Published in final edited form as:

Lancet Haematol. 2014 October 01; 1(1): e11–e12. doi:10.1016/S2352-3026(14)70017-1.

Managing the burden of sickle cell disease in Africa

Frédéric B. Piel, PhD^{1,§}, David C. Rees, MD², Thomas N. Williams, MD, PHD^{3,4}

¹Department of Zoology, University of Oxford, Oxford, UK

²Department of Paediatric Haematology, King's College Hospital NHS Foundation Trust, King's College London, London, UK

³Kenya Medical Research Institute–Wellcome Trust Research Programme, Centre for Geographic Medicine Research-Coast, Kilifi County Hospital, Kilifi, Kenya

⁴Department of Medicine, Imperial College, St Mary's Hospital, London, UK

Sickle cell disease (SCD) is a genetic disorder of growing global public health importance.¹ More than 300,000 homozygous neonates (HbSS) suffering from sickle cell anaemia (SCA) - the most common form of SCD globally¹ - are born every year, three-quarters being born in Sub-Saharan Africa.² Recent estimates based on demographic projections suggest that this number could rise to 400,000 by 2050.³ Relatively little is known about the natural history of SCD, particularly in Africa, and about the epidemiology of clinically relevant forms of SCD - HbSC disease and HbS-β-thalassaemia in particular.⁴ Even in resource-rich regions, it can be difficult to estimate the burden of SCD accurately.⁵ The difficulties are even greater in high-burden resource-poor countries where data on mortality rates of SCD patients are very limited,⁶ meaning that it is currently impossible to produce a credible estimate of the total number of individuals currently affected by SCD globally.

Positive advances have recently been made towards increasing awareness about SCD. In 2006, the World Health Organization recognised SCD as a global public health problem while a few years later, the 63rd World Health Assembly adopted a resolution on the prevention and management of birth defects, including SCD. September has become “sickle cell awareness month” in the USA, while the 19th of June has been delegated “World Sickle Cell Day” by the United Nations. Finally, since the 2010 edition of the Global Burden of Diseases, Injuries, and Risk Factors Study, SCD has been included in this comprehensive and systematic evidence-based assessment of the burden of major diseases and injuries. However, the impact of these changes has been limited, particularly from the perspective of patients living in resource-poor regions.

In recent decades, notable improvements have been achieved regarding the diagnosis and treatment of SCD in high- and middle-income countries including the introduction of penicillin prophylaxis in the under-5s, primary stroke prevention using transcranial Doppler ultrasonography and regular transfusions, and the use of hydroxyurea to reduce the frequency of acute complications in children and adults. Early diagnosis, particularly

[§]Corresponding author: fred.piel@zoo.ox.ac.uk.

The authors have no conflict of interest to declare.

through national screening programmes in countries such as the UK and USA, has facilitated the implementation of these interventions. Together with advances in general medical care, this has led to almost universal survival beyond the age of 18 in these countries, in contrast to almost certain death before the age of 10 in the 1950s; however, this encouraging picture needs to be balanced by i) the reality that, even with the best of care, life expectancy is still reduced by 20 to 30 years; ii) the huge financial costs of routine treatment and emergency care for patients with SCD; iii) a relatively poor quality of life during adulthood; and iv) the fact that the huge social and psychological impact of SCD on patients and their families remains under-appreciated. Whereas, a large number of small-molecule drugs have been designed specifically for various malignant diseases, no new drugs have been designed that specifically target the pathophysiology of SCD and there is therefore a pressing need to develop new pharmaceutical agents based on advances in molecular technologies.

The situation in Sub-Saharan Africa is alarming. Across large parts of the region, the birth prevalence of SCD exceeds 1%, fertility rates remain high, health infrastructures are poorly developed, and educational opportunities are limited, contributing to sustain inaccurate beliefs about the nature of the disease and its inheritance. In line with the 4th Millennium Development Goal, many countries within the region have achieved substantial reductions in childhood mortality. While undoubtedly positive, one direct consequence is that an increasing number of babies born with SCD in Sub-Saharan Africa are now surviving into later childhood, yet a lack of diagnostic and treatment facilities means that many are not receiving the health care that they require and will suffer unnecessarily from severe clinical complications, including recurrent pain, vasculopathy, heart disease, renal complications, acute chest syndrome and priapism. In addition, the lack of detailed epidemiological data, cost-effectiveness studies, mortality and morbidity data means that the evidence-base to support financial and political engagement is weak.

The research and clinical communities working on SCD face a difficult choice. One option, roughly in line with current public health agendas but unacceptable in our view, would be to wait for a greater evidence to be assembled before taking action. An improved cheap, reliable and rapid diagnostic test for SCD would be a key development. Nevertheless, considering the numerous public health and political challenges that African countries are currently facing (including the current Ebola outbreak and polio eradication efforts) and the relative neglect from which SCD is still suffering, the prospects of significant short-term improvements for patients suffering from SCD in Sub-Saharan Africa seem very limited.

The alternative, which we favour, would be to establish an immediate concerted international commitment from governments, funding agencies, pharmaceutical companies and the research and medical communities to develop a specific public health agenda for Sub-Saharan Africa in order to scale up available interventions and reduce the health burden of SCD.⁷ A good example of the benefits of such a proactive approach is provided by Graham Serjeant's Jamaican cohort of 100,000 neonates followed since the early 1970s.⁸ Alongside major improvements in the life-expectancy and quality of life of patients born with SCD, this study - initiated with financial support from UK institutions - allowed (and still does allow) the gathering of valuable data on the epidemiology, clinical course and phenotypic

diversity of the disease.⁴ There is growing evidence that the introduction of newborn screening in high-risk populations and the implementation of simple and affordable interventions similar to those successfully used in high-income countries could save the lives of many thousands of children in African countries and result in significant improvements in their quality of life throughout childhood and adulthood.^{9,10} To date, no African country has implemented a nationwide newborn screening programme nor introduced the systematic use of penicillin prophylaxis and vaccination against *Streptococcus pneumoniae* and *Haemophilus influenzae type b* for all children with SCD. This would be particularly useful in Nigeria and the Democratic Republic of the Congo, where 45% of all affected births currently occur.³ Several global and regional networks bringing together clinicians, researchers and patients, including the Global Sickle Cell Disease Network (GSCDN) and the Sickle Cell Disease Research Network of Central Africa (REDAC), have already been set up but their impact will remain limited without further financial and political support.

The benefits of better prevention and management of SCD in Africa would inevitably have a substantial public health impact globally. We therefore advocate for the development of a proactive public health agenda to reduce the long-term burden of SCD in Africa.

References

1. Rees DC, Williams TN, Gladwin MT. Sickle-cell disease. *Lancet*. 2010; 376(9757):2018–31. [PubMed: 21131035]
2. Piel FB, Patil AP, Howes RE, et al. Global epidemiology of sickle haemoglobin in neonates: a contemporary geostatistical model-based map and population estimates. *Lancet*. 2013; 381(9861): 142–51. [PubMed: 23103089]
3. Piel FB, Hay SI, Gupta S, Weatherall DJ, Williams TN. Global burden of sickle cell anaemia in children under five, 2010–2050: modelling based on demographics, excess mortality, and interventions. *PLoS medicine*. 2013; 10(7):e1001484. [PubMed: 23874164]
4. Serjeant GR. The natural history of sickle cell disease. *Cold Spring Harbor perspectives in medicine*. 2013; 3(10)
5. Hassell KL. Population estimates of sickle cell disease in the U.S. *American journal of preventive medicine*. 2010; 38(4 Suppl):S512–21. [PubMed: 20331952]
6. Grosse SD, Odam E, Atrash HK, Amendah DD, Piel FB, Williams TN. Sickle cell disease in Africa: a neglected cause of early childhood mortality. *American journal of preventive medicine*. 2011; 41(6 Suppl 4):S398–405. [PubMed: 22099364]
7. Weatherall DJ. The challenge of haemoglobinopathies in resource-poor countries. *British journal of haematology*. 2011; 154(6):736–44. [PubMed: 21726207]
8. Serjeant GR, Serjeant BE. Management of sickle cell disease; lessons from the Jamaican Cohort Study. *Blood reviews*. 1993; 7(3):137–45. [PubMed: 8241829]
9. Williams TN, Uyoga S, Macharia A, et al. Bacteraemia in Kenyan children with sickle-cell anaemia: a retrospective cohort and case-control study. *Lancet*. 2009; 374(9698):1364–70. [PubMed: 19747721]
10. Mulaku M, Opiyo N, Karumbi J, Kitonyi G, Thoithi G, English M. Evidence review of hydroxyurea for the prevention of sickle cell complications in low-income countries. *Archives of disease in childhood*. 2013; 98(11):908–14. [PubMed: 23995076]