatisfied
- 4= Satisfied
- 5= Very satisfied

7. Didn't do work or other activities as carefully as usual?

- 1=Not at all
- 2=A little
- 3=Moderately
- 4=Mostly
- 5=Completely

### C. Psychological Assessment

8. Did you feel very nervous?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

9. Have you felt so down in the dumps, nothing could cheer you up?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

10. Have you been very happy?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

11. How much do you enjoy life?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

### D. Social Assessment

12. Do you feel happy about your relationship with your family members?

- Very unhappy = 1
- Unhappy = 2
- Neither happy nor unhappy = 3
- Happy = 4
- Very happy = 5

13. How satisfied are you with your friends?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

14. How satisfied are you with your study?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

### E. Environment Assessment

15. How satisfied are you with your physical environment (e.g. pollution, climate, noise, attractiveness)?

- 1= Very dissatisfied
- 2= Dissatisfied
- 3= Neither satisfied nor dissatisfied
- 4= Satisfied
- 5= Very satisfied

16. Have you enough facility to meet your needs?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

17. How satisfied are you with the conditions of your living place?

- 1=Not at all
- 2=A little
- 3=A moderate amount
- 4=Very much
- 5=An extreme amount

18. How many people are so close to you that you can count on them if you have serious personal problems?

- 1=None
- 2=1 or 2
- 3=3 to 5
- 4=6 or more

19. How much concern do people show in what you are doing?

- 1=A lot of concern and interest=5
- 2=Some concern and interest=4
- 3=Uncertain=3
- 4=Little concern and interest=2
- 5=No concern and interest=1

20. How easy is it to get practical help from friends if you should need it?

- 5=Very easy
- 4=Easy
- 3=Possible
- 2=Difficult
- 1=Very difficult

**QOL Assessment-** Quality of life assessment criteria is taken from WHO quality of life assessment. Quality of life improvement is very important in sickle cell anemia patient because in this disease quality of life of the patient is also hampered so reason for the assessment is to assess effect of the *Dadimadi Avaleha* in quality of life of patient. Assessment done before and after treatment and then compared the score for improvement.

**Table 2: Effect of Therapy**

Complain	Before Treatment	After Treatment	% of Relief
Pallor	4	1	75%
Pain in limbs	2	0	100%
Anorexia	2	0	100%
Fatigue	2	0	100%
Loss of appetite	3	0	100%
Weight	16 KG	18KG	-

**Table 3: Effect of Therapy**

Haematological Parameters	Before Treatment	After Treatment
Hb	9.3g/dL	11.3 g/dL
PCV	26.7%	33.1%
MCV	75.5 Fl	88.74 Fl
MCH	26.3Pg	30.29Pg
MCHC	34.9gm/dl	34.1gm/dl
RBC	3.54 millions/microL	3.73 millions/microL
WBC	10310/cmm	7500/cmm
PLATELET	559,000/cmm	189000/cmm

**Table 4: Effect of QOL parameters**

QOL Paramters	Before Treatment (Total score)	After Treatment (Total score)
General Assessment	9	10
Physical Assessment	9	15
Psychological Assessment	9	10
Social Assessment	9	10
Enviornmental assessment	16	17

*Dadimadi Avaleha* helped deal with all important aspects of *Pandu* i.e. Pallor, Anorexia, pain (limb), fever, periorbital edema, and fatigue. *Dadimadi Avaleha* contains the drug-like *Chitraka*, *Dhanyaka*, *shunthi pippali* which are *Dipana* i.e. improves the process of digestion, *Pachana* (like drug *Pippali*) detoxifies the body by removing *Ama* toxins. It improves digestion and reduces the accumulation of harmful cholesterol in the body, thereby improving metabolism and helping the body lose weight faster, which helps to establish proper nutrition for all *Dhatu* and is beneficial for *Dhatuposhana*. *Dadim*, *Dhanyaka*, and *Shunti* have antioxidant activity, help reduce sickle cell oxidative stress, and help prevent sickle cell anemia and SCA screaming(5). *Dipana* and *Pachana* preparations can improve the digestive process and eliminate damaged *Dosha* or *Aama* in the body. It also showed significant results of orbital edema, loss of appetite in *Pitta* and *Vata Dushti*, the elevation of *Vata* and *Pitta Dosha*, and the drug *Rakta Prasadana Karma* which can relieve *Shootha*. *Dadimadi Avaleha*, with the characteristics of *Rasa Prasadana*, can remove the ancient *Dosha* from the skin and help improve people's natural skin tone. hemopoetic action of the *Chitraka* which stimulates the hemopoiesis and production of healthy RBCs in the children with sickle cell anemia(7). *Coriandrum sativum* L. has been recommended for relief of insomnia in Iranian traditional medicine. In sickle cell anemia there is painful condition which lead to disturbed sleep and it is relieved by the *Dhanyaka*(8). *Dadimadi Avaleha* helps activation of macrophages as shown by an increased macrophage migration index. Sickle cell anemia is characterized by painful vaso-occlusive crises.

It is hypothesized that monocytes are activated in sickle cell disease and can enhance vaso-occlusion by activating endothelium(8). *Dadimadi Avaleha* has shown significant improvement in objective criteria(Hb,PCV, MCV, MCH, MCHC AND RBC). The result of Hb% assessment revealed an increase in the mean during the intervention period. Quality of life of a patient is also improved. *Dadimadi Avaleha* is having Properties that helps to improve the nutrition and health of children. Activity, playfulness, and increase in concentration, improvement in irritability have been found.

**Conclusion**

The main cause of the disease is *Bijadusti*, the consequences of which include *Agnimandya*, *Panduta*, Pain, Fatigue, etc. The subsequent *Tridosha Prakopa*, premature destruction of red blood cells and *Dhatukshaya* complicate the overall outcome of the disease. This case is a manifestation of a vascular occlusive crisis. No splenomegaly was observed in this case. The child received *Ayurvedic* medication. weight is improved, improvement in pallor, pain and other symptoms.

**Adverse drug reaction**

No any adverse drugs reaction found.

**Key message**

Sickle cell anemia causes high morbidity and mortality in children. The quality of life is affected by the chronic nature and painful crisis. *Ayurvedic* medicines can improve their quality of life.

**Conflict of Interest:** None.

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