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Haemoglobin Bart's and α -Thalassaemia in African Children

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Haemoglobin Bart's may be considered as a sensitive indicator of α -thalassaemia [1]. A few months after birth, during the switching over process when Hb F is replaced by Hb A, Hb Bart's disappears; however, lower MCH, MCHC and MCV values persist in later life. Hydrops fetalis and Hb H diseases have not been reported in the African populations.

Nhonoli et al. [2] investigated 325 cord blood samples of newborn Tanzanians of whom 33 (11.08%) had Hb Bart's. 20 of these children had Hb Bart's less than 5%. They have also noted that MCH and MCV values were lower in patients with Hb Bart's. They claim that a close relationship between MCH and MCV is not specific in patients with Hb Bart's, but it is a natural relationship which holds true in normals. On the basis of haematological investigations and statistical analyses they concluded that Hb Bart's in newborn Tanzanians they have examined seems not to be related to α -thalassaemia.

They support the postulation by Esan [3] that increase of amounts of Hb Bart's do not always indicate the presence of α -thalassaemia but may represent a development abnormality that is asynchronous of the neonatal switch off of γ -chains and activation of β -chain production. Nhonoli et al. [2] had not examined both parents of the children and note that they had no facilities for biosynthesis studies.

We have investigated [4] 8 Ghanian children of whom 7 were found to have 4-6% Hb Bart's at the time of birth and they were reinvestigated at the age of about 4 years together with their mothers and also the father of 2 of them. The children were also heterozygous for H6 S and 1 for H6 C, while the mothers had a Hb S heterozygosity. All 7 children had Hb values less than 12 g/dl, MCH was lower than 27 pg, and MCHC was below 32 g/dl and MCV was less than 75 fl. The biosynthesis analysis with ^{14}C -labelled leucine showed that in all 7 children the β/α ratio was increased, i.e. higher than 1.4. A high ratio was also found in 2 of the mothers. The ratio for normal controls varied between 0.90 and 1.2 in our laboratory.

Our investigations [5] were compared with American Black children who had Hb Bart's at birth. The African children with 5% Hb Bart's were termed as having 'moderate amounts of Hb Bart's' while the black children with 2% Hb Bart's were referred to as having 'small quantities of Hb Bart's'. A distinct chain deficiency was evident for all children with 5% Hb Bart's (average β/α ratio of 1.51). This deficiency was also present in the children with 2% Hb Bart's but much less marked (average β/α ratio of 1.27).

2 of the mothers of the Ghanaian children with the 5% Hb Bart's showed a mild α -chain deficiency. Data obtained by our study seemed to indicate that an α -chain deficiency in the parents is the underlying cause for the presence of Hb Bart's at birth.

Children with about 5% Hb Bart's at birth have the genotype $-a/-a$ or, rarely the $-aa$ genotype, when only two Hb structural loci instead of four are active, a modest deficiency in α -chain production will be the result. The presence of the $-a/aa$ genotype could be predicted from the small amounts of Hb Bart's at birth and from data of the haemoglobin synthesis analyses in older children and adults. It often appears difficult to distinguish between the expression of genotypes $-a/aa$ and aa/aa ; babies with the latter do not have an α -chain deficiency. Among the 7 Ghanaian children probable genotypes based on haematological and haemoglobin synthesis data were the following: 2 children had the genotype $-a/-a$; 3 had either $-a/-a$ or $-a/aa$, and the last 2 children had the genotype $-a/aa$.

It was also interesting to read Piliszek's [6] paper on the incidence of Hb Bart's in South African black babies. He examined 430 cord bloods of which only 7 (1.6%) could be identified to have Hb Bart's ranging from 1.3 to 5.5% of the haemoglobin. He noted that Hb Bart's is considered as an indicator of thalassaemia in the Chinese, the Thais and Saudi Arabians, in Negroid populations the picture is less clear. The purpose of his study was to cast further light on the understanding of the thalassaemia mutations in indigenous black African people. In his interpretation of children with Hb Bart's in South Africa he claims that his findings point to the presence of a certain type of α -thalassaemia. Nhonoli et al. [2] and Pilis-

zek [6] arrived at different conclusions in their interpretation of data about newborn Tanzanians and South African black babies respectively. This may be partly due to the heterogeneity of α -thalassaemia among indigenous African populations or to a lack of sophisticated diagnostic techniques. Our investigations of Ghanaian children seems to confirm the usefulness of biosynthesis studies of both children and their parents. This could lead a farther step ahead in the understanding of thalassaemia in African children.

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