



A Comparative Study of Point-of-Care Haemoglobin Electrophoresis for Newborn Screening in Rural Sierra Leone: A Cost-Effectiveness Analysis from an African Perspective

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Abstract

Sickle cell disease (SCD) is a significant public health burden in sub-Saharan Africa, contributing to high infant mortality. Conventional newborn screening using laboratory-based haemoglobin electrophoresis is frequently inaccessible in rural areas due to cost and logistical challenges. This study aimed to compare the cost-effectiveness of a point-of-care (POC) haemoglobin electrophoresis device against a standard laboratory-based approach for newborn screening in rural Sierra Leone. A comparative cost-effectiveness analysis was conducted from a healthcare provider perspective. Two rural districts were modelled: one using a POC device and the other using the central laboratory pathway. Data on costs, test turnaround times, and projected health outcomes were analysed to determine the incremental cost-effectiveness ratio. The POC strategy was more cost-effective for rural screening. It reduced the mean turnaround time for results from several weeks to two days. The POC pathway demonstrated a lower cost per correctly diagnosed case, largely due to reduced travel and sample transport expenses. Point-of-care haemoglobin electrophoresis represents a financially viable and more effective model for newborn SCD screening in remote, resource-limited African settings compared to centralised laboratory systems. National health policies in similar contexts should consider piloting and integrating POC devices into newborn screening programmes. Further research should evaluate long-term clinical outcomes and the feasibility of scale-up. sickle cell disease, newborn screening, point-of-care testing, haemoglobin electrophoresis, cost-effectiveness analysis, sub-Saharan Africa, health economics This study provides a practical, evidence-based economic analysis to inform the adoption of point-of-care diagnostic technologies for sickle cell disease in rural African health systems.

Keywords: *Sickle cell disease, Sub-Saharan Africa, Point-of-care diagnostics, Haemoglobin electrophoresis, Newborn screening, Cost-effectiveness analysis, Rural health systems*

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