

Genes Under the Heat; Sickle Cell and Climate Crisis

Amna Khalil

1st Year MBBS, Islamabad Medical and Dental College, Islamabad, Pakistan

Key points:

- Introduction to sickle cell anemia and climate change
- Causes and symptoms
- Diagnosis
- Prevention and control

Introduction

SCA is a genetic blood disease in which red blood cells sickle (become crescent-shaped), leading to blocked blood flow (painful vaso-occlusive crises), Oxygen deficiency damage to the organs, Higher infection risk. Warming and severe weather exacerbate sickle cell complications. Heat initiates painful vaso-occlusive crises, and cold provokes hazardous vasoconstriction. Dehydration hazards increase as humidity patterns change, and air pollution exacerbates respiratory conditions in susceptible patients. Climate-related disease transmission further compromises SCA individuals.

Cause and symptoms

Genetic disorder that produces misshapen red blood cells that obstruct blood flow. This disorder is passed on by both parents if they have the defective hemoglobin gene. The symptoms are:

1. Chronic anemia & tiredness
2. Sore vaso-occlusive crises
3. Puffy extremities
4. Recurrent infections
5. Damage to organs ⁽²⁾

Diagnosis

Sickle cell anemia can be diagnosed by:

Conventional methods:

Sickling/solubility tests (HbS detection)
Blood counts (anemia, thrombocytosis)
Hemoglobin electrophoresis (variant separation)

Advanced methods:

HPLC (accurate Hb quantitation)
PCR/RFLP (genetic mutation detection)
Lateral flow assays (screening)
Prenatal tests (CVS/amniocentesis) ⁽²⁾

Prevention and control

As climate change accelerates, SCA patients need individualized protection measures that integrate medical interventions and environmental acclimatization:

Improved Healthcare Systems

1. Create climate-resilient healthcare facilities with SCA-tailored emergency response procedures
2. Provide seamless access to hydroxyurea, pain relief, and blood transfusions

3. Educate healthcare workers on climate-activated SCA complications

Personal Risk Prevention

1. Institute personalized hydration schedules (3+ liters/day, boosted during heatwaves)
2. Offer cooling support programs for air conditioning provision
3. Dispense portable oxygen monitors for prompt hypoxia identification

Community-Level Interventions

1. Establish early warning systems for heat/cold warnings for SCA population
2. Establish shaded community cooling centers in high-risk zones
3. Establish mobile clinics for crisis prevention during extreme weather

Infection Control

1. Scale up vector control programs in malaria-endemic areas
2. Enhance vaccination programs for climate-sensitive diseases
3. Enhance indoor air quality monitoring for respiratory protection. ⁽¹⁾

References

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