Haematological and Molecular Characterisation of Haemoglobin E with Deletional Alpha-Thalassaemia among Kelantan Subjects

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Abstract

Heterozygous haemoglobin E (Hb E) with deletional alpha (α)-thalassaemia is commonly seen in Southeast Asia including Kelantan, a Northeastern state of Malaysia. Studies in Malaysia showed that Hb E is the commonest among Malay Kelantan, Penang and Senoi group of Orang Asli [1–5].

This study aimed to compare the haematological parameters (Hb, RBC, MCV, MCH, RDW and Hb E) among the heterozygous Hb E with deletional α-thalassaemia subjects. This study also intended to ascertain a cut-off value for heterozygous Hb E with deletional α-thalassaemia using automated capillary electrophoresis method.

A cross-sectional study was conducted involving secondary data collection of 219 samples of heterozygous Hb E with possible α-thalassaemia from all districts of Kelantan. Full blood count (FBC) was analysed using Sysmex XN 3000 automated blood cell analyser (Kobe, Japan). Hemoglobin (Hb) analysis was performed using automated CE system (Capillaries2; Sebia, France). Molecular characterisation was performed using multiplex gap-PCR and ARMS-PCR to detect both deletional and non-deletional α-thalassaemia, respectively. Qualitative data were expressed as frequency and percentage while quantitative data were expressed as mean, ± SEM and median. One-way ANOVA was used to test for mean Hb level, RBC count, MCV level, MCH level, and RDW level differences among six groups of heterozygous Hb E with concurrent deletional alpha thalassaemia in this study. The ROC curve was used to determine the cut-off point for Hb E level.

Eighty-nine samples of heterozygous Hb E were confirmed to have concurrent deletional α-thalassaemia. Heterozygous Hb E with heterozygous α3.7 gene deletion was the most common deletional α-thalassaemia observed in 56 samples (62.9%) and followed by heterozygous SEA gene deletion which were detected in 21 samples (23.6%). The haematological parameters showed there was a significant difference between groups. The cut-off point for Hb E level for predicting heterozygous Hb E with deletional α-thalassaemia...
from CE method was 24.7% (Table 1). The diagnostic performance for the cut-off point for Hb E level showed sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of 100% for all.

Table 1: Type of deletional alpha thalassemia in Kelantan

<table>
<thead>
<tr>
<th>Types of deletional alpha thalassemia</th>
<th>Number of patients (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterozygous α^3.7^ gene deletion</td>
<td>56</td>
<td>62.9</td>
</tr>
<tr>
<td>Heterozygous α^4.2^ gene deletion</td>
<td>3</td>
<td>3.4</td>
</tr>
<tr>
<td>Heterozygous SEA gene deletion</td>
<td>21</td>
<td>23.6</td>
</tr>
<tr>
<td>Homozygous α^3.7^ gene deletion</td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>Compound heterozygous α^3.7^ and α^4.2^ gene deletion</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Compound heterozygous α^3.7^ and SEA gene deletion</td>
<td>4</td>
<td>4.5</td>
</tr>
</tbody>
</table>

This cut-off value can be used in assisting the selection of heterozygous Hb E individual to proceed with DNA analysis for α-thalassaemia.

Keywords
ARMS-PCR, α-thalassaemia, Hb analysis, Hb E, Gap-PCR,

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References