
The Haemoglobin G Makassar (Codon 6 GAG>GCG) Cases in Malaysia: Molecular Identification and Characterization

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The aims of this study are to identify and characterize the Haemoglobin G Makassar. Haemoglobin G Makassar was identified in Makassar, Sulawesi (Celebes), Indonesia in 1969 and has been reported in a family of Thai origin in 2002. Haemoglobin G Makassar was found to share identical properties with haemoglobin S in routine haemoglobin separation by cation-exchange HPLC. It is therefore, patients with Haemoglobin G Makassar and Haemoglobin S may sometimes be mistakenly identified for each other.

There were four cases identified from year 2015 to 2016 in Peninsular Malaysia by Molecular Genetics Laboratory, Institute for Medical Research. All patients were asymptomatic with mild hypochromic microcytic anaemia. All patients were analysis with Haemoglobin S trait. Analysis by Capillary Electrophoresis showed that these patients had 39.9 to 44.0% of haemoglobin variant in zone S. Alpha and Beta globin gene analysis were performed on these samples.

DNA sequence analysis, revealed a single nucleotide substitution GAG to GCG at codon 6 of the beta-globin gene (Glu>Ala), indicating of Haemoglobin G Makassar for all the patients (Fig. 1). All patients were positive with Haemoglobin S trait. Multiple Amplification Refractory Mutation System (MARMS) PCR for Haemoglobin S was negative in all cases. However alpha-globin gene analysis showed that two of them had single alpha deletion ($\alpha^{3.7}$). The mean reading for HGB is 11.95 g/dL, for MCV is 72.1 fL and for MCH is 23.65 pg which all are lower than normal peoples.

The screening method may mistakenly identify Haemoglobin G Makassar as Haemoglobin S. Therefore identification and characterization of Haemoglobin G Makassar by several molecular methods such as polymerase chain reaction (PCR) and sequence analysis are necessary for confirmation of the diagnosis.

Table 1. Hematological summary of four patients

	Patient 1	Patient 2	Patient 3	Patient 4	Mean
HGB	11.4 g/dL	13.1 g/dL	11.8 g/dL	11.5 g/dL	11.95 g/dL
MCV	69.2 fL	74.9 fL	67.8 fL	76.5 fL	72.1 fL
MCH	22.0 pg	25.1 pg	22.8 pg	24.7 pg	23.65 pg

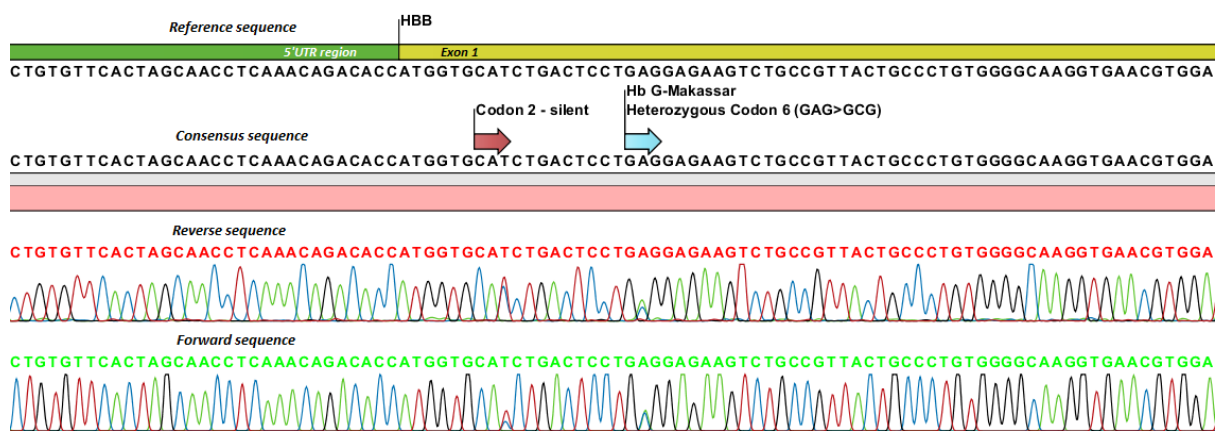


Fig. 1: shows sequence analysis of point mutation at codon 6 (GAG>GCG) of beta-globin gene.

Keywords: Haemoglobin G Makassar, Haemoglobin S, Molecular Identification, MARMS-PCR

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