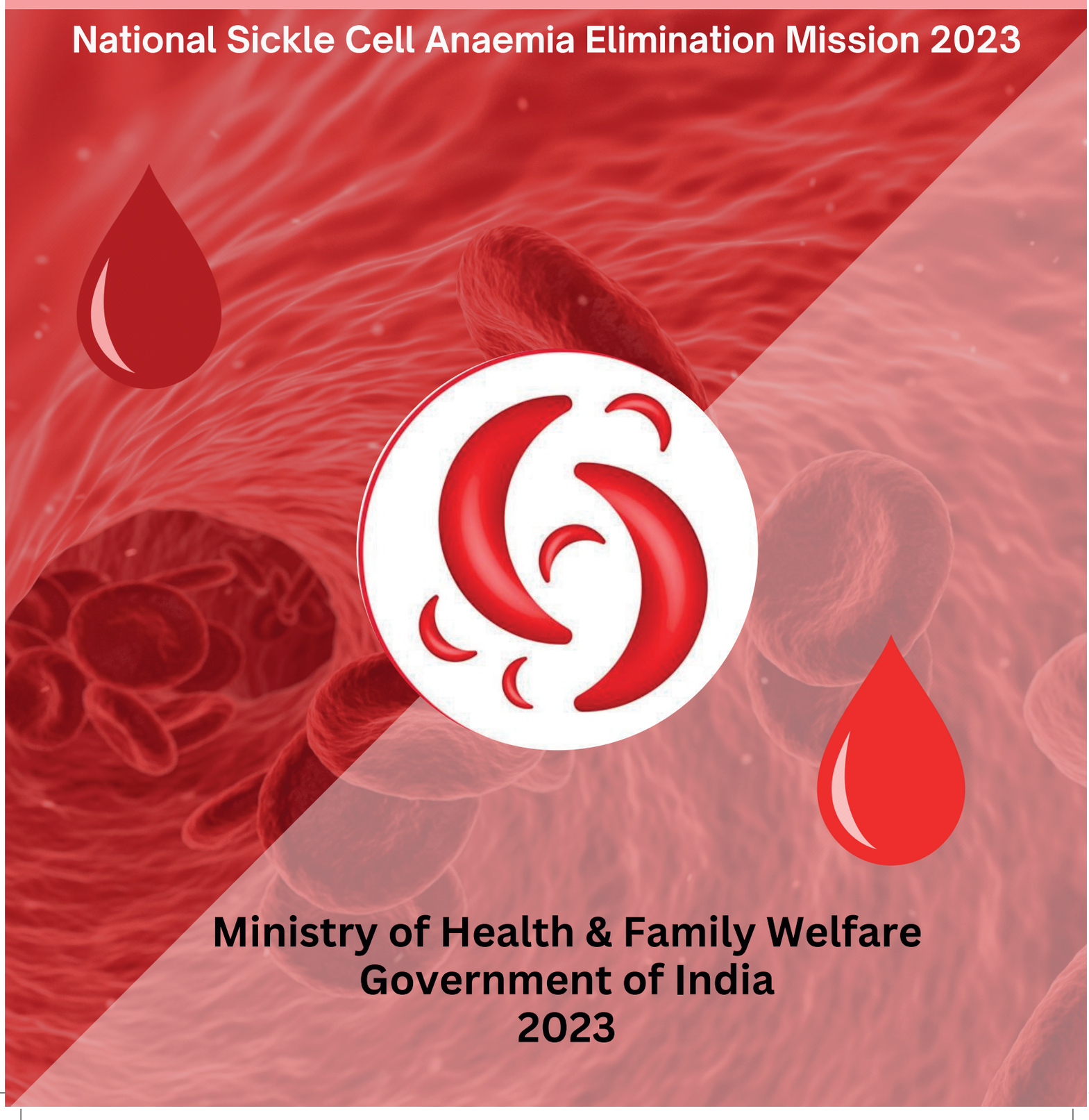
सत्यमेव जयते
Ministry of Health & Family Welfare
Government of India

NATIONAL HEALTH MISSION
राष्ट्रीय स्वास्थ्य मिशन

GUIDELINES FOR NATIONAL PROGRAMME FOR PREVENTION & MANAGEMENT OF SICKLE CELL DISEASE

National Sickle Cell Anaemia Elimination Mission 2023



Ministry of Health & Family Welfare
Government of India
2023

India's past, history, present and India's future will never be complete without the tribal community.

Tribal populations in India share a disproportionate burden of sickle cell disease. We will usher in a social revolution against this disease and bring in the most advanced science and technology to tackle it.

We are committed to improve the quality of life of people with sickle cell disease and ensure future generation is safe from it.

Hon'ble Prime Minister Shri Narendra Modi

डॉ. मनसुख मांडविया
DR. MANSUKH MANDAVIYA

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक मंत्री
भारत सरकार
Minister for Health & Family Welfare
and Chemicals & Fertilizers
Government of India

Foreword

I am glad that Ministry of Health and Family Welfare and Ministry of Tribal Affairs jointly have come forward to prepare guidelines for National programme on prevention and treatment of Sickle Cell Disease (SCD). The disease is highly prevalent among the tribal communities of India and has higher prevalence in 17 States. Ministry of Tribal Affairs conducted screening of tribal population in collaboration with ICMR and Department of Biotechnology and it is found that trait prevalence is about 10% and disease prevalence is about 1% in tribal population. However, this disease is not restricted to tribal population only and found in other communities and in other States also.

It is found that, with good management of disease, severity and complications can be curtailed to improve the quality of life and life span of the people suffering from the disease. The guidelines for National Sickle Cell Mission have been developed, to emphasize on an integrated comprehensive approach for both screening and management of SCD with a special focus on prevention and control. The program will be carried out in a mission mode, covering the entire population upto 40 years of age as a part of National Health Mission (NHM) in affected States/UTs. It is expected that once translated into practice, this will improve the quality of life, reduce complications and increase the life expectancy of patients with Sickle Cell Disease in India. It will also prevent further prevalence of the disease.

For awareness generation & pre-marital genetic counseling, it is planned to enhance the utilization of prenatal screening, premarital counseling, screening of all up to 40 years of age in phased manner and counseling services will be the focus of prevention & awareness. The Rashtriya Bal Swasthya Karyakram (RBSK) & Rashtriya Kishor Swasthya Karyakram (RKSK) programme of the Ministry of Health and Family Welfare are planned to be leveraged for awareness

Cont.../-

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generation. This would be integrated with RBSK haemoglobinopathies screening approach. Use of ICMR recommended new point of care tests for screening will significantly augment pace of screening at facility level or in outreach camps in a cost-effective manner. The scheme targets to cover a total of 7 crore population in these high prevalence states in a campaign mode, over a period of 3 years. Also, to digitalize the process, centralized data base through Sickle Cell App and Sickle Cell Portal will be maintained with ABHA ID as unique identification.

I am certain that this document will help in standardizing screening and treatment protocols across the country in helping us to achieve our desired goal of prevention and elimination of Sickle Cell Disease entirely from our country by 2047.

(Dr. Mansukh Mandaviya)

अर्जुन मुंडा
ARJUN MUNDA

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

मंत्री
जनजातीय कार्य मंत्रालय
भारत सरकार
शास्त्री भवन, नई दिल्ली-110001
MINISTER OF TRIBAL AFFAIRS
GOVERNMENT OF INDIA
SHASTRI BHAWAN, NEW DELHI-110001

Message

Hemoglobinopathies are the most common single gene disorders in population. In India, Sickling disorders make up the vast majority and impose a heavy economic burden on both the families and on the health resources. However, this can be controlled cost-effectively by programmes that integrate treatment with carrier detection and genetic counseling. Service development is challenging, because it requires inclusion of specific prevention approaches.

The diversity and heterogeneous distribution of hemoglobin disorders make it necessary to develop strategies at the country level. Carriers are easily detected by routine and new improved hematological methods and thus can be forewarned of their reproductive risk. Jan Vigyan data and recent data from health camps organized by MoTA demonstrate that screening and genetic counseling for hemoglobin disorders should be an intrinsic part of health care management of patients suffering from sickle cell.

The disease burden of such disorders is especially heavier on the Scheduled Tribe and other marginal groups. The incidence of Sickle Cell Disease and trait amongst the tribal population of India is found to be high.

The Government of India has, in its budget announcements for the year 2023-24, targeted elimination of Sickle Cell Anaemia by the year 2047. It is proposed, through the Sickle Cell Mission, to screen seven crore people towards this end, in what could be one of the largest such exercise in the world for the disease. Follow up action on management, treatment, counseling patients on management for improving the quality of life despite the disease, and genetic counseling to ensure that the transmission of the disease to the next generation is effectively prevented are some of the measures needed to ensure fulfilment of the commitment for success of the Mission.

The Ministry of Tribal Affairs (MoTA) will extend its complete support in active collaboration with Ministry of Health & Family Welfare (MoHFW) to bridge the gap between patients and health care services in tribal areas for prevention, care and management of sickle cell diseases. It strives to innovate and improve care delivery for people living with sickle cell disease through engagement of multiple stakeholders. The mission of elimination of SCD can become a reality only when there is public participation, *jan bhagidari.*

The National Sickle Cell Management Guidelines is a welcome step in ensuring awareness generation, counseling, management and treatment of the disease. I convey my best wishes for success of the Mission.

(Arjun Munda)

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प्रो. एस.पी. सिंह बघेल
PROF. S.P. SINGH BAGHEL

सत्यमेव जयते

राज्य मंत्री
स्वास्थ्य एवं परिवार कल्याण
भारत सरकार
MINISTER OF STATE FOR
HEALTH & FAMILY WELFARE
GOVERNMENT OF INDIA

FOREWORD

Unity in diversity is an incredible feature of India's demographic fabric. Tribal populations are integral to India's rich cultural heritage. India has the highest concentration of tribal populations globally. The National Health Policy 2017 too recommends specific measures in the provisioning and delivery of services for tribal populations considering their special health needs. The Government of India is committed to addressing tribal health issues as a priority, taking due cognizance of and leveraging tribal value systems, traditions and socioeconomic conditions.

Sickle cell disease, a genetic blood disorder afflicting especially the tribal populations, is a major public health problem in India. Tackling sickle cell disease calls for a multi-sectoral approach including civil society organizations and communities.

Under the guidance of our Hon'ble Prime Minister, the Hon'ble Finance Minister in her budget speech this year has announced launch of Sickle Cell Anemia Elimination Mission, entailing awareness creation, screening of 7 crore people of age group 0-40 in tribal areas and counselling, in order to eliminate the disease by the year 2047.

This roadmap for implementing the National Program for Prevention and Management of Sickle Cell Disease is coming at an opportune time to aid States in timely planning and implementation of mission interventions. I am sure we shall achieve the mission goal with the concerted and collaborative efforts of Ministry of Health & Family Welfare as well as the States.

(Prof. S.P. Singh Baghel)

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डॉ. भारती प्रविण पवार
Dr. Bharati Pravin Pawar

सत्यमेव जयते

स्वास्थ्य एवं परिवार कल्याण राज्य मंत्री
भारत सरकार

MINISTER OF STATE FOR
HEALTH & FAMILY WELFARE
GOVERNMENT OF INDIA

FOREWORD

National Sickle Cell Mission is aimed at eliminating sickle cell disease by 2047 and provide comprehensive care for people affected by sickle cell disease to improve their quality of life. The focus areas of the mission include awareness creation, universal screening of 7 crore people in the age group of zero to forty years in affected tribal areas, and counselling through collaborative efforts of central ministries and state governments, comprehensive care for people with sickle cell disease closer to their homes.

Sickle cell disease is a major public health concern in the country with disproportionate affliction among the tribal populations. The Ministries of Health and Family Welfare and Tribal Affairs have been working in coordination with states to tackle this challenge.

To augment the effectiveness of efforts, the centres of excellence are being established to leverage the use of cutting-edge technology and research. The mission also involves fostering community support by engaging individuals and institutions to support people with sickle cell disease in accessing care.

As our Prime Minister Shri Narendra Modi ji stressed the need for mapping of sickle cell anaemia among the tribal population on a scientific basis, we need to ensure that the coming generations of tribal population are free from this disease.

I am confident that these guidelines will enable states with a roadmap for timebound action to prevent and control sickle cell disease in the country.

BPP

(Dr. Bharati Pravin Pawar)

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रेणुका सिंह
RENUKA SINGH

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

राज्य मंत्री
जनजातीय कार्य मंत्रालय
भारत सरकार
MINISTER OF STATE
FOR TRIBAL AFFAIRS
GOVERNMENT OF INDIA

21st June, 2023

MESSAGE

Sickle cell disease is a genetic disorder causing a debilitating syndrome characterized by chronicanemia, acute painful episode organ infarction and chronic organ damage by a significant reduction in life expectancy amongst the tribal populations in India.

The guidelines for the National Programme on Prevention and Management of sickle cell disease collaboratively developed by the**Ministry of Health and Family Welfare and the Ministry of Tribal Affairs** focus both on prevention and care for the people with sickle cell. The guidelines adopt a holistic approach for prevention through universal screening and counselling of all individuals aged upto 40 years, early detection through point of care diagnostics and care, all closer to home.

The intersectoral approach highlighted in the guidelines emphasise the role of different ministries, state departments, non-government organizations, community-based organizations and Centres of Excellence in the affected states.

I am sure the guidelines would pave way for comprehensive planning, rapid implementation, and timely monitoring of the **National Sickle Cell Mission** in all the affected States. I urge the States for their collaborative and all out efforts in improving quality of life of all people affected by the disease.

(Renuka Singh)

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विश्वेश्वर टुडु
BISHWESWAR TUDU

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

जल शक्ति एवं
जनजातीय कार्य राज्य मंत्री
भारत सरकार
नई दिल्ली-110001
MINISTER OF STATE FOR
JAL SHAKTI & TRIBAL AFFAIRS
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NEW DELHI - 110001

Foreword

Sickle cell disease is a genetic disorder affecting the tribal populations disproportionately in our country. As per the data published by the Ministry of Tribal Affairs, one in every 86 births in Scheduled Tribes (ST) has Sickle cell disease. The report of the Expert Committee on Tribal Health highlighted sickle cell disease as one of the 10 special problems related to tribal health.

Since there is no cure for sickle cell disease, prevention and holistic care are the mainstay of sickle cell disease elimination mission. The existing tribal ministry initiatives such as Eklavya residential schools, Ashram schools and tribal residential hostels need to be leveraged to spread prevention awareness as well as ensure sickle cell disease screening adopting a saturation approach. The schools are to play a pivotal role in facilitating continuum of care of children living with sickle cell disease.

The guidelines for the Prevention and Management of Sickle Cell Disease have been developed through collaborative efforts of the Ministry of Health and Family Welfare and my Ministry. These guidelines emphasizean integrated and holistic approach to enable quality of life of people affected by the sickle cell disease.

I am confident that these comprehensive and practical guidelines would support Statesin planning and effective implementation of the National Sickle Cell Disease Elimination Mission and achieve our nationally committed goal of eliminating sickle cell disease as a public health problem by 2047.

21.6.2023

(Bishweswar Tudu)

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सचिव
RAJESH BHUSHAN, IAS
SECRETARY

भारत सरकार
स्वास्थ्य एवं परिवार कल्याण विभाग
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
Government of India
Department of Health and Family Welfare
Ministry of Health and Family Welfare

Foreword

Sickle Cell Disease is a genetic haemoglobin disorder common amongst the tribal population of India. The tribal population comprises 8% of India's population. Requiring lifelong management, sickle cell disease contributes to significant morbidity and mortality amongst the affected infants and children.

Ministry of Health and Family Welfare and Ministry of Tribal Affairs, Government of India have jointly worked to develop a comprehensive Guideline for Prevention and Management of Sickle Cell Disease in Mission mode. This mission mode action is especially relevant in 17 States of the Country, where sickle cell disease is highly prevalent.

The Guidelines enable access to screening, early identification, aid management of Sickle Cell Disease, all closer to home. The unique ABHA identification of relevant persons and exclusive Sickle Cell Disease portal which has been created, will go a long way in assuring consistent follow up of the affected patients apart while supporting documentation of the achievements.

I am certain that this document will help in not only standardizing the screening and treatment protocols across the Country, but also help us achieve our desired goal of prevention and elimination of Sickle Cell Disease from our Country by 2047.

Date : 17 June, 2023
Place : New Delhi

(Rajesh Bhushan)

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TABLE OF CONTENTS

BACKGROUND

Hemoglobinopathies are the commonest genetic disorders worldwide. They include thalassemia and abnormal variant hemoglobin such as Hemoglobin S, D, E, etc. They constitute a major burden of disease, mainly in malaria-endemic countries but have now become global due to population migration. World Health Assembly in 2006 passed a resolution urging member states "*to develop, implement and reinforce comprehensive national, integrated programmes for the prevention and management of hemoglobinopathies*[1]." The member states were also urged to develop and strengthen medical genetics services and community education and training.

An estimated 7% of the world's population carries an abnormal hemoglobin gene, while about 300,000-500,000 are born annually with significant hemoglobin disorders. They consist of two major groups – Thalassemia and Sickle cell syndromes. Sickle cell syndromes are more frequent and constitute 70% of affected births worldwide.

Sickle Cell Disease (SCD) is a hemoglobin disorder that requires lifelong management and contributes to infant, childhood as well as adult morbidity and mortality.

SCD, as a genetic condition, is widespread among the tribal population in India where about 1 in 86 births among STs have SCD[2]. Hemoglobinopathies are more widely prevalent among the tribal population than the non-tribal communities in India. The disease has a higher prevalence in States like Madhya Pradesh, Gujarat, Maharashtra, Rajasthan, Chhattisgarh, Bihar, Jharkhand, West Bengal, Odisha, Tamil Nadu, Telangana, Karnataka, Assam, Andhra Pradesh, Uttarakhand, Uttar Pradesh, and Kerala. Due to population migration, the disease is also seen in non-tribal population subgroups.

MoHFW report of the expert committee on tribal health (2018)[3], highlights the fact that tribal communities in India have poorer health indicators, greater burden of morbidity and mortality, and also limited access to healthcare services in comparison to the rest of the population. The report has listed **SCD** as one of the 10 priority problems in tribal health that affect the tribal people disproportionately. Addressing the health concerns in tribal population groups, the Ministry of Tribal Affairs has also set up a "Tribal Health Cell" as a collaborative effort, to work in close partnership with MoHFW to facilitate the strengthening of primary health care systems and health research in tribal areas.

For the reduction in the prevalence of sickle cell anaemia, several national and state-specific initiatives have been planned and undertaken. Identifying SCD as a genetic blood disorder affecting tribal populations in Central, Western, and Southern India, NHM prepared and disseminated comprehensive guidelines to control and prevent Hemoglobinopathies, including SCD. This includes prenatal diagnosis, counselling, and setting up of early intervention centers to prevent and treat the complications arising from the disease. Through the guidelines, the detection and genetic counselling of parents with Sickle Cell trait can help in guiding parents to understand the risk of sickle cell disease in the offspring.

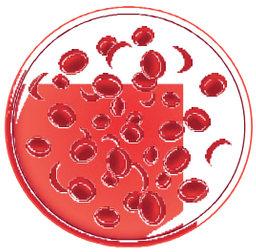
1 WHO resolution on Sickle Cell Disease (WHA59.20) and Thalassemia (EB118.R1), 29 May 2006. (http://www.who. int/genomics/WHO-TIF_genetics_final.pdf)
2 https://tribal.nic.in/
3 https://nhsrcindia.org/sites/default/files/2021-07/Tribal%20Health%20in%20India-Detailed%20Report.pdf

At present there is no permanent cure for the disease. However, with good management of the disease, severity, and complications can be curtailed to improve the quality of life and life span of the people suffering from the disease. With this focus, the guidelines for **National Sickle Cell Anaemia Elimination Mission** have been developed, to emphasize an integrated comprehensive approach for both screening and management of SCD with a special focus on prevention and control. These guidelines entail a strategic roadmap for the prevention and management of sickle cell disease amongst tribal populations as well as non-tribal people in selected geographies of certain states where the disease prevalence is high. While in its initial stage, the mission would prioritize its intervention in the high prevalence and tribal states, the plan would subsequently expand to include all states/UTs in a phase-wise manner with an incremental approach.

The roadmap has set a target of screening all population up to 18 years of age in the first year and the remaining age group (up to 40 years) in the following years in the said populations and geographies. This would be integrated with Rashtriya Bal Swasthya Programme (RBSK) hemoglobinopathies screening approach, and existing strategies would be leveraged to ensure the screening and early diagnosis of SCD in all individuals across levels of care with a focus on preventive and promotive care at the primary level health care facilities.

The roadmap also includes actions for advancing effective care and management of the disease. It also strives to innovate and improve care delivery for people living with sickle cell disease through the engagement of multiple stakeholders.

OVERVIEW OF SICKLE CELL DISEASE



Blood is a specialized body fluid and has four main components: plasma, red blood cells, white blood cells, and platelets. **Hemoglobin (Hb) is a protein-based molecule found in the red blood cells** (RBC) that carries oxygen in our body and gives blood its red color. Normal red blood cells are biconcave, have no nucleus, and being flexible can easily change shape, which helps them to fit and move easily through the smallest blood vessels called capillaries. Sickle Cell Disease is an inherited **red blood cell disorder**, wherein the mutation in the gene causes the formation of atypical hemoglobin. This causes RBCs to lose their normal shape and become C-shaped, like sickles or crescent moons and lose flexibility. These rigid, sticky cells can get stuck in small blood vessels and cause clogging of blood vessels causing slowing or blocking blood flow and oxygen to parts of the body. It is one of the most common monogenic disorders globally with an autosomal recessive inheritance. James Herrick first described the characteristic sickle-shaped red cells and Linus Pauling and his colleagues showed that sickle hemoglobin (HbS) had an altered electrophoretic mobility and defined the molecular disease in 1949. Normal red blood cells can live up to 120 days but sickle cells only live for about 10 to 20 days. The primary pathophysiology is based on the polymerization of deoxy HbS with the formation of long fibers within the RBCs causing a distorted sickle shape and leading to increased hemolysis and vaso-occlusion by sickle red cells. Also, sickle cells get destroyed by the spleen because of their shape and stiffness. Sickled cells get stuck in this filter and die. With fewer healthy red blood cells circulating in the body, a person becomes chronically anaemic and sickled cells also damage the spleen. It results in various complications like anaemia (Sickle Cell Anaemia), frequent infections, pain, and swelling as well as chronic damage to various organs in the body including the brain, liver, lungs, etc.

TYPES OF SICKLE CELL DISEASE:

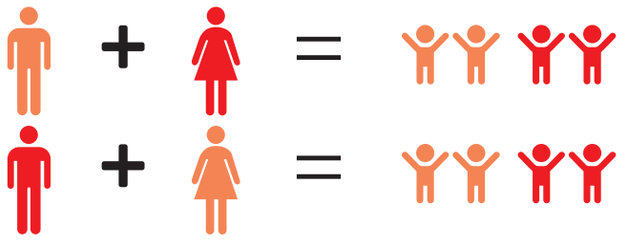
Normal Human Hemoglobin A (HbA), also known as adult hemoglobin, (Hemoglobin A1 or $\alpha\mathbf{2}\beta\mathbf{2}$) consists of two subunits of beta-globin and two subunits of alpha-globin. These two genes have to function normally and in tandem to produce normal hemoglobin in human children and adults. When faulty hemoglobin replaces normal hemoglobin (HbA), the person can be a sickle cell carrier or have sickle cell disease. A person can be a sickle cell carrier or have sickle cell disease if normal hemoglobin (HbA) is replaced by faulty sickle hemoglobin. Sickle hemoglobin (HbS) is a result of a point mutation in the beta-globin chain. If only one subunit of beta globin is affected, the person has a trait, and if both are affected, the person has sickle cell disease. Patients with sickle cell trait inherit HbS from one parent and HbA from the other, making them heterozygous and carriers of disease. Patients with sickle cell disease inherit two genes that code for HbS from both parents, making them homozygous. At times a patient may inherit the beta thalassemia gene from one parent and the sickle cell gene from another parent

The most common types of Sickle cell hemoglobinopathies are – HbSS, HbS Beta Thalassemia, and sickle cell trait.

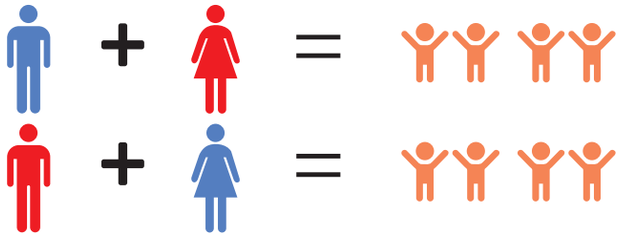
HbSS: People who have the HbSS form of SCD, inherit sickle cell genes (“S”), from both parents. This is commonly called sickle cell anaemia / disease and is usually the most severe form of the disease.

HbS beta thalassemia: People who have this form of SCD, inherit one sickle cell gene (“S”) from one parent and one gene for beta thalassemia, another type of hemoglobinopathy, from the other parent. Those with HbS beta thalassemia usually have a severe form of SCD.

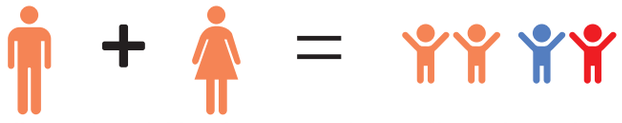
If both parents have sickle cell disease, there is a 100% chance that their children will be born with the disease



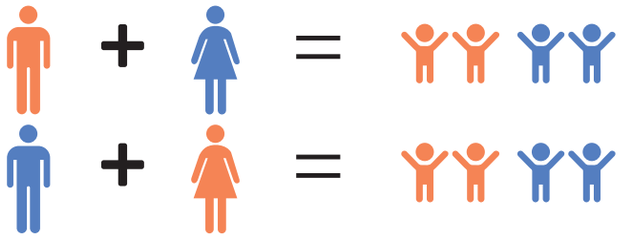
If one parent has sickle cell trait and the other has sickle cell disease, then children have a 50% chance of being diseased and 50% of being carriers



If one parent is normal and the other has sickle cell disease, then children have a 100% chance of being carriers



If both parents have sickle cell trait, their children have a 25% chance of being diseased, a 25% chance of being normal, and a 50% chance of being carriers



If one parent has sickle cell trait and the other is normal, then children have a 50% chance of being normal and 50% chance of being carriers

COMPLICATIONS

Individuals with SCD suffer from both acute and chronic complications, which include recurring episodes of pain commonly called vaso-occlusive crisis (VOC) - acute chest syndrome (ACS), aseptic necrosis of bone, micro infarction of spleen, brain and kidney, infections, stroke, and organ damage affecting every organ in the body. Recent studies reiterated that the individual with SCD may incur red cell dehydration, abnormal adhesion of RBCs to the vascular endothelium, inflammatory events and activation of all cells in the vessels, and abnormalities of nitric oxide metabolism leading to increased thrombotic complications and multi-organ disease as well as other complications like hand

and foot syndrome (dactylitis) presenting as swelling of hands and feet. Given the effects of Sickle cell disease on the spleen, the immune system also gets affected in individuals with this disease. Thus, individuals with SCD have weakened immune systems and are more likely to get repeated infections.

These chronic complications require care coordination from a multidisciplinary team which includes primary care teams, primary care physicians (PCPs) and hematologists among other specialists. Among SCD-related complications, VOC events have long been identified as a higher risk factor for death and the most common cause of hospital admission among SCD patients. There is a need for trained medical staff and the availability of the required infrastructure to deal with these complications.

Details of complication and management at each level are given in **Annexure 6**

PREVALENCE OF SICKLE GENE IN TRIBAL COMMUNITIES OF INDIA

India has the largest density of tribal population globally. As per Census 2011, India has an 8.6% tribal population which is 67.8 million across the Indian states. The MoHFW tribal health expert committee report has listed sickle cell disease as one of the 10 special problems in tribal health that affect the tribal people disproportionately, thus making this an important intervention.

The first description of sickle hemoglobin in India was by Lehman and Cutbush in 1952 among the tribal populations in the Nilgiri hills of south India. In the same year, Dunlop and Mazumder also reported the presence of sickle hemoglobin in the tea garden workers of upper Assam who were migrant labourers from tribal groups in Bihar and Odisha. In another large multi-centric study, 15200 tribes belonging to 14 primitive tribes from Maharashtra, Gujarat, Tamil Nadu, and Odisha were screened for SCD. The HbS allele frequency varied from 0.011 to 0.120 and beta-thalassemia allele frequency varied from 0.005 to 0.024 and around 26.2% were associated with iron deficiency anemia also.

Since then, many population groups have been screened, and based on various studies, it is found that States with prevalence of SCD includes- Gujarat, Rajasthan, Uttarakhand, Maharashtra, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, West Bengal, Tamil Nadu, Telangana, Andhra Pradesh, Karnataka, Kerala, Uttar Pradesh & Assam. Ministry of Tribal Affairs conducted a screening of the tribal population in collaboration with ICMR and the Department of Biotechnology. Out of the 1,13,83,664 persons screened in different States, about 8.75% (9,96,368) tested positive **(Trait – 9,49,057, Disease – 47,311).**

Data from published sources has been collated with reference to the project being conducted by ICMR using variable screening methodology in various States and Districts (**Figure 1**)

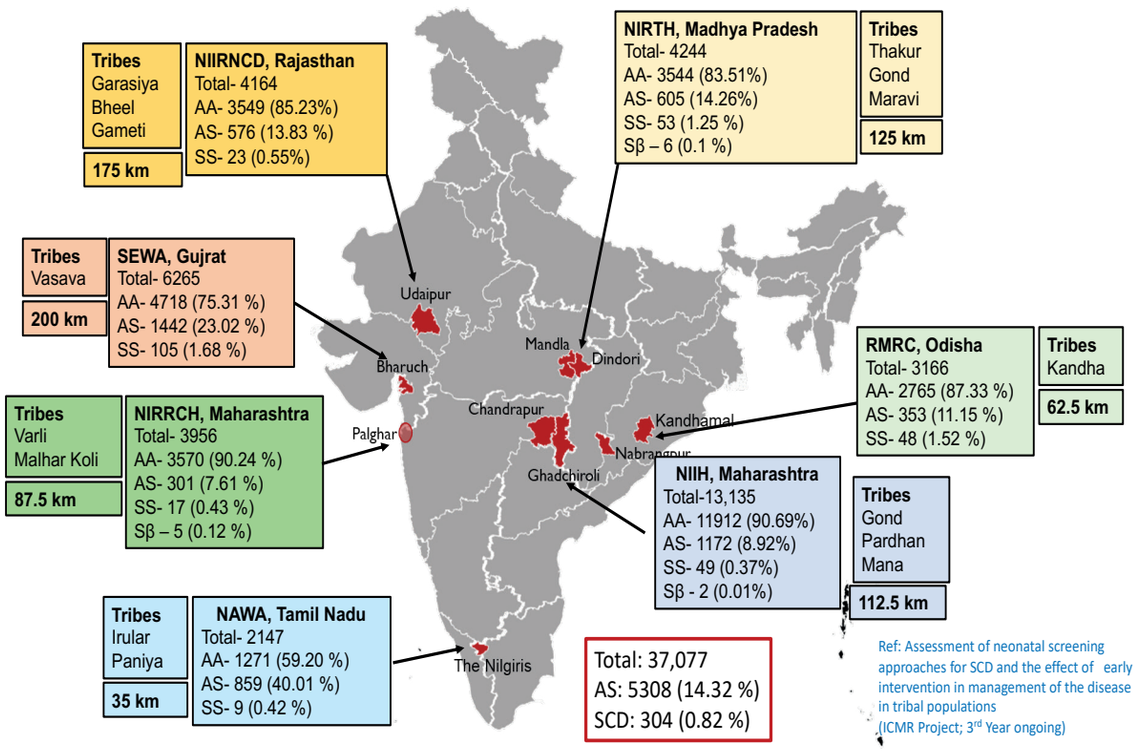


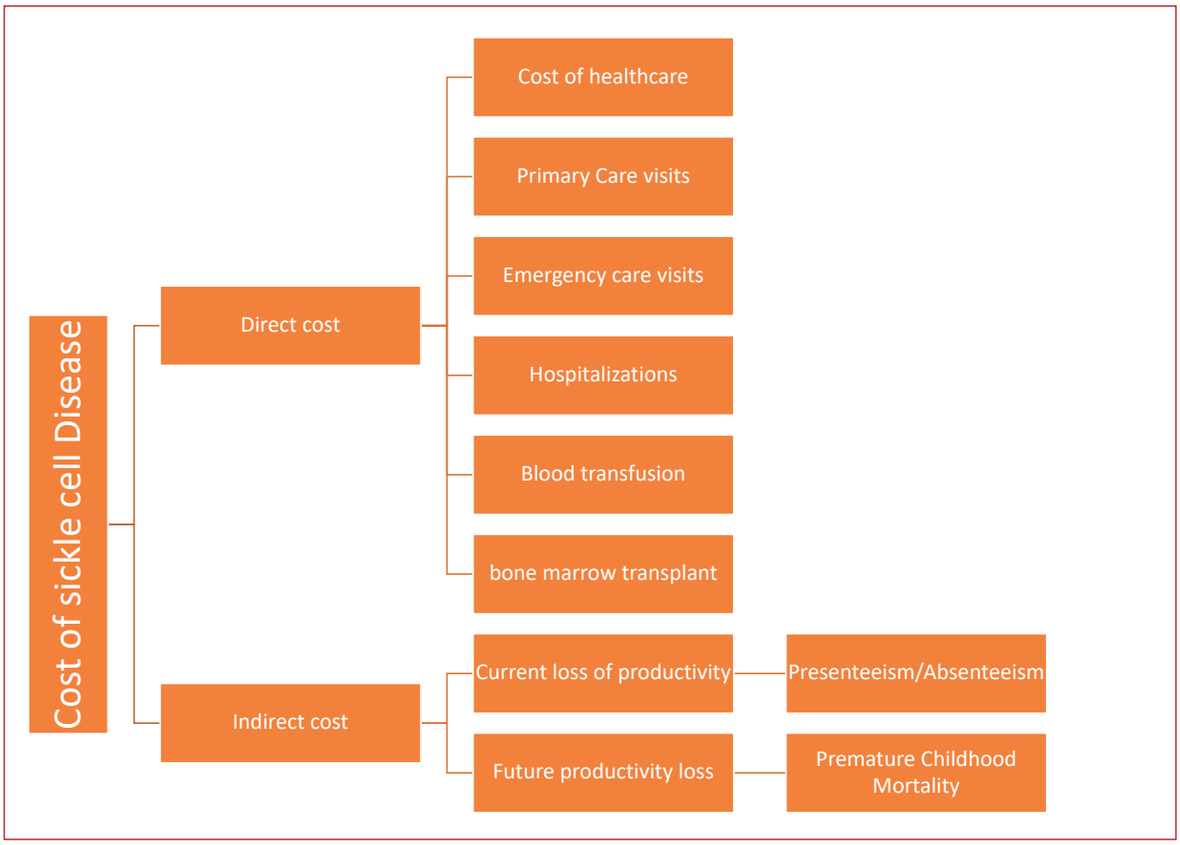
Fig 1 The individual states and district screening were done at different time points and using different technology. The screening methodology was also variable- from targeted screening of symptomatic individuals to population screening etc.

SOCIAL AND ECONOMIC IMPLICATIONS OF SICKLE CELL DISEASE (SCD)

SCD has a significant macroeconomic effect on the Indian economy, given the severe complications of the disease, and the need for routine and lifelong care. These are add-ons when linked to already existing social and psychological problems attributed to clinical symptoms, depressive symptoms, absenteeism and deterioration in productivity. The financial implications include both the direct and indirect costs of the disease. Direct costs are those that are met by the healthcare system; for sickle cell disease, these include the cost of screening, primary and emergency care visits, cost of drugs, hospitalizations, blood transfusions, bone marrow transplants, and other out-of-pocket expenditures borne by the patient. Indirect costs are those met by families and wider society. The first is due to lost productivity because of parents' missing days of work to look after their children. The second is the future loss to the economy as sickle cell disease deaths mainly occur in children and young adults causing early deaths that erode the future workforce.

Given the association with health care costs due to long-term management, and aforementioned associated factors, this may also lead to financial hardship for population subgroups of middle and lower economic status.

Figure 2: Major contributing factors to direct and indirect costs of sickle cell disease



NATIONAL SICKLE CELL ANAEMIA ELIMINATION MISSION

GOAL

Eliminate sickle cell disease as a public health problem in India before 2047

PRIORITY AREAS FOR MANAGEMENT OF SICKLE CELL DISEASE

To achieve the aforementioned time-bound goal of eliminating sickle cell disease as a public health problem in India, there is a need for increasing awareness about the disease in the community, implementing mass screening activities for early identification, providing diagnostic and therapeutic care at primary level with linkages, building a strong network of diagnosis and linkages, implementing robust monitoring system, strengthening the existing primary health care mechanism to incorporate SCD related strategies, capacity building of primary, secondary and tertiary health care teams and building cost-effective intensive interventions at higher care facilities.

The overall aim is to enable access to affordable and quality health care for all SCD patients, and to lower the prevalence through awareness, change of practices, and screening interventions.

OBJECTIVES

1. Provision of affordable, accessible, and quality care to all SCD patients
2. To reduce the prevalence of SCD and sickle cell trait

These objectives would be attained through strategies spanning awareness generation, strengthening of screening and testing facilities, strengthening primary care services, strengthening of laboratory services for screening and early diagnosis, facilitation of management & treatment, establishing linkages across levels of care, inter-sectoral convergence towards holistic approach and linkages with social security schemes/packages.

Strategic Pillars

I. Primary prevention strategies:

- Primary prevention strategies focus on awareness generation and pre-marital and pre-conceptional counselling to prevent the conception of a child with homozygous genotype.
- Prevention requires setting up genetic counselling and testing interventions in high prevalence districts to prevent sickle cell disease in the offspring. Genetic counselling and health promotion activities can lead to substantial reduction in the number of children born with the disease.
- Widespread community involvement and support are essential as there are existing diversity of cultures and opinions about a number of issues relevant to genetics, such as human reproduction issues.

II. Secondary Prevention and Screening:

Secondary prevention focuses on the following components related to early diagnosis and care of sickle cell disease.

- Screening for detection of Sickle Cell Trait to reduce the birth of children affected with Sickle Cell Disease and screening for early detection of sickle cell disease to achieve a reduction in mortality and morbidity with improvement in quality of life of the affected.

III. Holistic management and continuum of care

- Management of persons with sickle cell disease at primary, secondary, and tertiary health care levels
- Advanced diagnostic and treatment modalities at tertiary health care facilities
- Integration with AYUSH
- Patient support system
- Community Adoption
- Rehabilitation

SCOPE OF SICKLE CELL PROGRAMME

The program shall be carried out in a mission mode covering the entire population from zero to 40 years of age. In the first year the priority will be given to population between zero to eighteen years of age which will be followed by screening of the entire population up to 40 years of age in the second and third year. The program shall be a part of the National Health Mission and shall focus on universal population-based screening, prevention, and management of sickle cell disease in all tribal and other highly prevalent areas of India. While in its initial stage, the mission would prioritize its intervention in the high prevalence states, the plan would subsequently expand to include all states/ UTs in a phase-wise manner with an incremental approach. The mission aims to cover 7 crore people with screening, counseling for prevention, and care for people with SCD in three years.

Initially, the focus shall be on 17 states with higher prevalence of SCD viz., Madhya Pradesh, Gujarat, Maharashtra, Rajasthan, Chhattisgarh, Bihar, Jharkhand, West Bengal, Odisha, Tamil Nadu, Telangana, Karnataka, Assam, Andhra Pradesh, Uttarakhand, Uttar Pradesh and Kerala.

A targeted approach for screening may be adopted in non-tribal districts based on prevalence of the Sickle Cell Disease as assessed during routine facility-based testing of antenatal mothers in the 1st trimester, at the primary health care facilities in the State.

The programme would be integrated with existing mechanisms and strategies under NHM to ensure the utilization of existing resources and also minimize the duplication of efforts. For example, the established platform of Rashtriya Bal Swathya Karyakram (RBSK), Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), and Anaemia Mukt Bharat would be leveraged to achieve the targets for the Sickle Cell mission

PRIMARY PREVENTION - AWARENESS GENERATION & PREMARITAL COUNSELLING

Multiple platforms shall be utilized for awareness generation for the prevention and control of SCDs. Enhancing the utilization of prenatal screening, premarital genetic counselling, screening of all up to 40 years of age, and counselling services shall be the focus of prevention awareness. The Rashtriya Bal Swasthya Karyakram (RBSK) & Rashtriya Kishor Swasthya Karyakram (RKSK) of the Ministry of Health and Family Welfare would be leveraged for awareness generation. This would be integrated with the RBSK hemoglobinopathies screening approach, and existing strategies would be leveraged to ensure the screening and early diagnosis of SCD in all individuals across levels of care.

AT INDIVIDUAL /HOUSEHOLD LEVEL

ASHAs, community health volunteers, local NGOs, etc., shall be engaged in raising awareness towards SCDs through home visits. ASHA, as part of her routine population enumeration and empanelment process, would undertake a line listing of identified SCD patients within her catchment area. As a routine set of activities, ASHAs are already preparing a list of eligible couples, which may be linked with the programme to identify and provide genetic counselling and mobilizing the couples to the nearest Ayushman Bharat Health and Wellness Centre (AB-HWC) for SCD screening, prevention, and clinical management.

Individuals with known or detected SCDs would also be encouraged to register on Sickle Cell Disease Support Corner, which is MoTA's initiative to bridge the gap between patients and health care services in tribal areas.

AT COMMUNITY LEVEL:

Platforms such as monthly Village Health Sanitation and Nutrition Committee (VHSNC)/ Mahila Arogya Samiti (MAS) meetings, Village/Urban Health Sanitation and Nutrition Days (VHSND/ UHND) meetings at Anganwadi, Jan Arogya Samitis in AB-HWC, Arogya Sabha, Self-Help Groups (SHG), youth clubs, parent-teachers meetings in schools, etc., shall be leveraged to sensitize people on the importance of sickle cell disease and screening service available at AB-HWCs. To complement these efforts, the tribal head, key influential individuals among the local tribal and other communities shall be engaged. For rural areas or urban slums, places with community gathering such as haat bazaar, or fixed-day markets may also be included for generating awareness amongst community members on SCD. Locally relevant awareness modalities such as street plays, miking, wall writings and paintings, quizzes, etc., shall be undertaken to raise community awareness of sickle cell disease and the national mission.

Patients Support Groups (PSG) would be formed, facilitated by the MPWs/ASHA or other frontline workers to improve treatment compliance and engaging not only those with the disease condition but also family members or caregivers.

Community platforms should develop mechanisms for community level referrals for per-marital and per-conceptional screening backed by genetic counselling services. Also, at the level of community, for all individuals detected or known as carriers or patients, extended family screening is to be ensured.

AT SCHOOLS:

In all blocks with sickle cell disease, Community Health Officers (CHO) at Sub Health Centre – Health and Wellness Centre (SHC-HWC) and Medical Officers at Primary Health Centre – Health and Wellness Centre (PHC-HWC), Urban Health and Wellness Center (UHWC) Urban Primary Health Centre – Health and Wellness Centre (UPHC-HWC) shall conduct talk sessions and counselling at all schools & colleges including 'tribal residential schools, tribal hostels, and Ekalvya Model Residential Schools, for early detection of SCD among school going children.

AB-Health and Wellness ambassadors would also be trained to enable them to transact health promotion and disease prevention information in the form of interesting activities which would be either classroom-based or as an outreach. Teachers shall be educated to identify early symptoms of crisis in SCD children so that they can provide paracetamol and hydration in emergency cases. Regular reinforcement of messages/ themes through IEC/BCC activities such as interactive activities/ posters/classroom and assembly discussion and field level will need to be undertaken.

Existing mechanisms under School Health Programme would be leveraged to ensure SCD-related activities across schools. Parents-teacher meetings would also be utilized as a platform to spread awareness in high-prevalence areas.

Those children found to have sickle cell trait will be given plain folic acid through schools and HWC. Also, proper counselling and awareness shall be provided to the families. However, proper treatment guidelines (eg. hydroxyurea, prophylactic antibiotics,etc.) should be followed up at every stage of the disease.

Eklavya Model Residential School (EMRS), one of the flagship initiatives of GoI, would be utilized as a platform to undertake and ensure all SCD-related interventions at this level.

AT HEALTH CARE FACILITY LEVEL:

Counsellors at the primary health care centers will be primarily responsible for providing counselling services to all individuals diagnosed positive with Sickle cell disease. The existing counsellors shall be leveraged at all the PHC-HWC/UPHC-HWC and shall be trained on sickle cell disease genetic counselling.Primary health care teams including CHOs, ANMs, ASHAs, Medical Officers, and Staff Nurses in AB-HWC will be trained on all aspects of SCD prevention, control, counselling and management. They will organize community awareness events on SCD regularly. The platform of Rashtriya Kishor Swasthya Karyakram (RKSK) and its Adolescent Friendly Health clinics (AHFC) shall be used for reaching out to adolescents for awareness generation, screening, and genetic counselling.

All the eligible individuals and couples identified as positive or at risk either at the community level or at SHC-HWC/UHWC will be referred to the counsellor at PHC-HWC/UPHC-HWC for further advice. Advise on pregnancy continuation shall be provided in case both parents are identified as carriers. Higher centers will also be engaged in providing counselling services to walk-in patients or patients referred from lower-level facilities

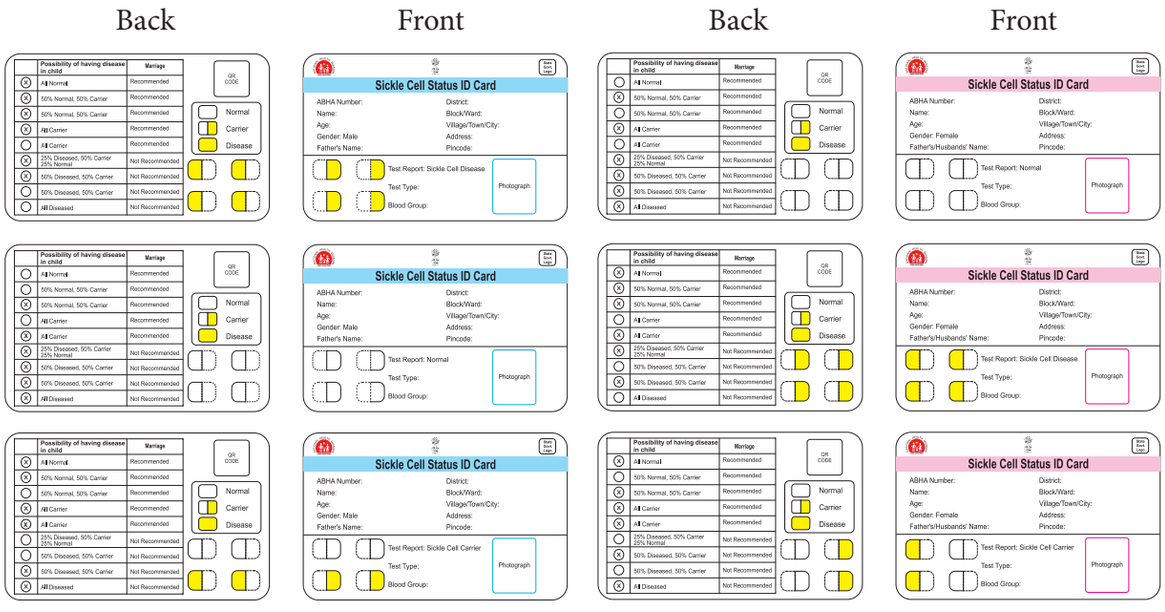
SICKLE CELL CARDS:

Counsellors at the primary health care centers shall be using sickle cell cards for the purpose of pre-marital and pre-conceptional counselling by matching the cards of prospective matches. Matching of the cards will show the chances of their children being born with SCD or SCT. Every individual who is screened for SCD will be provided a Sickle cell card. The card will show the status of the individual viz, Normal, Carrier or Diseased. The cards are color coded separately for male (blue) and female (pink). Based on the card's status, the individual will receive treatment and counselling services.

The card has details such as gender, test report (Sickle cell disease/ Sickle cell carrier/ Normal) on the front side of the card. The rear side of the card has details on possible outcomes of conception if any person with either sickle cell disease or carrier marries.

While matching the cards they should be placed together and held against the light, the holes coinciding will give the possibility of having disease or trait in the child. The following are the matching possibilities:

- If two individuals having sickle cell disease marry, there is a 100% chance that their children will be born with SCD
- If a sickle cell disease individual and a sickle cell trait individual marry, there is a 50% chance that their children will be born with the disease and 50% chance that their children will be carriers
- If a sickle cell disease individual and a normal individual marry, there is a 100% chance that their children will be born with sickle cell trait
- If two individuals having sickle cell trait marry, their children have 25% chance of being diseased, 25% of being normal and 50% chance of being carriers
- If a sickle cell disease trait and a normal individual marry, their children have 50% chance of being normal and 50% chance of being carriers



IEC AND MASS MEDIA:

The Health Promotion strategy recommended by the National Health Policy 2017 emphasizes institutionalizing intersectoral coordination at national and sub-national levels to optimize health outcomes, through the constitution of bodies that have representation from relevant non-health ministries. This should be in line with the emergent "Health in All" approach as a complement to Health for All, thus making the base for all planned IEC/BCC activities. Under this program, Ministry of Tribal Affairs will play a pivotal role in awareness generation. The mentees and mentors of the GOAL (Going Online as Leaders) program run by the MOTA with Facebook will be used as ambassadors for generating awareness on health issues including Sickle cell disease. TV/radio jingles would be used to create awareness about the facilities provided by the Government for Sickle Cell patients and to disseminate the success stories of sickle cell patients. **World Sickle Cell Day** is marked every year on **19 June** to raise awareness about sickle cell disease, and this can be included in the Annual Health Calendar across AB-HWCs.

Existing platforms for IEC within NHM and MoTA would be utilized for spreading awareness and information on SCD. (Details of different IEC strategies are given in **Annexure 3)**

ENGAGEMENT OF CBOS/NGOS:

NGOs working in the area in the sector of health, especially tribal health shall also be utilized for mobilization, awareness, and providing pre-marital counselling and prenatal screening services. The NGO involvement framework under NHM may also be referred to while engaging with an NGO in these areas.

SECONDARY PREVENTION: UNIVERSAL SCREENING AND EARLY DIAGNOSIS

Universal screening of all populations up to the age of 40 years will be done using a mass screening approach. In the first year priority will be given to population upto eighteen years and then the entire population up to 40 years will be screened subsequently and incrementally. In each district, blocks with a high prevalence of population with sickle cell disease would be identified for saturation of screening. However, target groups will be defined to utilize the support of various other programmes like Rashtriya Bal Swastya Karyakram (RBSK), and Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) to cover the population under these schemes.

	Target group	Purpose	Approach
1.	New-born/Infant	New-born screening is a suitable strategy to initiate prophylactic treatment of diagnosed cases to reduce under-5 mortality	Facility-based screening at the secondary or tertiary care facilities, by the trained health worker The commonly used technologies for Newborn Screening for SCD include high performance liquid chromatography (HPLC), Isoelectric focusing (IEF) and capillary electrophoresis (CZE) .Citrate agar electrophoresis is not affected by the high amount of Hb F and can be used for new-born testing for sickle cell.
2.	Children from 6 months to 10 years of age	Screening of children for prophylactic treatment and early management	Screening of children by RBSK teams either camp based or in Anganwadis / Schools / Ashramshalas / EMRS
3.	Adolescent	Screening of adolescents can be a sustainable and cost-effective strategy	At primary care facilities or outreach camps, Rashtriya Kishore Swastya Karyakram shall be leveraged for the awareness and screening of adolescents
4.	Premarital	Preventing higher risk couple from getting married	At primary care facilities or outreach camps
5.	Antenatal screening	Two provide a couple information and option for reproductive decision making including prenatal testing	Antenatal screening of all pregnant mothers in sickle anemia-affected geographies shall include compulsory screening for SCD along with other tests to high-risk risk pregnancies. The Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) program,Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakaram (JSSK)would be leveraged for this.
6.	Prenatal diagnosis (If required)	To reduce the birth of child with sickle cell disease	At the tertiary care facilities
7.	Cascade screening	Screening of extended family members of carriers and sickle cell positive people.	Outreach screening and facility-based camps may be adopted

FACILITY-BASED SCREENING AT SHC-HWC AND PHC-HWC

On a daily basis, opportunistic screening shall be conducted for people attending the outpatient services at the SHC-HWC/UHWC & PHC/UPHC-HWC. At SHC-HWC for screening and confirmation GoI-approved paper-based Point of care test shall be used as one step confirmatory test.

The GoI -approved electrophoresis-based Point of care test shall be used at the PHC-HWCs and UPHC-HWCs for screening and confirmation of diagnosis .If the POC is not available at the facility then solubility test can be used for screening purpose. If screening by solubility test or doubt for other haemoglobinopathy refer patients to District hospital for confirmation through electrophoresis/ HPLC.

The individuals belonging to the following categories shall be prioritized for screening for sickle cell diseases and sickle cell trait.

- Antenatal screening (early 1st trimester) of all pregnant women for sickle cell carrier status. If any pregnant woman is found to be a sickle cell carrier, then her husband too would be tested for carrier status
- Prenatal screening including partner screening of the antenatal woman who is positive for sickle cell trait or disease.
- Universal screening of all new-born and people upto 40 years of age
- Cascade screening of extended family members of carriers and sickle cell positive people.
- Additionally, dedicated mass screening days will be organized at AB-HWCs by gathering a larger number of community members. All the eligible individuals will be mobilized for screening at the AB-HWCs by the ASHA and ANM/MPW in collaboration with Jan Arogya Samitis (JAS) and Village Health Sanitation and Nutrition Committees (VHSNC)/Mahila Arogya Samiti (MAS)

OUTREACH SCREENING CAMPS

Sickle cell screening of people in remote tribal hamlets and other pockets shall be carried out through Mobile Medical Units or through dedicated teams. The states may choose other appropriate approaches for mass screening camp methods including outsourcing to appropriate agencies.

- All people under 40 years of age would be screened. Initially upto 18 years of age will be prioritized for screening, followed by expanded coverage to include pregnant mothers, newborns, extended family members of carriers, and disease
- Solubility test shall be used for the community based screening
- Pre and post-test counselling, pre-marital, and preconception counselling services shall be provided for sickle cell disease prevention by a trained nurse/ counsellor of PHC-HWC/UPHC-HWC
- IEC and BCC activities for sickle cell disease prevention shall be undertaken using audio-visual media and other engaging modalities
- Individuals identified positive will be referred to the nearest primary care facility (SHC-HWC/ UHWC/PHC-HWC/UPHC-HWC) for confirmation of diagnosis and treatment initiation

Also, outreach screening camps on a monthly basis shall be undertaken by SHC-HWC/UHWC and PHC-HWC/UPHC-HWC at schools, ashram schools, tribal hostels, and anganwadi. The school screening event may be undertaken on the weekly Health and Wellness Day. The Village/ Urban Health Sanitation and Nutrition Days (VHSND/UHND) shall also be leveraged for outreach screening camps for screening of children and pregnant mothers. Outreach screening camps at the hostel shall be planned quarterly in coordination with the hostel warden and functionaries of the tribal department. Deploying suitable teams after the micro-plan, the target population based on age and occupational status may be screened.

INTENSIVE SCREENING IN HIGH-PRIORITY AREAS

Mapping exercises shall be conducted throughout the endemic states to identify and grade blocks as per the prevalence. Grading of blocks may be done as below:

Grade A: Blocks with prevalence >= 30%

Grade B: Blocks with a prevalence of 15-29%

Grade C: Blocks with a prevalence 3-14%

Grade D: Blocks with a prevalence < 3%

Universal screening is to be initially focused on Grade A and B blocks. This may be followed by Grade C blocks. Blocks in Grade D shall require a targeted screening approach.

States may form dedicated teams for universal screening

TOOLS FOR SCREENING AND DIAGNOSIS

Option 1: One step approach

GoI-approved Point of Care test * (Confirmatory test)

Option 2: Two-step approach
Mass screening / Initial screening - using Solubility test (Tube based) If found positive for Solubility test in field setting

↓

Confirmation - using GoI-approved Point of Care confirmatory test at SHC-HWC/UHWC/PHC-HWC/UPHC-HWC or Hb- HPLC/Capillary zone electrophoresis/Agarose gel/Cellulose Acetate Hb Electrophoresis testing at District Hospital

SCREENING TEST:

Solubility Test:

Test tube-based turbidity tests i.e. SOLUBILITY TEST (For HbS) can be used for mass screening of populations. The solubility test is rapid (takes just about 5 min), reliable with minimal observer variation, does not need any microscope, and requires a very small blood sample. It is also a cost-effective test. The sensitivity is 100% while specificity is on an average 91.66%. Positive Predictive value of 80% & Negative Predictive value of 100%.

(Ref: Journal of Research in Medical Education & Ethics 11/2012; 2(3):214- 216)

CONFIRMATORY TESTS

- Point of Care (POC)-States may also opt for the Point of Care (POC) test which is a one-step confirmatory sickle cell test validated by GoI for mass screening. The average cost of these tests should be up to Rs. 100 depending upon the quantity of tests used and should be sourced from the GeM portal. This tests can be performed by staff with minimal training. Rapidly distinguish normal, carrier and sickle cell disease. Single test with high sensitivity and specificity As these POC tests are confirmatory tests they do not require referral to the district hospital.
- High-performance liquid chromatography (HPLC) is a confirmatory test with high sensitivity and specificity. It detects most of the Hb Variants.
- The other confirmatory tests are capillary zone electrophoresis or gel electrophoresis.

PRENATAL SCREENING:

Prenatal diagnosis is indicated only in two circumstances as explained below:

Prenatal diagnosis required	Prenatal diagnosis not required
If a sickle cell disease individual and a sickle cell trait individual marry, there is a 50% chance that their children will be born with the disease and 50% chance that their children will be carriers	If two individuals having sickle cell disease marry, there is a 100% chance that their children will be born with SCD. They should be counselled and helped in an informed decision making regarding continuation of the pregnancy
If two individuals having sickle cell trait marry, their children have 25% chance of being diseased, 25% of being normal and 50% chance of being carriers	If a sickle cell disease individual and a normal individual marry, there is a 100% chance that their children will be born with sickle cell trait
	If a sickle cell disease trait and a normal individual marry, their children have 50% chance of being normal and 50% chance of being carriers

Chorionic Villous Sampling (CVS) is done to determine the disease status of the fetus. This should be done only in designated and certified centers .CVS is a prenatal test in which a sample of the foetus is drawn from placental tissue during the week eight to twelve weeks of pregnancy. The sample can be taken through the cervix (trans-cervical) or the abdominal wall (transabdominal). The test can be done as early as 10 weeks of pregnancy. Being a specialized technique, it can be performed by experienced specialists only and should be judiciously considered weighing the 'risks' and 'benefits' for the patients. The person and/or family members should be counseled to make an informed choice.

These tests shall be undertaken by specialists, only at select tertiary care centers/SCD Centres of Excellence.

Table: Screening and Diagnosis at various levels of Care

Site of screening	Screening/confirmatory tests	Person to conduct the test
Initial screening 1. at the community level – outreach screening, Schools, Anganwadi Centres 2. At SHC-HWC/UHWC 3. At PHC/UPHC-HWC	• Test tube-based turbidity tests - SOLUBILITY TEST (For HbS)** +Digital Hemoglobinometers for identification of mild and moderate Anemia Or • GoI-approved electrophoresis based Point of Care test as one-step confirmatory test at PHC / UPHC	MPW (M/F) at community level CHO at SHC-HWC level Lab technician at PHC-HWC level
At CHC (Rural/ Urban)	For screening: • Solubility test for (for HbS) +Digital Hemoglobinometers for identification of mild and moderate anaemia For confirmation: • GoI-approved electrophoresis based Point of Care test as one-step confirmatory test	Lab technician
At District Hospitals/ DEIC	For screening: • Solubility test for (for HbS) +Digital Hemoglobinometers for identification of mild and moderate anaemia For confirmation: • High-Performance Liquid Chromatography/Capillary zone Electrophoresis for confirmation of diagnosis	Lab technician
AIIMS, state medical colleges (selected Medical Colleges and/or selected Tertiary Care Centres in the State)	All types of diagnostics available	Hematologist / Pathologist

*** If hemoglobin is less than 7% the test false negative results are known. Hence patient/client has to be referred to CHC/District Hospital where Hb electrophoresis/HPLC is possible*

NEWBORN SCREENING:

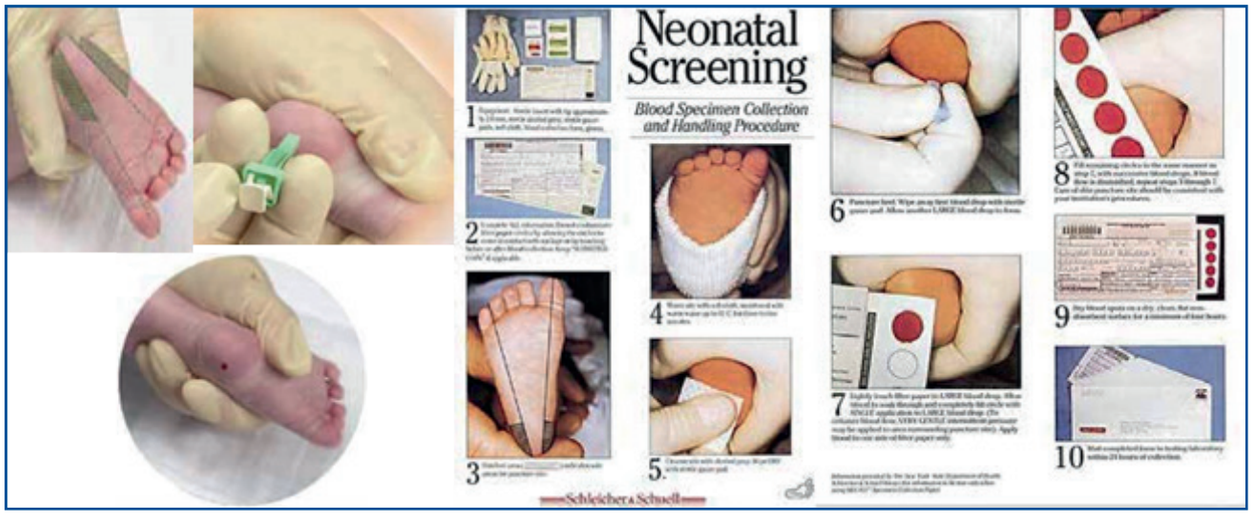
The objective of newborn screening is to detect infants at risk of sickle cell disease within the neonatal period. This is intended to improve outcomes through early treatment and care.

Newborn screening shall be conducted for sickle cell disease and trait at all public health institutions conducting institutional deliveries, in sickle cell endemic areas. The dried blood spot card is used for sickle screening and the routine Hb-HPLC equipment with the Hb variant program is used.

Informed consent: An explanatory leaflet detailing the purpose, process, and outcomes of newborn screening for sickle cell conditions must be provided to the parent(s) before screening. The purpose of screening should be explained before testing. In cases where the infant's parent(s) does/do not

wish the child to be screened for sickle cell disease (or any of the other conditions), the decision to opt out of testing must be specifically documented. ICMR'S ethical guidelines for all subjects are to be invariably followed.

Newborn sampling: The dried blood spot card is used for sickle screening. For complete and proper processing of the specimen, four good-quality spots are required. Ideally, the sample should be dispatched to the newborn screening laboratory within 24 hours of collection. In normal circumstances, the delay should not affect analysis using the techniques described below



However, in occasional cases, if it has been kept in unsuitable conditions, excessive oxidation may occur rendering the sample unsatisfactory for analysis.

Dried Blood Spot sample card made from Whatman Filter paper No.3.

Usually, Guthrie cards are used for collecting DBS samples. They are essentially made of Whatman grade 3 paper (labeled as 901 in the catalogue) complete with a barcode and label for identification. DRIED BLOOD SPOT (DBS) Sample cards can also be prepared using Whatman filter paper no 3, as shown in the above photograph, and print 1cm circles on it along with the sample card number.

AFFECTED PERSON IDENTIFICATION:

Each individual being screened shall be registered for an ABHA ID. Individuals with confirmed sickle cell disease diagnosis shall be registered at the respective HWC and linked with the ABHA ID with updated details on sickle cell disease or carrier status.

DIAGNOSTICS AND DRUGS

Under National Health Mission (NHM), in the Sickle Cell Disease prevalent areas, States shall ensure the availability of sickle cell disease testing at all SHC-HWC and PHC/UPHC-HWCs/U-HWCs. Clinical protocols for early diagnosis and intervention for sickle cell disease (SCD) shall be adopted. Teleconsultation services at AB-HWCs shall be leveraged especially in 'sickle cell crises' for prompt management.

States/UTs may choose to outsource, to appropriate private agencies, universal screening for sickle cell disease both in the community as well as in Ayushman Bharat Health and Wellness Centres(AB-HWC) and higher healthcare centers. The states shall develop guidelines for outsourcing, with relevant selection criteria inclusive of licensing requirements of labs, and service components – like community mobilization, blood sampling, testing, sample transport, reporting, data entry, quality assurance, coverage, costs, etc.

Availability of basic drugs like Hydroxyurea, prophylactic penicillin, and vaccinations shall be ensured at public health facilities – AB-HWCs and referral centers. All these could be prescribed and administered at PHC/UPHC-HWC and at SHC-HWC, CHO shall dispense only under the guidance of PHC-MO.

At all first referral centers, daycare facilities for transfusion and monitoring shall be established.

NHM shall support all the needs listed above at the district and sub-district facilities.

Treatment facilities at the higher level of care, i.e. Tertiary level facilities to be financially supported through MoTA, and would be linked with Health care facilities below and utilizing the established linkages under NHM.

HOLISTIC MANAGEMENT & CONTINUUM OF CARE

Without universal screening, SCD patient is generally diagnosed when she/he comes to the hospital with anemic symptoms, or sickle cell crisis. It is a common painful complication seen in patients of sickle cell disease. Acute episodes of severe pain (crises) are the primary reason that these patients seek medical care in hospital emergency departments.

Young children with SCD have an increased susceptibility to bacteremia due to Streptococcus pneumonia, which can be fatal in many cases. Acute splenic sequestration crisis is another cause of mortality in infancy. Hence, early diagnosis and providing care are critical in SCD, as lethal complications can occur even in the first few years of life in pre-symptomatic children.

MANAGEMENT OF SICKLE CELL DISEASE

Once the individual is confirmed positive for sickle cell disease ,the treatment shall be initiated at the PHC-HWC/UPHC-HWC level and at SHC-HWC level in consultation with medical officer. The goal for management should be patient centric focusing on life course approach with appropriate counseling of patient, educating regarding possible complications, pre-marital and pre-conception counselling.

General principals of management

- To improve quality of life and life expectancy of the affected individuals.
- Prevent and reduce the number of crises and complications
- Treat crises and complications promptly and effectively
- Promote a healthy lifestyle.

a) **Prophylactic management:** Folic acid and penicillin treatment shall be considered for prophylactic management. Folic acid helps to prevent deficiency resulting from increased cell turnover. Recommended dose of folic acid is 5mg daily to all SCD patients above one year of age. For below one year of age recommended dose is 2.5 mg daily.

   SCD patients develop functional hyposplenia therefore oral Penicillin is recommended for children upto 5 years of age or lifelong for those who had splenectomy. The dosage of penicillin is as follows:

   - Oral Penicillin V potassium 62.5mg/bd for 1 year
   - 125mg/day after 1 year until the age of 2 years
   - 250mg/day till 5 years

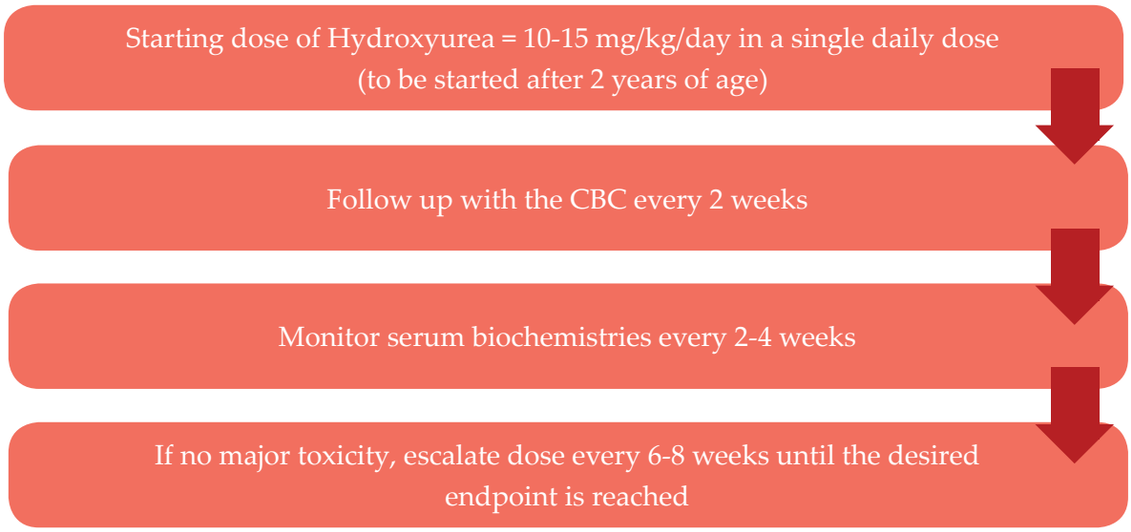
   SCD patients are at risk of severe infections due to hyposplenia especially infections due to encapsulated bacteria therefore, early vaccination shall be instituted to prevent infection and complications in later stages of life. For newborn children, vaccination as per schedule in the National Immunization schedule. For adults vaccination, national guidelines needs to be followed

b) **Preventive Management:** To avoid crisis, nutrition, health maintenance, and comprehensive care is important. Education of both patients and caregivers about sickle cell disease including 'Do's and Dont's in acute conditions before coming to the hospital, shall be undertaken.

c) **Treatment for severe symptoms:** Hydroxyurea should be considered for patients experiencing repeated episodes of acute chest syndrome or with more than three crises per year requiring hospitalization. Hydroxyurea has been proven to decrease complications in children, such as - pain crisis, acute chest syndrome and strokes.

Hydroxyurea can be initiated by PHC MO at PHC-HWCs and the starting dose of Hydroxyurea is 10-15 mg/kg/ day in a single daily dose. Once started on hydroxyurea, the MO should follow up patient with the complete blood count (CBC) every 2 weeks; serum biochemistries every 2-4 weeks. (Details of Hydroxyurea treatment in **Annexure 4**)

Children under the age of two should be referred to a higher centers for pediatric consultation.



MANAGEMENT OF COMPLICATIONS

a) **Management of acute chest syndrome (ACS):**

It is a medical emergency which requires management in the intensive care unit. Hydration should be monitored carefully to avoid the development of pulmonary edema, and oxygen therapy should be vigorous. Blood transfusion to decrease the proportion of sickle red cells may be needed. Intravenous antibiotics may have to be administered in severely ill ACS. Pain control and incentive spirometry can prevent lung collapse

b) **Strokes and transient ischemic attacks (TIAs):**

Though rare in the Indian phenotype, children who develop these complications will benefit from hydroxyurea. These patients may benefit from blood transfusions to decrease HbS levels, and post stroke may need anticoagulation, along with required monitoring for anticoagulation medicines. Though unusual, this is a serious condition and such patients should be referred to a higher center to receive evaluation and required management. Patients who have suffered strokes, TIAs etc. will need Transcranial Doppler (TCD), computerized axial tomography, MRI,

or MRI with angiography. Comprehensive management of SCD requires a multi-specialty team, especially for young children with these complications.

c) Transfusion:

This is needed only in special indications. Not all patients will require blood transfusion. In children receiving regular transfusions monitoring of serum ferritin and chelation therapy may be needed.

MANAGEMENT OF SCD IN PREGNANCY

Pregnancy poses additional risks of complication for both pregnant mother suffering from SCD and the fetus. All pregnancies need be managed as high-risk pregnancy

Complete health check-up, treatment of any anaemia and medications prior to conception is ideal. Folic acid is recommended daily before, and during pregnancy. Vitamin D should be prescribed as a supplementation during pregnancy.

Risks during pregnancy

- infection, thromboembolic events
- increase in spontaneous miscarriage
- increased risk of pre-eclampsia and pregnancy-induced hypertension
- premature labor and acute painful crises during pregnancy
- fetal growth restriction
- antepartum hemorrhage
- maternal mortality
- increased incidence of perinatal mortality

Females who are planning a child should

- Stop hydroxyurea (HU) 3 months prior to planned conception
- Avoid iron chelation medicines as these are potentially teratogenic. These drugs should be stopped before conception. If there is evidence of iron overload, that should be treated while the couple is planning for conception. Since sickle cell disease may also have iron deficiency, that should be treated as per guidelines for other pregnant women.

FOLLOW UP

MO/CHO at all the primary health facilities will undertake regular checkup of all confirmed patients, every 3-6 months. The services include:

- Monitoring for fever, jaundice, pallor and spleen size on each health visit
- Monitoring Hb levels
- Refill of medications
- Counselling on Diet, stress management and risk reduction

- At all PHC-HWCs, vaccination and penicillin prophylaxis therapy for all new-born identified with SCD
- Co-morbidity management
- In case of any complications, teleconsultations, or referral to the specialists
- Pain relief medications like NSAIDs, acetaminophen, along with syndromic management at SHC-HWCs and PHC/UPHC-HWCs for immediate relief
- In the event of pain crisis, Hydroxyurea shall be initiated by PHC MO at PHC-HWCs. PHC-MO shall continue to monitor and conduct teleconsultation with the specialist for termination of hydroxyurea treatment based on clinical endpoint criteria
- Regular home visits and supportive counselling services shall be provided by ASHAs and MPWs during treatment and to ensure treatment adherence. SCD patient register shall be maintained to ensure the regular follow-up. Educational material should be given to the caregiver and older children, so they understand about the disease, and especially about fever. Sickle cell carriers, usually have mild disease, but may need follow up for regular health maintenance, some will need intervention for fever, pain etc.
- Genetic counseling should be made available to all carriers as well as those with SCD

TELE MEDICINE FACILITY

At AB-HWCs, roll-out of telemedicine services through e-Sanjeevani-HWC will be strengthened. Specialists at e-Sanjeevani-HWC Telemedicine hubs shall be trained on all aspects of SCD. Ministry of Tribal Affairs in collaboration with ICMR/AIIMS or similar reputed institutes would open a Helpline and also facilitate Tele Medicine facility at centre of excellences for sickle cell disease. Public awareness regarding both variants of e-Sanjeevani application viz., e-Sanjeevani HWC and e-Sanjeevani OPD shall be undertaken.

SECONDARY CARE

District hospitals would render specialist care for patients with sickle cell disease. The centres would also ensure downward referral to Ayushman Bharat - Health and Wellness Centres for follow up care. The care of sickle cell disease shall be included in the National Health Authority's Ayushman Bharat PMJAY benefit package also.

TERTIARY CARE

In each of the sickle cell anemia endemic States, Ministry of Tribal Affairs (MoTA) along with AIIMS, New Delhi in that state, 2 other Centres may be identified and upgraded as centres of excellence. The chorionic villous sampling testing would be provided in selected tertiary care centres. MoTA shall extend support to these States for Infrastructure and HR at these centres. The private facilities, wherever available can also be empaneled for CVS testing till the facilities at COEs are developed. Selected Centres of Excellence (CoE) shall be in such a way that they can provide bone marrow transplant services also for eligible individuals with SCD

INTEGRATION OF AYUSH IN SICKLE CELL DISEASE CARE

Yoga is an integral component of comprehensive primary healthcare provided through Ayushman Bharat Health and Wellness Centres (AB-HWC). Ministry of AYUSH, Ministry of Health and Family

Welfare, Ministry of Tribal Affairs in coordination shall support epigenetic and clinical research on the role of Yoga in the prevention and cure of sickle cell disease complications.

An action research project has been sanctioned by MoTA to understand the efficacy of Yoga based life-style intervention (YBLI) in reducing oxidative stress and its related complications at different organ and systems level for the management of sickle cell anemia. This pilot project is being implemented by Swami Vivekananda Yoga Anusandhana Samsthana, S-VYASA University, Bengaluru and INFOMED, Ahmedabad. The interim findings have shown promising results in controlling painful crisis.

Based on the final outcomes of the project, the integration of Yoga in SCD prevention through AB-HWCs and secondary care centres shall be undertaken. Arrangements for Yoga therapists for this initiative may be made through National AYUSH Mission. MoTA shall also financially support Ministry of AYUSH in research on therapeutic drugs

PATIENT SUPPORT SYSTEM

Sickle cell disease may pose catastrophic economic consequences on both the individual with the disease and the family. For individuals with sickle cell anemia, support system for ensuring continuum of care and socioeconomic support shall focus on the following elements.

- ASHA shall maintain a line list of patients with SCD. ASHA & ANM/MPW and Community Volunteer wherever available, shall monitor treatment adherence. Wherever appropriate, a family member/care giver may also be assigned with the responsibility of observing treatment. The family member shall be trained and supported by ANM with support from CHO. To promote treatment adherence, appropriate technological solutions such as frequent calls, SMS reminders, IVRS, etc. may be deployed.
- Individuals confirmed positive for sickle cell disease shall be linked for disability certification and consequent socio-economic benefits.
- Jan Arogya Samitis of SHC-HWC/UHWC and PHC-HWC/UPHC-HWC shall lead the community mobilization efforts reaching out to individuals and organizations. JAS shall facilitate the following:
    a. IEC or BCC activities to increase the awareness in the community about sickle cell disease and mobilise community support
    b. Social, financial and nutritional support for the affected families leveraged through adoption by corporates, industries, organisations & individuals.
    c. linkage with skill development programmes and other relevant national programmes/ schemes of the government for economic livelihood.
    d. Sustained availability of medicines and diagnostics for SCD at the health facilities.

COMMUNITY ADOPTION

Community adoption involves leveraging community support for people with sickle cell disease by identifying, orienting and motivating voluntary individuals and organizations. This initiative shall:

1. Provide additional support for patients with sickle cell disease (SCD) to improve treatment outcomes
2. Enhance community support in the care of sickle cell disease
3. Leverage corporate social responsibility

EXPECTED OUTCOMES

The expected outcomes of community adoption are as follows:

- Enhance awareness in the public and active involvement of society in the fight against Sickle Cell Disease
- Improved nutrition for the Sickle Cell Disease patients resulting in better treatment outcomes
- Reduction of out-of-pocket expenditure for the family

SCOPE OF SUPPORT:

Identified donor can engage to support the consented individual or family of an individual or an entire geography (block/ward/ district) affected by SCD.

Type of support:

- *For Individuals/Families: The type of additional assistance that may be provided by the donors to the consented SCD patients shall include the following:*
  - Nutritional support
  - Counselling for lifestyle, treatment adherence and stress management
  - All vaccine as per National Immunization Schedule
  - Mobility support for follow up hospital visits including for penicillin and hydroxyurea prophylaxis
  - Vocational support
- *For blocks/ward/district:* For Donors opting to support to adopt the entire geography affected by SCD, the support may be extended in the following:
  - IEC/BCC activities for community awareness
  - Outreach screening camps for SCDs
  - Counselling for lifestyle, treatment adherence and stress management
  - Vaccine for all identified patients as per National Immunization Schedule
  - Vocational support
  - Genetic Counselling support

IMPLEMENTATION PLAN OF COMMUNITY ADOPTION:

Step 1: Development of integrated web portal and obtaining consent from SCD patients:

- Creation of ABHA ID based e-registry for individuals with SCDs
- Integration with centralized application for developing line listing of patients infected with SCDs
- Identification of patients through mass screening campaign and creating line list of all individuals with SCDs
- Mapping of individuals and families with SCDs through frontline workers.
- MO/CHO/MPW/ASHA shall approach the patients directly in person, listed from their area, and inform them about the support available under this intervention. The patient and family shall be also informed that their details shall be made available to the donor.
- Written consent will be obtained from the patient that the enrolment of the patient is his/her informed choice
- For patients who are newly registered in CPHC system, an OTP will be sent to the client's mobile number and OTP will act as consent for the enrolment of beneficiaries

Step 2: Dissemination of plan:

- Use of mass media tools, SMS, digital banners, posters, leaflets, AV testimonials, social media assets, job aids etc.
- Inter-ministerial collaboration to increase public awareness regarding the program.
- Engagement with the mass media at the national and state level.
- Newspaper and TV/radio jingle-based announcements.

Step 3: Donor identification:

- Web portal will be developed for self-registration of donors. The page will have provisions to enter the details of the donor, state/UT wise list of districts, blocks, and cities, and the number of existing SCD patients in the block/city. The donor can choose one or more blocks/ urban wards and the intended duration for providing support. They can also enter the type of assistance that they would like to provide for the patients in the area.
- Information about the portal shall be widely disseminated through the use of mass media channels.
- District Health Society (DHS) under the chairmanship of district collector will engage with potential donors across corporates, public sector undertakings, institutions, citizens, elected representatives, etc. DHS Chair shall approve such donations to be finally implemented for the benefit of people with SCD.

Step 4: Service delivery:

- The assistance shall be provided by the identified donor to the patient, as mutually agreed with the district committee on SCD
- The donor and the district committee on SCD shall utilize existing systems or develop new systems to deliver assistance
- The donor should ensure the quality of in-kind assistance provided to the SCD patients

REHABILITATIVE CARE:

The individuals with SCD are to be made aware of the following:

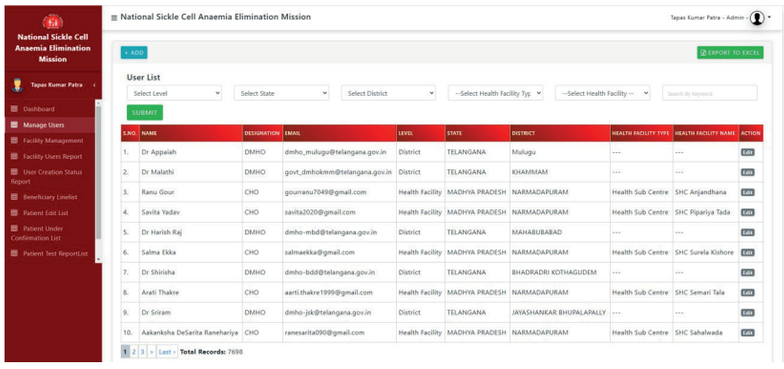
- States have extended support to individuals and children suffering from SCD
- That they can apply for Disability cards as individuals with SCD are now recognized under Rights of Persons with Disability Act 2016
- Facilities under Rights for Persons with Disability Act,2016 and amendments
- As Sickle Cell Disease is one of 21 benchmark disabilities under RPWD, any individual with SCD will be eligible for the following:
    - Free education from 6 to 18 years of age
    - 4% reservation in the education and government jobs
    - 5% reservation in higher education
    - Other rights under RPWD Act 2016

NATIONAL SICKLE CELL ANAEMIA ELIMINATION PORTAL

Under National sickle cell Anaemia Elimination programme, National Informatics Center has developed following software:

- Web Application/portal
- Common API to migrate state existing data
- Mobile Application Administrative Information

WEB PORTAL



The objective of 'Sickle Cell' web application is to facilitate a dashboard, creation of various level of users, beneficiary data edit and download various MIS reports. In home page the citizens can download their own sickle certificate, check the guest dashboard and also get various information related to sickle cell.

The portal has following features

1. Before using the web app, the user must get her/his government email id registered through concerned District User / State User / State Admin. User will be able to login only if her/his government email id is registered.
2. Citizens can get various information related to mission and sickle cell disease from the home page. It consists of various menu like about us, media gallery, contact us, user manual, Know your reports.
3. Citizen can download their sickle certificate from **Know Your Report** menu. They have to provide their registered mobile no that they have provided during registration. OTP will be sent to same registered mobile no and after successful verification they can get their sickle certificate.
4. User can get the cumulative and daily count of total registered, screened, negative, diseased and carrier national wide.
5. State and District user can edit the details entered from mobile application in case of any mismatch/mis typing done during the registration. For that they have to click on Patient edit List and click on edit button present against each record.
6. User can get the details of the patient whose screening test is done and he/she is found to be positive but confirmation test is not conducted yet. They can also download it in PDF and CSV format

SICKLE CELL MOBILE APPLICATION

The data of every person would be captured through a Mobile Application developed by National Information Center after due generation of ABHA (unique Health ID) of every person being screened or provided healthcare. The same would be stored in a Central Repository/database linked to a MoHFW portal and Ayushman Bharat Digital Mission.

The application has following features:

- beneficiary registration
- test details (solubility, HPLC/Electrophoresis or Point of Care) captured in both online and offline mode
- integration with ABHA ID

The application contains following details:

- **Registration:** To record the screened person's details.
- **Screening Test Details:** To record the results of solubility or POC test.
- **HPLC/Electrophoresis Test Details:** To record the HPLC/ Electrophoresis test details.
- **Syncing:** To Sync offline (local database) data with the server's data

The indicators pertaining to sickle cell disease intervention at SHC-HWC/UHWC and PHC-HWC/UPHC-HWC are updated in the Sickle cell Mobile application developed by National Informatics center on a daily basis. These indicators shall be used for reviewing the status of implementation of the sickle disease prevention and care at all levels of care.

For more details on web portal and mobile application visit the link below

https://sickle.nhm.gov.in/home

OPERATIONAL FRAMEWORK

HUMAN RESOURCES:

States are encouraged to make use of existing human resources effectively for SCD prevention and elimination. However, there is an additional provision of having one counsellor for two PHC/UPHC-HWCs for the purpose of counselling and facilitating the services. States have liberty to modify the role as per local context.

CAPACITY BUILDING

Module Development

A team of experts on SCD constituted by MoHFW has developed detailed training modules for primary healthcare personnel at Ayushman Bharat Health and Wellness Center (AB-HWC) covering all aspects related to SCD from prevention and early diagnosis to holistic management. The target personnel includes medical officers, community health officers, staff nurse, MPW/ASHA.

The training module for **Medical officers** delves on leading the primary health team for prevention and comprehensive care of sickle cell disease including awareness generation, screening and counselling, early diagnosis, treatment initiation and continuum of care.

The training module for **Community Health officers** focusses on sickle cell prevention and care leadership at SHC-HWC level. This includes awareness generation, screening and counselling, referral for early diagnosis, treatment and maintaining continuum of care.

The training module for **Staff Nurses** delves supporting the medical officer in awareness generation, screening, early diagnosis, treatment initiation and continuum of care.

The training module for **MPW/ASHA** focusses on awareness generation, referral and follow up support.

The copies of such training material will be provided to all States and will also be made available digitally on Sickle Cell support corner, Sickle Cell Portal developed by MoHFW, websites of MoHFW and NHSRC.

Training of Medical, Paramedical Staff

Training of all healthcare professionals is crucial to treat SCD patients effectively leading to better health outcomes to patients. The three Centres of Excellence (one AIIMS and 2 other select medical colleges) established with MOTA support in each selected state, along with MoHFW and State Tribal Department functionaries shall build the capacity of the human resources at various levels of the State Departments of Health and Family Welfare, and Tribal Development for tackling SCD. Awareness and training programme for Ekalvya Model Residential School teachers and school students will be conducted by MoHFW, TRIs and NTRI. The medical and paramedical staff will be trained in a time bound manner so that there are trained staffs available in each district of the states.

MONITORING

The Sickle cell Portal wherein through Dashboard the necessary monitoring of the Mission progress shall be undertaken. The Monitoring and evaluation tools shall be provided at National level, State level and District level so that necessary and constant steering can happen.

The performance assessment and grading of the better performing states and districts shall also be done by prescribing the indicators in consultation with NITI Aayog.

States may use the following suggested set of indicators to monitor:

Parameters
Total number screened for Sickle Cell Disease
Number diagnosed with Sickle cell trait
Number diagnosed with Sickle Cell Disease
Number of persons with Disease registered at the facility
Number of patients receiving Inj. Penicillin for the prophylaxis of infection
Number of patients taking treatment(hydroxyurea)
Number of persons with Disease under community adoption scheme

KEY ACTIVITIES AT VARIOUS LEVELS

Sickle Cell Disease Programme Sub-Committee at State, District and Block Level

Programme sub-committee for Sickle Cell Mission shall be constituted at State, District and Block in each implementing state. The State level programme sub-committee shall be sub-committee of the State Health Society. It shall drive policy, technical support and overall monitoring of Sickle Cell Disease program in the state. It will be chaired by the State Mission Director, National Health Mission and co-chaired by the Head of the State Department of Tribal Affairs.

The sub-committee shall include representatives from Department of Primary and Secondary Education, Department of Social Welfare, Department of Women and Child Development, representatives from two Academic institutions preferably from the Centers of Excellence and representatives from three NGOs/ Civil society organizations working in Tribal Health and/or Sickle Cell Anemia. The subcommittees shall review the programme regularly and share a monthly report of programme performance to the State Health Society.

Similar sub-committees at the District and Block level shall be created with District Collector as Chair and Tahsildar/Block Development Officer/Block Panchayat Executive Officer/Municipal corporation/ ULBs as Chair respectively. Representatives corresponding to the member Departments in state sub-committee shall be members at District and Block level sub-committees of the Sickle Cell Mission. As in State sub-committee, two representatives from Academic institutions and representatives from 3. NGOs/ Civil society organizations working in Tribal Health and/or Sickle Cell Anemia in the District shall be part of the District level sub- committee. The Block level sub-committee may or may not have a representative from the academic institutions. However, representatives from 3 NGOs/ Civil society organizations working in Tribal Health and/or Sickle Cell Anemia in the block shall be included. The Member of Parliament shall be a special invitee in the district subcommittee. The District and Block level sub-committees will be involved in operational planning, implementation, and field monitoring

of the Sickle Cell Mission. The District and Block level sub-committees too shall regularly review the Sickle Cell Mission program implementation and performance and submit report to the district health society.

The District Health Society shall at least once a quarter, hold a special review of the Sickle Cell Mission.

At the Ayushman Bharat - Health and Wellness Centres

The Jan Arogya Samitis (JAS) shall plan, organize and monitor the facility-based screening camps in both urban and rural areas. The block level officials of the tribal department and women and child development department shall be invited members for all planning, coordination, and monitoring of the screening camps. All data pertaining to the screening, patients identified and on treatment, persons lost for follow up shall be part of the monthly reporting of the AB-HWCs on the AB-HWC portal.

At the Village/Slum Level

The ANMs, ASHAs and MAS would use the platform of Village/Urban Health, Sanitation and Nutrition Committees to build awareness and to organise outreach screening camps. The tribal chieftains, tribal representative, the Ashram school teachers and wardens of the tribal hostel shall be mandatorily invited if they are not members of the VHNSC.

ROLES AND RESPONSIBILITIES OF STAKEHOLDERS

Sickle cell disease care requires a multi-stakeholder approach. In order to ensure optimal care and improved outcomes for patient with SCD, each stakeholder type will need to embrace a unique set of roles and responsibilities. While the district Hospitals are equipped with necessary diagnostics and management facilities, the Tertiary care Hospitals including AIIMS and other should have facilities for prenatal diagnosis and BMT facilities.

The various recommendations have been outlined in previous sections. The list is indicative and not exhaustive.

Role of Ministry of Health & Family Welfare

- Under NHM, necessary support will be extended to states for prevention and management of sickle cell at public healthcare facilities including screening.
- Develop SOPs and clinical guidelines for SCD care and management
- Develop M&E framework for effective program monitoring, implementation and management
- Integrate care of SCD in the PMJAY care package
- Registry maintenance through SCD portal
- Support states in roll-out of telemedicine services in all the endemic areas of SCDs.

Role of AIIMS, Centres of Excellence and all Medical Colleges

- Provide chorionic villous sampling (CVS) and other advanced diagnostics
- Provide care for all referred patients

- Being a telemedicine hub support primary and secondary health care institutions in clinical management of patients with severe Sickle cell disease
- Undertake capacity building of healthcare providers on SCD
- Undertake public health and clinical research related to sickle cell disease
- Act as a technical guide to states on clinical management of sickle cell anemia
- Neonatologist, Gynecologist to play key role along with Haematologist

List of AIIMS, centers of excellence and all medical colleges is given in **Annexure 1**

Role of ICMR, Dept. of Bio Technology and other Research Institutions:

- Include sickle cell disease as a priority area of research. Research may include the studies of etiology, genetic/epigenetic studies for prevention effectiveness, care models etc.
- Undertake clinical trials and studies to promote newer therapies and drugs for SCD treatment
- Department of Bio-Technology to act as scientific partner

Role of Ministry of Tribal Affairs:

- Lead IEC, BCC and social media campaigns for prevention, care and control of SCD
- Support universal screening, early identification
- Formalize role of Eklavya Model Residential Schools in awareness generation, students screening for SCD
- Facilitate NGOs and CBOs supported by ministry to engage in awareness generation and universal screening in their areas of operation
- Support establishment of Centres of Excellence in each state for chorionic villous Sampling
- Fund CSIR & Ministry of AYUSH for research in SCD management

Role of States and Health Department

- Constitute Sickle Cell Programme Sub-Committee at the state, district and block levels
- Sensitize and engage rural and urban local bodies, panchayats, municipal corporations, ULBs etc.
- Prepare plan for universal screening
- Identify and support centers of excellence in the states
- Allocate financial resources from NHM PIP and leverage MoTA grants
- District Health Society to monitor the performance of the program on a monthly basis

Role of NGOS:

- Support states and districts in awareness generation and community mobilization, capacity development of health care providers and facilitators offering counselling services, ensuring treatment adherence and follow up of sickle cell disease
- Pilot innovations for strengthening early detection and diagnosis of SCDs at state, district and community levels for evidence-based SCD management

Indian Red Cross Society

- Support States and districts in providing blood transfusion services for the critical patients diagnosed with SCDs
- Leverage their thalassemia screening and counselling centres for providing services related to SCDs
- Include SCD awareness as one of the agenda in their youth -led community-based interventions

Role of Other Ministries

Ministry of Education

- Participate in state/district and block level committees
- Create awareness regarding sickle cell disease among school-going children and during parent - teacher meetings
- Ensure support of school health ambassadors in organizing camps for screening of school going children

Ministry of Women and Child Development

- Enable screening of children in anganwadi by RBSK teams either camp based or in schools in tribal areas / ICDS centres
- Participate in state/district and block-level sub-committee
- Create awareness regarding screening diagnosis and management of SCDs through the Anganwadis and SHGs

Ministry of Social Justice & Empowerment

- Participate in state/district and block level sub-committee
- Create awareness regarding screening diagnosis and management of SCDs
- Ensure disability certification and benefits of other relevant socio-economic schemes for persons affected by sickle cell disease

ROLE AND RESPONSIBILITIES OF HEALTH PERSONNEL

Sl No	Human resource	Roles and responsibilities
1.	Urban community platforms/ JAS/VHSNC	• Identification of the total target household and mobilize the vulnerable population with the help ASHAs to the screening camp/facility • Support to ASHA in arranging the screening camps • Community awareness through household visits • Discuss with the ASHA and make a weekly/monthly plan to address their specific health needs and burdens. • Follow up with the ASHAs and visit the identified vulnerable households/ individuals/groups again on intermittent rounds to monitor the delivery of care.
2.	ASHA	• Identification and mobilization of the eligible population for screening camps/ facility level screening • Community awareness through household visits, VHSND, MAS, JAS, camps, etc. • Pre-marital and preconception counselling • Motivate ANC and partner for screening • Establishment of patient support groups • Follow-up care of the confirmed cases
3.	MPW (M/F)	• Provide group and individual counselling on sickle cell anemia prevention and control • Support CHO in conducting outreach and facility-based screening camps for Sickle cell disease • Support CHO in recording and reporting the screening activities • Support CHO in assuring the availability of logistics, diagnostics and consumables as required for the camps
4.	Staff Nurse	• Provide group and individual counselling to the people on sickle cell anemia prevention and control • Assure availability of logistics, diagnostics and consumables as required for the camps for the PHC
5.	Laboratory Technician	• Conduct sickle cell screenings • Assure availability of diagnostics and consumables as required for the camps for the PHC • Participate in both facility-based and community-based screening for SCD

Sl No	Human resource	Roles and responsibilities
6.	Counsellor	• Provide group and individual counselling to the people on sickle cell anaemia prevention and control • Support MO in organizing screening camps • Maintain line list of diagnosed individuals in the catchment area for counselling support • Under monthly capacity building sessions for CHOs/ASHAs/MPW on counselling care of individuals diagnosed with SCDs • Pre and post-test counselling to all referred patients or OPD patients for SCDs • Support PHC team during screening camps • To provide information about community adoption options available for affected families and undertake informed consent of patients • Provide information about pregnancy continuation in case of carrier parents and motivate partner screening
7.	Community Health Officer	• Plan and organize screening camps bi-weekly • Assuring the availability of logistics, diagnostics, and consumables as required for the camps • Screen persons for sickle cell disease • Pre and post-test counselling • Record and report the activities • Refer identified cases to higher centres for diagnosis and treatment initiation • Follow-up of confirmed cases at the facility and the household through ASHAs
8.	Medical Officer	• Plan and organize screening camps bi-weekly • Support catchment area SHC in conducting screening camps • Ensure availability of logistics, diagnostics and consumables as required for the camps for the PHC as well as catchment SHC • Screen persons for sickle cell disease • Pre and post-test counselling • Treatment initiation • Referral of the identified cases to higher centres for diagnosis and treatment initiation • Follow-up of confirmed cases

SERVICE DELIVERY FRAMEWORK

Community level	AB-HWCs/ primary healthcare facilities	Secondary healthcare facilities	Tertiary care facilities & CoEs
Awareness generation and mobilization • Community awareness by ASHA and MPW, through home visits, VHSNC/MAS, and JAS • Sensitization through self-help groups and youth clubs • IEC and BCC activities through TV, radio, newspaper, etc • Involvement of community influence ers, like tribal head, teachers, sarpanch, etc in creating awareness • Pre-marital and pre-conception counsel-ling by ASHA/MPW • Follow-up of diagnosed individuals and patients on treatment • Establishment of patient support groups **Screening camps** • Sickle cell disease screening of adolescents in schools and Hostels • Screening of remote and inaccessible tribal hamlets through Mobile Medical Units • Counselling and social support • Referral of screened patients with solubility test positive • Working with JAS for registration of patients for the community adoption scheme	**At SHC-HWC level** • Registration of all individuals and pro-vision of ABHA ID • Screening at all AB-HWCs in select districts both on outpatient basis and on scheduled facil-ity-based screening camps • Screening of referred cases from the out- reach camps • Opportunistic outpatient-based screening of individuals at AB-HWCs • Couple counselling • Referral of screened reactive cases for confirmation of diagnosis and treatment initiation at higher centers • Hydroxyurea follow up medication refill • E-registry • Blood grouping and matching for individuals confirmed to be having sickle cell disease/trait • Teleconsultation services to higher centers **At PHC-HWC level** • Screening and confirmatory test • Teleconsultation services to higher centres • Tele-counselling for nutrition, stress management and treatment adherence • Prophylactic penicillin and vaccinations for newborns • Holistic management of crisis and other complications • Initiation of hydroxyurea based on need and follow up medication refill • Mapping and Facilitation of patients for community adoption	• Confirmation of sickle cell diagnosis using HPLC/ electro- phoresis of individ uals referred from PHC/SHC/ Community • Screening of all sus- pected individuals • specialist care for patients with sickle cell disease • Downward referral • Transfusion services as required • Inclusion of SCD services under PMJAY package	• Prenatal screening (chorionic villous sampling testing) in select tertiary care centers • Select COE shall pro- vide bone marrow transplant service for eligible in-dividuals with SCD **Capacity building by CoEs:** • capacity of the HR at various levels of the State Departments of HFW & Tribal Development for tackling SCD. • Awareness and training programme for Eklavya Model Residential School teachers and school students with guid-ance from MoHFW, TRIs and NTRI

FINANCIAL NORMS OF THE PROJECT

Sl no	Item	Unit Price	Year 1 (2022-23) (in lakhs)	Year 2 (2023-24) (in lakhs)	Year 3 (2024-25) (in lakhs)
1	Point of care Test OR Solubility tests + HPLC/ electrophoresis Test	Upto Rs. 100	150	350	200
2	Hydroxyurea for SCDs (@ 1% of the total Screened Persons)	Rs 1000/year/ patient	1.5	3.5	2
3	PCV Vaccination	As and when part of UIP / after due NTAGI recommendations			
4	Human resource- counsellor	Rs. 319 Cr Per annum (For 1 counsellor each in 2 PHCs)			

ADVANCED RESEARCH

The Council for Scientific and Industrial Research (CSIR) IGIB is working on CRISPR CAS-9 therapy on cells or Sickle Cell Disease. The breakthrough success of CRISPR-CAS (Clustered Regularly Interspaced Short Palindromic Repeats- CRISPR Associated) methods for correcting genetic diseases in patients has fuelled significant scientific investment into bringing such methods to the clinic. This technology (which won the Noble Prize in Chemistry in 2020) has the potential to be a single dose cure for blood disorders like Sickle Cell Anemia.

Central Council for Research in Ayurvedic Sciences (CCRAS) an autonomous body of the Ministry of AYUSH has developed two coded formulations, AYUSH-RP and AYUSH-SC3 for managing SCD through systemic drug development process.

The acute, subacute (28 days) and sub-chronic (90 days) toxicity studies on AYUSH-RP have been conducted by the CCRAS. An exploratory clinical study on AYUSH-RP has highlighted that there were fewer episodes of SCD related pain crises, no need of blood transfusion during the study period, and no iron overload with the medication. Ayurveda intervention was also found to be safe and well-tolerated. Based on these outcomes, CCRAS shall undertake randomized controlled study titled "A Randomized controlled open label clinical study to evaluate the efficacy and safety of an Ayurvedic intervention as add on for prevention of crises in sickle cell anemia"

The research studies will be undertaken by the CCRAS independently and as well as in collaboration with ICMR. The Ministry of Tribal Affairs shall provide funds through its schemes of Centre of Excellence, TRI scheme, Grants under SGATOTSP/Article 275(1) of Constitution and will also facilitate funding through STC funds available with Department of Science and Technology.

SUMMARY & CONCLUSION

These guidelines provide a blueprint for action by highlighting key domains and strategic recommendations to improve SCD care and where each stakeholder can identify and implement specific strategic recommendations. While the challenge to provide advance care for patients with SCD seems daunting, it is indeed achievable, especially with engaged active partners leading the way. A multi-stakeholder approach is needed to mitigate the barriers and ensure improvement in the quality of care for individuals with SCD and for preventive and promotive efforts.

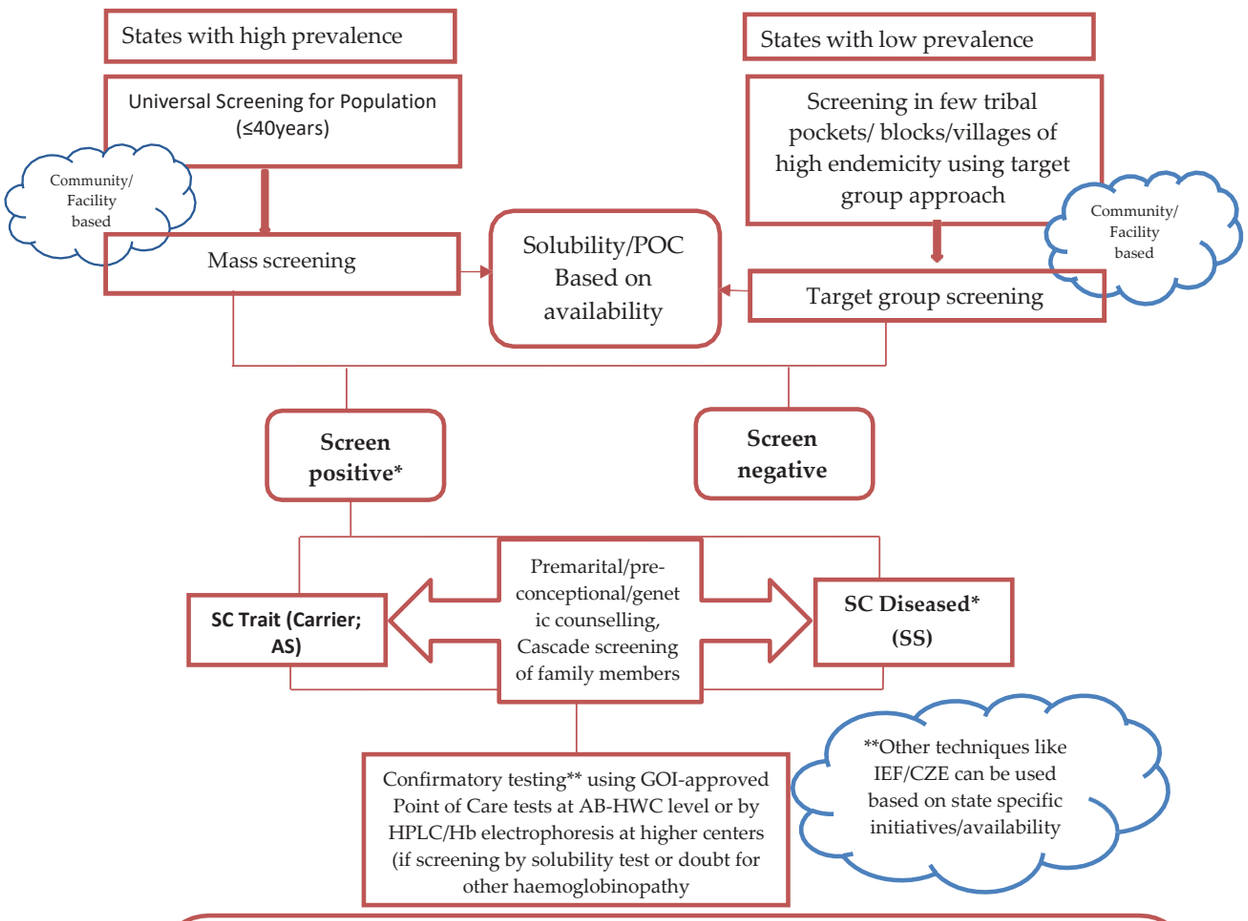
ANNEXURES

ANNEXURE 1 :
STATE-WISE INSTITUTIONS TO BE CENTRE OF EXCELLENCE (INDICATIVE LIST)

S.No	State	Institutes
1.	Andhra Pradesh	GIMSR Medical College, Visakhapatnam
		GSL Medical College & General Hospital, Rajamahendravaram
		Rajiv Gandhi Institute of Medical Sciences, Srikakulam
2	Telangana	Nizam's Institute of Medical Sciences- Hyderabad
		Vijaywada Medical college
		AIIMS Bibinagar
3	Maharashtra	KEM hospital
		Nagpur Medical College
		Special Centre for Hemoglobinopathies-Chandrapur ICMR-NIIH
4	Gujarat	Indian Medical & Scientific Research Foundation, Rajkot, Gujarat
		Surat Medical College
		Ahmedabad medical college
5	Rajasthan	SMS Medical College, Jaipur
		RNT Medical College Udaipur
		AIIMS Jodhpur
6	Madhya Pradesh	NSCB Medical College, Jabalpur
		Govt. Medical College, Indore
		AIIMS Bhopal
7	Chhattisgarh	Govt. Medical College & Hospital, Jagdalpur
		Sickle cell Institute
		AIIMS Raipur
8	Tamil Nadu	Medical College, Salem
		Govt Medical College, Coimbatore
		AIIMS, Madurai
9	Odisha	Veer Surendra Sai Institute of Medical Sciences, Burla
		Govt. Medical College, Cuttack
		Paripada Medical college

S.No	State	Institutes
10	West Bengal	Institute of Haematology & Transfusion Medicine, NRS Medical College, Kolkata
		Medical college Kolkatta
		Department of Human Genetics, Institute of Genetics & Genomic Science, Kolkata
11	Uttar Pradesh	RML medical college KGMU medical college , BHU medical college
12	Jharkhand	RIMS Ranchi
13	Bihar	PMCH-Patna
		Indira institute of medical sciences
14	Karnataka	Victoria Institution of Medical Science
		KR hospital and medical Mysore
		Chamraj nagar super speciality hospital
15	Kerala	Calicut Medical College
		Government Medical College Ernakulam
		Government Medical College, Palakkad
16	Uttarakhand	Govt. Medical college Uttarakhand
		Government Medical College Haridwar
		Government Doon Medical College
17	Assam	Guwahati Medical College, Guwahati
		Assam Medical College, Dibrugarh
		Silchar Medical College, Silchar

ANNEXURE 2:
SICKLE CELL DISEASE MANGEMENT



***Prevention Treatment and Management for SCD**

1. Preventive strategies to the community along with focused counselling to the affected person and family is one of the key strategy in reducing the incidence of SCD.
2. Prophylactic treatment (all vaccination for infections/folic acid etc.)
3. Regular treatment with Hydroxyurea
4. Nutrition intervention and diet counselling
5. Psychological support to adolescents and adults for life long management of disease
6. Management of complications with defined upward and down ward linkages
7. Blood support for transfusion

Awareness generation
Using local mass media/Public platforms like schools. Public health facilities for education about the prevention strategies

Counselling and support
Group counselling by forming patient support groups and information sharing

Data management and monitoring
Sickle cell disease electronic data base via SMART application

ANNEXURE 3 :
IEC STRATEGIES

It is the most important component for the prevention and control of Sickle Cell Disease. The aim of IEC strategy is creation of an informed society willing to participate voluntarily in screening programmes and take steps for preventing births of children affected with the disease and access care if affected with the disease.IEC strategies planned and developed should focus on following points:

- Inheritance pattern and genetic risk
- Sensitize to requirement of routine follow up and monitoring
- Attention to fever and grade of fever
- Importance of adequate hydration, dangers of dehydration
- Vaccination
- Recognition of pain
- Home therapy for pain
- Need of chronic medications like hydroxyurea
- When to seek medical help- danger signs, Splenic palpation, looking out for pallor, jaundice etc.

Implementation strategy

Strategy	Content
Mass communication and media	messages should aim to remove any stigma by promoting knowledge of genetics and inheritance by general and targeted campaigns and awareness about prevalence of disease and that it is preventable. People should be made aware of specific initiatives of the government.
Mid media activities	IEC material and campaigns developed by the States should also focus on promotion of voluntary blood donation to fulfil requirements of blood and to improve access to care services to all affected by promoting knowledge of the treatment modalities available through the public health facilities. The display of posters at all health facilities and identified community places should be ensured. Non-government organizations (NGO) and community-based organizations can be involved in development of resource materials. States should work with education department for inclusion of information about hemoglobinopathies in the school textbooks and school health programs.

Strategy	Content
Inter-personal communication and one to group communication These are very effective IEC tools with well trained counsellors and informed healthcare personnel. Some specific points of application are listed below:	
Adolescent screening in schools:	An organized IEC module to ensure communication and retention of information is vital for success of carrier screening programme for adolescents • A pre-screening power point assisted 30-minute educational talk by Field IEC officer or School Health and wellness ambassadors • Distribution of booklets on sickle cell and anemia urging the students to read and keep the booklet and organizing a quiz session based on booklet and talk. • One to one communication with those having positive screening test • One to one counselling at the time of follow up visit at school or PHC/CHC for collection of samples for confirmatory testing of those with single positive diagnostic test.
At AWCs and AFHCs At SC, PHC, CHC and DH During Blood donation camps and at Blood centre	One to one counselling in at least two to three sessions and reinforcement of information by healthcare workers – ASHAs.
At DEICs	Inform children who have sickle cell disease about care and prevention of complications and affected families about the importance of family (cascade) screening.

ANNEXURE 4 :
TREATMENT WITH HYDROXYUREA

Hydroxyurea (HU), is a ribonucleotide reductase inhibitor found effective in sickle cell disease patient. It has been shown to reduce hemolysis through improved erythrocyte hydration, and macrocytosis. HU augments Nitric oxide (NO) release leading to vasodilatation. Twenty percent patients with this disease will never need it and another 20 percent of the patients will not respond to it well. Hence each patient needs to be evaluated for possible hydroxyurea therapy.

A trained Medical Officer will be able to oversee management of SCD requiring hydroxyurea and should follow up with each patient once a month or whenever there is any problem or for dose modification.

Target groups-

- in children above 2 years of age, and in adolescents with SCD, offer treatment with hydroxyurea regardless of clinical severity to reduce complications (e.g., pain, dactylitis, ACS, anaemia) related to SCD.
- In adults and children with SCD who have chronic kidney disease and are taking erythropoietin, hydroxyurea is added to improve anaemia. However lower doses are required in patients with CKD.
- In persons with HbS beta+ thalassemia disease who have recurrent SCD-associated pain that interferes with daily activities or quality of life, hydroxyurea therapy can be considered after consulting a specialist.

Following points to be considered while staring treatment with Hydroxyurea

Starting dose	10-15 mg/kg/day The dose can be increased gradually till 35 mg/kg/day (Maximum Tolerance dose) depending upon the need
Follow-up	The Patients initiated on hydroxyurea have to be monitored every 4 weeks, for Complete Blood Count, differential WBC every time before the decision to adjust dosage is considered. The response to control of symptoms may take up to 3 to 6 months and should also be recorded
Non response to HU Therapy	In persons with HbS–thalassemia disease who have recurrent SCD-associated pain that interferes with daily activities or quality of life, or not demonstrating a clinical response to appropriate doses and duration (one year) of hydroxyurea therapy, refers to district hospital for further investigation and management.
Counselling of patients for hydroxyurea therapy	Patients should be reminded that the effectiveness of hydroxyurea depends on their adherence to daily dosing Should be counselled not to double doses if a dose is missed Females of reproductive age should be counselled about the need for stopping 3 months prior to conceiving Clinical response to treatment may take 3 to 6 months

ANNEXURE 5 :
LIST OF DIAGNOSTIC SERVICES (ACCORDING TO LEVEL OF FACILITY)

Diagnostic tests	HWC-SHC & UHWC	PHC	CHC	SDH	DH
Solubility test	E	E	E	E	E
GoI approved Point of Care Tests	E	E	E	E	E
HPLC/ Electrophoresis			D	E	E
Sickling test	D	E	E	E	E
Peripheral Blood Film	D	E	E	E	E
CBC		E	E	E	E
Platelet		E	E	E	E
Differential Leucocyte Count		E	E	E	E
reticulocyte count	D	E	E	E	E
Renal Function tests	D	E	E	E	E
Liver function tests	D	E	E	E	E
Urinalysis (Dipstick)	E	E	E	E	E
Serum ferritin			D	D	E
PFT*					E
Echocardiogram		E	E	E	E
MRI					D
Haemoglobin	E	E	E	E	E
Arterial blood gas test				E	E
2D-ECHO					D
Electroencephalography (EEG)					D
Urine test for pH, specific gravity, leucocyte esterase, glucose, bilirubin, urobilinogen, ketone, protein, nitrite, Urine for microalbumin,	D	E	E	E	E
Urine Microscopy		E	E	E	E
Urine for creatinine and Albumin to creatinine ratio (ACR)			E	E	E
Serum potassium		E	E	E	E

E: Essential; D: Desirable, *- DH above 100 beds

ANNEXURE 6 :
LIST OF COMPLICATIONS AND ITS MANAGEMENT (ACCORDING TO LEVEL OF FACILITY)

Acute complications		Chronic complications
Vascular events- stroke, TIA, VTE	**Non- vascular**	
Vaso-occlusive crisis	Infection	Chronic pain
CVA	Severe anemia	Anemia
Acute chest syndrome	sequestration crises	Lung disease and PAH
Renal infarcts	Hemolytic crises	Renal impairment and secondary hypertension
Bone pain	Aplastic crises	Osteoporosis, avascular necroses (head of femur, humerus etc), bone infarcts and other complications
Myocardial infarction		Cardiac dysfunction and diastolic dysfunction
Priapism		Hepatobiliary dysfunction
Pregnancy related problems		Chronic leg ulcers
		Proliferative retinopathy
		Neurologic deficit/ seizure

Chronic complications and management

Sr. No	Complication	Intervention	PHC	CHC	DH
1	Chronic pain AVN, leg ulcer, no cause identified	Hydroxyurea	Y	Y	Y
		Drug treatment	Paracetamol, Amitryptiline NSAID±	Amitryptiline Gabapentinoid Serotonin and norepinephrine reuptake inhibitors (SNRIs) Tramadol Opioid NSAID	Amitryptiline Gabapentinoid SNRI Tramadol Opioid NSAID
		Physical therapy	Simple joint mobilization Yoga Heat application	Y OT/PT	Y OT/PT
		Psychotherapy/ CBT	-	-	Y
2	Chronic anemia	Investigate CBC+Retic+PBF Serum Iron profile including ferritin,B12/ Folate,LFT/KFT DCT/ICT,BG+Rh and Cross Match	-	Y	Y
		Extended RBC phenotype (C/c/E/e/Kk/Fy/Jk)	-	-	-
		Hydroxyurea	Y	Y	Y
		Erythropoitein	-	-	Y
		Iron supplements	Y	Y	Y
		Folic acid	Y	Y	Y
		Blood transfusion	-	Y	Y
		Oral Iron Chelation Drugs	-	As per need in selected blocks	Y
		Integrated services for Hemoglobinopathies & Haemophilia	-	-	(Desirable)

Sr. No	Complication	Intervention	PHC	CHC	DH
3	Lung disease Pulmonary Hypertension Pulmonary Thromboembolism Asthma Lung Fibrosis	History, Exam, SpO2	Y	Y	Y
		Chest x-ray	-	Y	Y
		Spirometry	-	-	Y
		HRCT/CECT/CTPA	-	-	Referral to higher centre
		2D-ECHO	-	-	
		Right Heart Catheterization	-	-	
		Polysomnography	-	-	
		d-dimer, BNP/NT-proBNP	-	-	D
		Inhalers for asthma	Y	Y	Y
		Anticoagulation prophylaxis PTE recurrent/acute	-	-	Y
		Pulmonary specialist consultation for management of chronic hypoxia and PAH	-	-	Referral to Higher centre
4	Hypertension	Antihypertensive (preferable ACE inhibitors and ARB) target BP 130/85 or less	Y	Y	Y
5	Renal disease,Proteinuria CKD,Hematuria , papillary necrosis UTI,Loss of urinary concentration ability	Investigation Urine routine & Microscopy Urine culture and sensitivity KFT ,Imaging -USG	 Y Y -	 Y Y Y	 Y Y Y
		Treat proteinuria* with ACE-I/ARB	Y	Y	Y
		Treat HT	Y	Y	Y
		Nephrology specialist consultation	-	-	D
		Hemodialysis			Y

Sr. No	Complication	Intervention	PHC	CHC	DH
6	Osteoporosis Bone disease-AVN, osteomyelitis, bone necrosis	Diagnosis X-ray	-	Y	Y
		Calcium+ vit D3	Y	Y	Y
		Pain management	Y	Y	Y
		OT/PT	-	Y	Y
		MRI			Desirable
		Orthopaedic assessment	-	-	Y
		Orthopaedic procedure	-	-	Y/D
7	Cardiac dysfunction LVH,MI,Heart failure	Investigations ECG 2D-ECHO Chest X- ray Iron level with ferritin NT-proBNP	 - - D - -	 Y - Y D -	 Y Y Y Y Referral to Higher centre for Echo and NT-proBNP
		Treatment ACE-I/ ARB/beta blocker/ Furosemide/ nitrates/ statin/iron chelation as indicated (Refer to higher centre for iron chelation therapy)	Y	Y	Y
		Cardiology specialist consult	-	-	Y/D
8	Hepatobiliary dysfunction Gall stones (pigment) CBD stones Hepatitis-acute & chronic Sequestration crisis Sickle cell cholangiopathy	Investigations LFT, PT, Iron, Viral markers- HBV, HCV, HAV, HEV USG abdomen	LFT, Viral markers	Y	Y
		Gall stone disease surgery	-	-	Refer to higher centre
		Iron chelation			y
		Surgery consultation	-	Y	Y
		Specialist gastroenterology consult	-	-	D

Sr. No	Complication	Intervention	PHC	CHC	DH
9	Leg ulcers	Dressings	Y	Y	Y
		Antibiotics-oral, topical	Y	Y	Y
		Pain treatment-NSAIDs	Y	Y	Y
		Opioids	-	Y	Y
		Hydroxyurea	Y	Y	Y
		Chronic BT	-	-	Y
		Surgery consultation	-	Y	Y
		Plastic surgery consult/ skin graft	-	-	Refer to higher centre
10	Eye disease Sickle retinopathy	Refraction	Y	Y	Y
		Ocular tension	-	D	Y
		Fundus examination (Fundus photos for online consult)	-	Y	Y
		Eye specialist consultation	-	D	Y
11	Neurological disease Headache Stroke Cognitive dysfunction Seizures	Investigations CT Scan MRI EEG	-	-	D
		Aspirin	Y	Y	Y
		HU	Y	Y	Y
		BT	-	Y	Y
		Seizures- drugs AED	Y	Y	Y
		Drugs - headache	Y	Y	Y
		Neurology Specialist consultation	-	-	Refer to higher centre
		OT/PT	-	Y	Y

Facilities at the next referral centre would include services available at the referring centre besides other services

*Proteinuria defined as 1+ or more on two occasions in an overnight first pass urine sample or timed urine collection exceeding 500mg/dl. UTI or hematuria should be ruled out, screen for Diabetes Mellitus& Hypertension.

Y: Yes; N: No; D: Desirable; OT/PT: Occupational Therapy/Physiotherapy; BT: Blood transfusion; SNRI: Serotonin Nor-epinephrine Reuptake Inhibitor, PBF-Peripheral Blood Film, ESA-Erythropoiesis Stimulating Agent; CBT: Cognitive Behavioural Therapy; PH: Pulmonary Hypertension; PAH-Pulmonary Artery Hypertension; AED-Anti-epileptic drugs.

ANNEXURE 7 :
LIST OF MEDICINE (ACCORDING TO LEVEL OF FACILITY)

Essential Medicines at various Health facilities			
SDH/ DH	**CHC**	**PHC**	**SHC**
Hydroxyurea Capsule *	Hydroxyurea Capsule	Hydroxyurea Capsule	Hydroxyurea Capsule
Clonidine Tablet	Ferrous Salt (A) + Folic Acid (B)	Ferrous Salt (A) + Folic Acid (B)	Ferrous Salt (A) + Folic Acid (B)
Ferrous Salt (A) + Folic Acid (B)	Ferrous Salts	Ferrous Salts	Ferrous sulphate + Folic acid Syrup
Ferrous Salts	Folic Acid Tablet	Folic Acid Tablet	Folic Acid Tablet
Folic Acid Tablet	Iron Sucrose Injection	IFA syrup	NSAIDs
Iron Sucrose Injection	Heparin Sodium Injection		
Heparin Sodium Injection	Warfarin Tablet		
Warfarin Tablet	IFA syrup		
Ibuprofen tablet/ Syrup Diclofenac Tablet/ Inj Paracetamol tablet/ syrup	Ibuprofen tablet/ Syrup Diclofenac Tablet/ Inj Paracetamol tablet/ syrup	Ibuprofen Oral Liquid / Tablet Diclofenac Tablet/ Inj Paracetamol tablet/ syrup	Ibuprofen tablet Diclofenac Tablet/ Inj Paracetamol tablet/ syrup
Penicillin	Penicillin	Penicillin	Penicillin
Clarithromycin Tablet	Clarithromycin Tablet		
Desferrioxamine Injection			
Enalapril Tablet	Enalapril Tablet	Enalapril Tablet	Enalapril Tablet
Tramadol capsule/ Inj Morphine Tablet/ Inj Codeine Tablet/ Oral solution	Tramadol capsule/ Inj Morphine Tablet/ Inj Codeine Tablet/ Oral solution	Tramadol capsule	

* As per IPHS, Hydroxyurea is available at SDH/DH, However, in states with high endemicity, Hydroxy urea can be made available up to the level of PHC by indenting from DH, with a system of monthly dispension to the CHO (in charge of HWC-SC) for identified SCD patients with a mandatory criteria of monthly follow up and required testing by the medical officer at PHC.

ANNEXURE 8 :
INDICATION FOR REFFERAL

Indications for referral to Medical officer at PHC:	• Acute pain without any relief with NSAID & hydration in 1 hour • Pain with associated features: ➢ Vomiting and unable to take medicines. ➢ Pain with documented fever more than 100.4°F/38° ➢ Pain with respiratory distress, either respiratory rate more than 24/min or saturation less than 95% ➢ Pain with increased jaundice or cola coloured urine or brown to black urine • Acute abdominal pain with distension • Central chest pain more than 20 minutes • Chest pain associated with breathing difficulty or low oxygen saturation less than 95% • Fever documented to be more than 100.4°F/38°C • Haemoptysis or blood in sputum • Stroke- motor weakness, asymmetrical face, unable to speak coherently, confused, unresponsive to command or pain • Blood in urine or decreased urine output (frequency less than 4 times or subjective reduction in volume • Painful penile erection • Acute worsening of skin pallor or jaundice • Cold clammy skin/ impending shock • Fits or seizures • All pregnant patients • Swollen Feet • Progressive difficulty in breathing superimposed on baseline limitation or on activities of daily living
Indication for referral to CHC	• Need for overnight hospitalisation- moderate-severe pain requiring opioid, mild -moderate acute chest syndrome • Need for simple blood transfusion • Need for clinic-based service

Indication for referral to District Hospital	• Need for ICU • Need for Exchange transfusion • High risk ANC/delivery in SCD mother • Specialty consultation- pain specialist, cardiology, pulmonology, neurology, nephrology, ophthalmology, Orthopaedics, surgery • Specialty investigations and labs- HPLC, Electrophoresis, ECHO, PFT, CT • At any level, the MO or specialist may evaluate for ambulatory care or admission to facility. Some of the criteria that necessitates admission is given below; • Admission criteria • Moderate to severe pain requiring overnight stay or not relieved in 6 hours' time with/without persistent vomiting not relieved with medication and requiring parenteral hydration • Fever with sepsis (fever with altered mental status or Respiratory rate>24/min or hypotension) • Acute onset of Hypoxia (SpO2<95% on room air or exercise desaturation greater than or equal to 5% from baseline or PaO2<80mmHg, assuming at sea level) due to any cause. • Hypotension • DVT/PTE • Acute sequestration crisis • Hyper-haemolytic crisis • Acute anaemia with haemoglobin decline >2gm% from baseline • Blood transfusion • Seizures/ Stroke • Acute renal failure • Priapism • Delivery in SCD patient. • Some patients may need admission for evaluation of their chronic complications and inpatient evaluation can expedite this process. • Social conditions can complicate the way patients access healthcare. These factors (e.g. long travel distance) may also be considered while evaluating admission criteria.

Indications for referral to tertiary centre	• Acute persistent Abdominal pain refractory to opioids and fluid therapy • Acute Cholecystitis • New AST/ALT elevation more than 3 or 4 times of normal • Fulminant Priapism lasting more than 4 hours • Acute onset Hemiparesis • Acute New onset Seizures • Altered level of Consciousness • Acute Respiratory Distress / Haemoptysis • Oxygen Saturation < 95% on oxygen mask • Persistent fever > 100*F documented on > 2 occasions despite antibiotics • Painful persistent joint swelling • Consultation with certain speciality/ areas and commensurate medicines/investigations may not be available at DH (as defined in IPHS) and hence would require further management at higher centres

LIST OF ABBREVIATIONS

ABHA	Ayushman Bharat Health Account
AB-HWC	Ayushman Bharat - Health and Wellness Centres
ACS	Acute Chest Syndrome
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
ASHA	Accredited Social Health Activist
AYUSH	Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy
BCC	Behaviour Change Communication
BMT	Blood or marrow transplant
CAS	Community Arogya Samiti
CBC	Complete Blood Count
CHO	Community Health Officer
CoE	Centres of Excellence
CPHC	Comprehensive Primary Healthcare
CSIR	Council of Scientific & Industrial Research
CVS	Chorionic Villous Sampling
DBS	Dried Blood Spot
DH	District Hospital
DHS	District Health Society
EMRS	Eklavya Model Residential School
GeM	Government e Marketplace
Hb	Haemoglobin
Hb A	Normal Haemoglobin
Hb S	Sickle Heamoglobin
HPLC	High-performance liquid chromatography
ICMR	Indian Council of Medical Research
IEC	Information, Education & Communication
JAS	Jan Arogya Samiti
MAS	Mahila Arogya Samiti
MO	Medical Officer
MoTA	Ministry of Tribal Affairs

MPW	Multi-Purpose Worker
NGO	Non-governmental organization
NHM	National Health Mission
NSAID	Non-steroidal anti-inflammatory drugs
OPD	Outdoor Patient Department
PCP	Primary Care Physicians
PHC-HWC	Primary Health Centre– Health and Wellness Centre
PMSMA	Pradhan Mantri Surakshit Matritva Abhiyan
PMSSY	Pradhan Mantri Swasthya Suraksha Yojana
PoC	Point of Care
PSG	Patient Support Group
RBC	Red Blood Cell
RBSK	Rashtriya Bal Swasthya Karyakram
RKSK	Rashtriya Kishore Swasthya Karyakram
SCD	Sickle Cell Disease
SCT	Sickle Cell Trait
SHC-HWC	Sub Health Centre - Health and Wellness Centre
SN	Staff Nurse
TCD	Transcranial Doppler
TIA	Transient Ischemic attack
UHWC	Urban Health and Wellness Centre
ULB	Urban Local Bodies
UPHC-HWC	Urban Primary Health Centre – Health and Wellness Centre
VHSNC	Village Health, Sanitation, and Nutrition Committees
VHSND	Village Health, Sanitation, and Nutrition Day
VOC	Vaso-occlusive crisis

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