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ORIGINAL ARTICLE

Haemoglobin Profile of Newborns Using the SC Haemotype Test at the Kpalimé Prefectural Hospital Centre, Togo

Mawouto Fiawoo*, Mensa Amblasso, Hèzouwè Magnang, Mazama Pakoudjare, Sofako Egloh, Ayoko Agbodaze, Ahoéfa Vovor and Nadiedjoa Kokou Douti

Department of Paediatrics, Faculty of Health Sciences, University of Lomé, Togo

***Corresponding author:** *Mawouto Fiawoo, Department of Paediatrics, Faculty of Health Sciences, University of Lomé, Togo*

Abstract

Introduction: Sickle cell disease is a monogenic disease due to the substitution of a glutamic acid by a valine at position 6 in β-globin leading to the production of abnormal S hemoglobin. The objective was to determine the hemoglobin profile of newborns at Kpalimé hospital.

Methods: This was a prospective cross-sectional study conducted from 1 July to 30 September 2024 at the maternity ward of the Kpalimé Prefectural Hospital Centre, focusing on newborns and their parents.

Results: A total of 298 newborns were screened. The sex ratio of newborns was 1.01, and 6.7% of newborns were born to consanguineous parents. The prevalence of major sickle cell disease was 3.3%, including 2.3% homozygous SS and 1% heterozygous SC. Sickle cell traits AS, AC and haemoglobin CC were found in 12.1%, 6.4% and 1.7% of newborns, respectively. Normal haemoglobin AA was found in 76.5% of newborns. The prevalence of the sickle cell gene was 15.4%. Parents, including 90.9% of mothers and 96.3% of fathers, didn't know their haemoglobin status.

Conclusion: The prevalence of haemoglobinopathies S and C was high. Genetic counselling is important to reduce the incidence of this disease.

Keywords

Sickle cell disease, Newborn, SC haemotype, Togo

Introduction

Sickle cell disease is a serious monogenic genetic disorder of red blood cells caused by the substitution of glutamic acid with valine at position 6 in β-globin, resulting in the production of abnormal haemoglobin (HbS) [1,2]. As the most common genetic disorder in the world, it is a major public health issue. According to the World Health Organisation (WHO), in 2021, 7.74 million people worldwide had sickle cell disease, with 515,000 new cases, mainly in sub-Saharan Africa, which accounted for nearly 80% of global cases. Sickle cell disease is responsible for significant mortality among children under 5 years of age: 81,100 deaths in 2021, making it the 12th leading cause of death in this age group when considering the total burden of mortality. Hydroxyurea has reduced many major complications. Neonatal screening combined with parental education and comprehensive care can significantly reduce morbidity and mortality during the first year and early childhood [3].

Neonatal screening programmes are being implemented in many countries to identify infants with sickle cell disease at an early stage. This usually involves analysing a blood sample taken from newborns to detect abnormalities in haemoglobin profiles. Early diagnosis through neonatal screening allows for rapid intervention and prompt treatment of affected infants [4]. In Togo, neonatal screening for hemoglobin disorders using the isoelectrophocalisation technique was carried out in 1988 and then in 1998 [5,6]. Not only was this technique difficult to implement routinely in Togo, but there was also the problem of follow-up, and neonatal screening for sickle cell disease was not made systematic in Togo. Since February 2024, the National Centre for Sickle Cell Research and Care has provided the maternity ward of the Kpalimé Prefectural Hospital Centre with SC haemotype tests for neonatal screening

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for sickle cell disease. The aim of this study was to describe the haemoglobin profile of newborns at the Kpalimé Prefectural Hospital Centre.

Methods

This was a prospective cross-sectional study conducted from 1 July to 30 September 2024 at the maternity ward of the Kpalimé Prefectural Hospital Centre, focusing on newborns and their parents. The sampling was exhaustive. Our study included newborns delivered at the maternity ward of the Kpalimé Prefectural Hospital Centre who underwent neonatal screening for sickle cell disease and whose results were available. Newborns who were referred and those delivered at the maternity ward of the Kpalimé Prefectural Hospital Centre who were not screened or whose results were invalid or unavailable were not included. Newborns whose parents were reluctant were excluded. The SC haemotype was the screening test used.

The parameters studied were neonatal screening results, parents' sociodemographic data, and parents' knowledge of their own haemoglobin status. The data collected were processed using Excel SPSS (Statistical Package for the Social Sciences) software. Authorisation from the ethics committee of the Faculty of Health Sciences was obtained before the study began.

Results

A total of 298 newborns were included. Homozygous sickle cell disease (SS) and double heterozygote sickle cell disease (SC) were found in 2.3% and 1.0% of cases, respectively (Figure 1).

The fathers had a mean age of 34.8 ± 7.8 years and the mothers had a mean age of 27.9 ± 7.3 years (Table 1).

In 57.1% of cases, fathers had completed secondary education, with 42.0% having completed lower secondary education and 15.1% having completed upper secondary education. In 59.7% of cases, mothers had completed secondary education, with 44% having completed lower secondary education and 15.7% having completed upper secondary education (Figure 2).

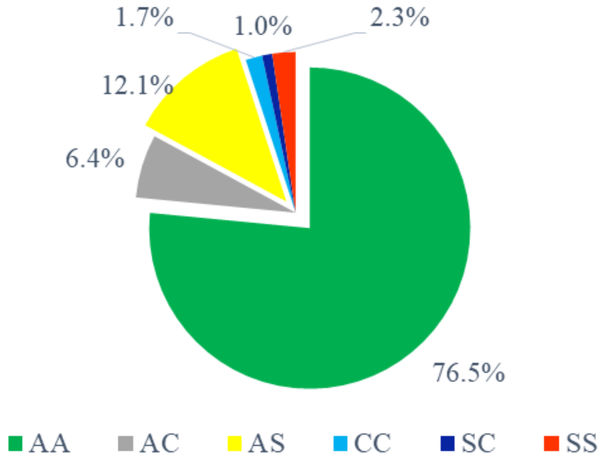

Figure 1: Distribution of newborns according to screening results.

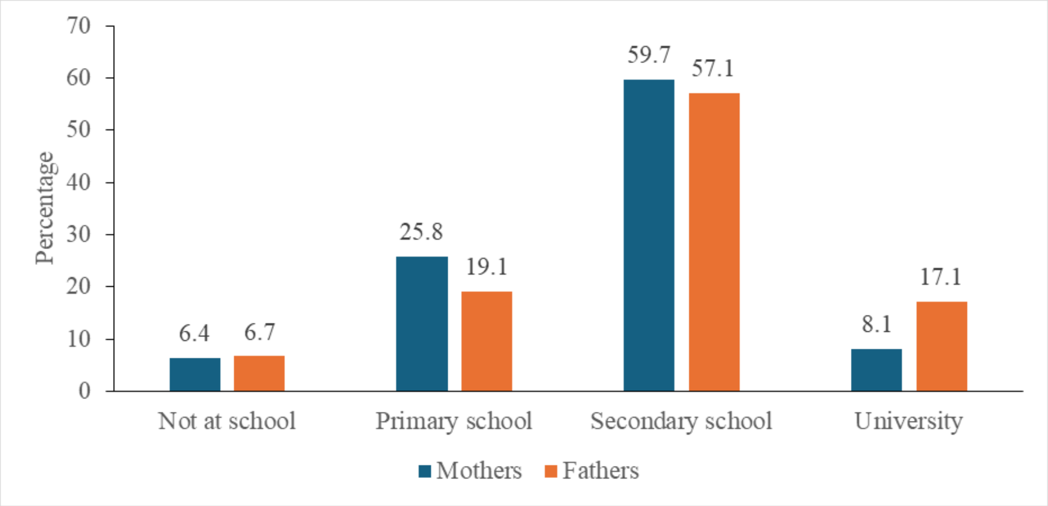

Figure 2: Distribution of mothers and fathers by level of education.

Table 1: Distribution of parents by age.

		Father's age (years)	Mother's age (years)
Mean		34.8	27.9
Standard deviation		7.8	7.3
Minimum		18	14
Maximum		60	57
Percentiles	25	29.8	22.0
	50	35.0	27.0
	75	40.0	34.0

Newborns from consanguineous parents accounted for 6.7% of cases. In 90.9% of cases, mothers did not know their haemoglobin status. They had haemoglobin AA (5.4%), AS (1.3%), AC (0.7%), SS (0.7%) and SC (1.0%). In 96.3% of cases, the fathers didn't know their haemoglobin status. They had haemoglobin AA (2.4%), AS (0.3%), AC (0.3%) and SS (0.7%).

Discussion

The frequency of major sickle cell disease was 3.3% in newborns, with 2.3% of the homozygous SS form and 1% of the double heterozygous composite SC form. North, et al. in Togo in 1988, Segbena, et al. in Togo in 1998, and Shongo, et al. in the DRC in 2017 found 2.3%, 3.4%, and 3.4% of newborns with major sickle cell syndrome, respectively [5-7]. The frequency of haemoglobin AS was 12.1%. Shongo, et al. in the DRC in 2017 found 12.14% of AS [7]. This rate of major sickle cell disease remains high. Systematic screening for sickle cell disease combined with genetic counselling for adolescents (with sickle cell disease or AS) and their parents will help to reduce the proportion of major sickle cell disease within the population.

The mean age of mothers was 27.9 years. Djadou, et al. in Togo in 2018 found a mean age of 26 years among mothers [8]. Tchente, et al. in Cameroon in 2016 found a mean age of 29 among mothers [9]. This similarity in the age of mothers could be explained by the fact that this is the optimal age range for women to have children in our communities. A proportion of 6.7% of newborns were born to consanguineous couples. The rate of consanguineous marriage was 56% in a study in Saudi Arabia in 2005, but the authors didn't find a statistically significant link with sickle cell disease [10].

Almost all parents didn't know their haemoglobin status (90.9% of mothers and 96.3% of fathers). This could be because people don't know much about sickle cell disease and don't get prenatal tests done, like haemoglobin electrophoresis for pregnant women. In 2023, a study in Burkina Faso on the knowledge and attitudes of pregnant women and health workers regarding early screening for sickle cell disease reported that 40.19% of pregnant women didn't know their haemoglobin status [11]. Healthcare workers must raise awareness of sickle cell disease among the population and strongly recommend that all pregnant women undergo routine haemoglobin electrophoresis.

Conclusion

The frequency of sickle cell disease and its gene in newborns at the Kpalimé Prefectural Hospital Centre was high. Most parents didn't know their haemoglobin status. Further studies on neonatal screening for sickle cell disease in other health facilities with larger sample sizes would provide much more representative data at the national level.

Competing Interests

The authors declare no competing interests.

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