ORIGINAL ARTICLE

Diagnostic Significance of Haemogram Parameters and RBC Indices in Haemoglobin E Trait

*T Khondaker[1], AKJ Ahmed[2], SK Amin[3]

ABSTRACT

Background: Hemoglobin E disease are the most common structural haemoglobinopathies, reaching its highest frequency in South East Asia and also prevalent in Bangladesh. There are very few data for effective screening of HB E trait. The aim of the study was to analyze hematological profile and RBC indices as a marker of screening for Hb E trait.

Methodology: A cross sectional observational study was conducted among 150 subjects at Dhaka Shishu (Children) Hospital from December 2008 to November 2009. On the basis of Hb electrophoresis, all subjects were divided into three groups. Group I comprised of 50 subjects with Hb E trait, group II comprised 51 subjects with ß thalassemia trait and Group III comprised of 49 normal subjects. Result of RBC indices and blood count were compared between Hb E trait and normal study population.

Results: In group I the mean age was 29.53 years and the age range was 2-47 years. In group II the mean age was 30.31 years and the range was 1-55 years. In group III the mean age was 21.81 years and the range was 1-52 years. The present study revealed the mean±SD haemoglobin level (g/dl) in group I (E trait) and group III (normal subjects) were 11.76±1.91 and 10.77±1.4 respectively. Statistically no significant difference was found between these 2 groups (P>.05). The mean corpuscular volume (MCV) in mean±SD in group I and group III were 72.89±12.24 fl and 77.35±10.27 fl respectively. No statistical significance was found as P>0.05. The mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) in group I were 24.84±2.71pg & 32.97±2.27 g/dl and in group III were 28.28±2.71 pg & 32.97±2.38 g/dl respectively. There were no significant difference between group I and III regarding MCH and MCHC.The mean RBC count in E trait and normal subject group were 5.01±71 million/cmm and 4.61±0.65 million/cmm respectively. There was no significant difference was found P>0.05. Mean red cell distribution width (RDW) in group I and III were 14.32 ±2.34 and 14.83±1.28 without any statistical difference (P>0.05)

Conclusion: In our study there were no diagnostic significance of Blood count and RBC Indices for detection of Hb E trait. More study should be conducted to find out reliable marker of screening for Hb E carrier.

Key Words: Hb E Disease, Hb E Trait. ß Thalassemia trait

Introduction

Hemoglobinopathies and thalassaemia are heterogeneous group of hereditary disorders prevalent worldwide[1]. They represent a major public health problem in many areas of the world including South East Asia[2]. The hereditary disorder of haemoglobin usually present as either a reduced rate of production of one or more of the globin chain (thalassaemia) nor those in which there is

[1]Dr Tarannum Khondaker, Junior Consultant, NICU, Anwer khan Modern Medical College & Hospital

[2]Dr Abul Kashem Jalaluddin Ahmed, General practitioner, Drayton Street Family Practice, Nanango, Australia

[3]Dr Syed Khairul Amin, Professor and Head, Department of paediatrics, Anwer khan Modern Medical College and Hospital

**Corresponding Author*

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structural changes in a globin chain like Hb E, Hb C, Hb D etc[3]. Hb E is the second most prevalent Hb variant in the world and has a worldwide carrier of 53 million.4It is estimated that about 250 million people (4.5% of the population) carry a potential pathological haemoglobinopathy gene and about 3,00,000 infants are born with major haemoglobinopathies[6]. Haemoglobin E is the second most common variant haemoglobin worldwide and it is the hallmark of South East Asia and extends from Eastern part of India, Bangladesh, Burma, Laos, Thailand and Cambodia. It is estimatated that 30 million South East Asians are heterozygous of Haemoglobin E[7]. It has been noted to be an important health problem in the Indian subcontinent and South east Asia. It has replaced B thalassemia as the most common thalassemia disorder in many regions. The frequency of Hb E approaches 60% in many regions of Thailand, Laos and Cambodia. The World Health Organization (WHO) estimated that in Thailand at least 1,00,000 new cases of Hb Eß thalassemia are expected in the next few decades[8].

There is no definite data regarding carriers of hereditary disorder existing in Bangladesh. A conservative World Health report has estimated that 3 percent (3.6 million) carriers of ß thalassemia and 4 percent(4.8 million) are carriers of Hb E in Bangladesh. More than two thousand thalassemic children are born every year in Bangladesh[9]. A study showed that carrier status of Hb E is 6.1 % and about 40% from tribal children of Bangladesh[10].

Hb E is caused by a substitution of glutamic acid by lysine at position 26 of the ß globin chain[11]. Patient of Hb E trait has no clinical significance. Patient may have mild microcytosis without anemia.

The impact of problem is that haemoglobin E carriers and homozygous Hb E people can produce diseased off spring if they get married with ß thalassemia carriers. The Hb E/ß thalassemia compound heterozygote is the most common abundant form of thalassemia disease in Bangladesh[10]. The compound heterozygote state of Hb E ß thalassemia results in a variable phenotype ranging from a complete lack of symptoms to transfusion dependency[13,14]. Approximately one half of the patients are phenotypically similar to patients with thalassemia major who require regular transfusion therapy and the other half resembles thalassemia Intermedia[15]. Transfusion dependent severe E ß thalassemia patients need regular blood transfusion, iron chelation therapy and treatment of various complications which are very expensive. In India,the cost of treatment of thalassemic child amounts to Rs 90,000 to 100,000 annually at around 3 years of age which increases as the child grows. As a poor country , it is not possible for us to bear expense of treatment of thalassemia patient. The only available curative treatment of thalassemia is bone marrow transplantation which is far beyond our reach. Majority of the patient die due to lack of treatment[16]. The present management gives a probable life expectancy beyond third or fourth decade. The quality of life of patients and burden of the families due to treatment represents for public health service clearly underline the fundamental aspects of prevention rather than treatment[17,18]. Prevention which includes population education, mass screening, genetic counseling and prenatal diagnosis is the only effective way to cope with such disease[16,18]. For effective genetic counseling the population at risk needs to be identified. The aim of the carrier screening is to identify carriers of haemoglobin disorders in order to assses the risk of couple having a severly affected child and to provide information on the options available to avoid such an eventuality[19]. NESTROFT (Naked Eye Single Tube Red cell Osmotic Fragility Test) is found to be very useful for detecting beta thalassemia trait[20]. Beta thalassemia trait can also be screened by using RBC indices where MCV and MCH values are low with high RBC count[21]. Hb E heterozygote are clinically well. Screening of Hb E carrier is equally necessary as they combine with B thalassemia trait to cause Hb E ß thalassemia which is the most common thalassemia syndrome in Bangladesh. There are doubtful role of blood count and RBC indices in detecting Hb E trait. The false negetive result with MCV and MCH for screening is unacceptable especially in a population where there is significant high prevalence of Hb E[22]. The only screening as well as confirmatory test for detection of Hb E trait is Hb E estimation by Hb Electrophoresis which

needs skilled personnel and require sophisticated equipments. For countries with limited resources, mass screening can be conducted using cheaper and a less complex methods[23]. There are no study in our country which can analyze the diagnostic significance of Blood count and RBC indices in detecting Hb E carrier state. The present study was carried out to see the role of Blood count and RBC indices as a marker of screening for Hb E trait.

Methodology

This hospital based cross sectional study was carried out at Dhaka Shishu (Children)Hospital from December 2008 to November 2009. A total number of 150 subjects were selected who were older than

1 year,not suffering from acute infections and without ß thalassemia major or Hb E ß thalassemia attending Dhaka Shishu Hospital Thalassemia Center were tested for haemoglobin, red cell count, red cell indices, peripheral blood film and haemoglobin electrophoresis. On the basis of Hb electrophoresis, all subjects were divided into three groups Group I comprised of 50 subjects with Hb E trait, Group II comprised 51 subjects with ß thalassemia trait and Group III comprised of 49 normal subjects. Hb E traits were detected by Hb electrophoresis when Hb E level was found between 20% to 35%. 49 subjects were detected normal by electrophoresis report and rest of 51 subjects were found to have B thalassemia trait. Among the study population, blood film, RBC indices and blood count were compared between Hb E trait and normal study population. Data were analysed by SPSS programme.

Results

Table I: Age distribution among the study population (n = 150)

Age (year)	Mean +- SD	Range
E Trait (n= 50)	29.53 +- 10.70	2-47
B Trait (n=51)	30.31+-9.85	1-55
Normal (n=49)	21.81+-14.26	1-52

In group I the mean age was 29.53 years and the age range was 2-47 years. In group II the mean age was 30.31 years and the range was 1-55 years. In group III the mean age was 21.81 years and the range was 1-52 years.

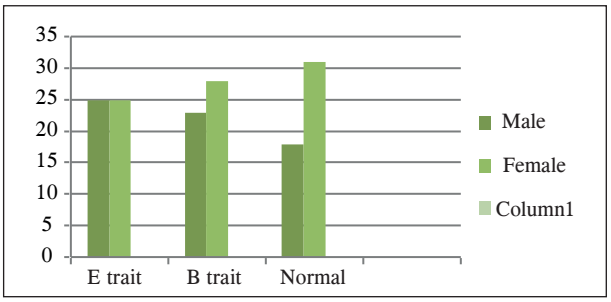

Figure 1: Sex distribution of study population (n=150)

In group 1, 25 male and 25 female (n=50), in group II, 23 male and 28 female (n=51), and in group III 18 male and 31 female (n=49) subjects were included.

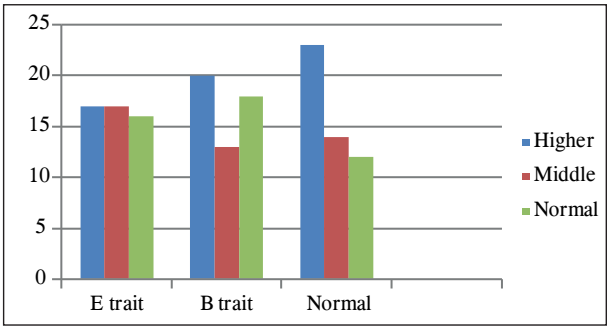

Fig -2 : Socio economic status of study population (n= 150)

In group I there is no significant variation of socio economic status but in group II and in group III the majority are from higher socio economic group.(fig 2)

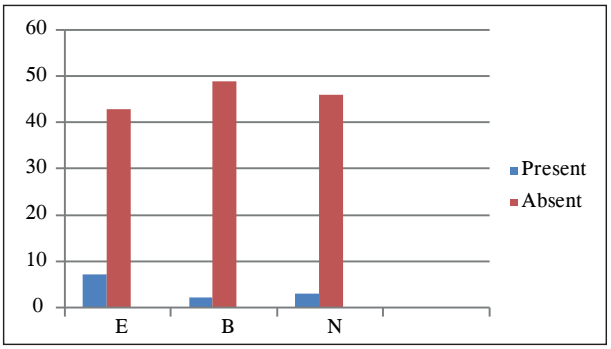

Fig 3 : Presence of consanguinity among the study population (n=150)

In all the 3 groups majority of the study population were from non consanguineous parents but in Group I, seven of the subjects among the total 50 were from consanguineous parents.

Comparison of Hematological parameter between E trait and normal subjects

Table 2 : Comparison of hematological parameter between Hb E trait and normal subjects

Hematological Parameters (Mean)		Mean +-SD	P value
Hb% (gm/dl)	Normal (n=49)	10.77+-14	0.17
	E trait (n=50)	11.76+-1.91	
MCV (fl)	Normal (n =49)	77.35 +-10.27	0.68
	E Trait (n =50)	72.89 +-12.24	
MCH (pg)	Normal (n=49)	28.28+-2.716	0.33
	E trait (n=50)	24.84+-3.71	
MCHC(gm/dl)	Normal (n=49)	32.97+-2.38	0.11
	E trait (n=50)	3282+-2.27	
RBC Count (million/cmm)	Normal (n=49)	4.61 +-.65	0.87
	E trait (n=50)	5.01+-.71	
RDW (%)	Normal (n=49)	14.83 +-1.28	0.11
	E Trait (n =50)	14.32+-2.34	

The present study revealed the mean±SD haemoglobin level (g/dl) in group I (E trait) and group III(normal subjects) were 11.76±1.91 and 10.77±1.4 repectively. Statistically there was no significant difference was found between these 2 groups (P>.05). The mean corpuscular volume (MCV) in mean ±SD in group I and group III were 72.89±12.24 fl and 77.35±10.27 fl respectively. No statistical significance was found as P>0.05. The mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) in group I were 24.84±2.71pg & 32.97± 2.27 g/dl and in group III were 28.28±2.71 pg & 32.97± 2.38 g/dl respectively. There were no significant difference between group I and III regarding MCH and MCHC.

The mean RBC count in E trait and normal subject group were 5.01±71 million/cmm and 4.61±0.65 million/cmm respectively. There was no significant difference was found.P>0.05. Mean red cell distribution width (RDW) in group I and III were 14.32±2.34 and 14.83±1.28 without any statistical difference (P>0.05)

Discussion

A number of studies have conducted by Fuchroen et al[23], Wiwanikit et al[24], Kannadit et al[25] and Siripakorn et al[26] and their sample size were 301, 213, 808 and 436 respectively to make an screening protocol for thalassemia patients in Thailand. In the present study in group I the mean age was 29.53 years and the age range was 2- 47 years. In group II the mean age was 21. 81 years and the range was 1-52 years. The other study done by Fuchroen et al for simplified screening for thalassemia and Hb E in rural communities the age range was 8 - 30 years.[23]

In the present study in all 3 groups majority of the study population were from non consanguineous parents. Regarding socio economic status in group I there is no significant variation of socio economic condition but in group II and in group III the majority of the subjects are from higher socio-economic group. It indicates that Dhaka Shishu (Children) Hospital Thalassemia Centre is creating awareness among all groups of people having thalassemia syndrome from different economic background. The other studies which have already mentioned earlier did not show anything about consanguinity and socio-economic status.

The present study revealed that the mean± SD haemoglobin level g/dl in Group I(E trait) and group III

(normal subjects) were 11.76±1.91 and 10.77± 1.4 respectively. Statistically there was no significant difference was found between there 2 groups. Similar results were obtained by Fucharoen et al, who found normal haemoglobin level in both groups.[23]

The mean corpuscular volume (MCV), mean corpuscular haemoglobin(MCH) and mean corpuscular haemoglobin concentration(MCHC) in mean (±SD) for group I was 72.89±12.24, 24.84±3.71 pg and 32.82 ±2.27 g/dl respectively and for group III were 77.35±10.27 fl, 28.28± 2.71 pg &32.97±2.38 g/dl respectively. No statistical significance was found regarding all parameters (p>0.05). MCV,MCH and MCHC in E trait group were closer to normal subjects. Similar results were obtained by Fucharoen et al.[23] Other study done by Sanchaisuriya et al 22 showed MCV and MCH were normal in E trait and they may give false negetive result for screening of E trait if RBC indices are considered as screening method.

The present study showed that RBC count in E trait and normal subject group were 5.01±0.71 million/cmm and 4.61±0.65 million/cmm respectively. But there was no significant difference was found P>0 .05. Mean red cell distribution width (RDW) in group I and III were 14.32 ± 2.34 and 14.83±1.28. That was also not statistically significant P>0.05. The similar result was obtained by Fucharoen et al23 that showed no significant

difference of RDW in different subjects who had different type of haemoglobin disorder. Many haemoglobin E carriers will be missed when these cut off values are used.

Conclusion

The frequency of Hb E diasese is increasing day by day, though there is no effective prevention or screening program for the disease in Bangladesh. Many countries like Mediterranean and Western countries take initiatives to prevent this disease by antenatal diagnosis, screening, carrier detection and genetic counseling. Bangladesh needs such type of effective program to combat this deadly disease. The confirmatory tests needed for diagnosis of E trait are closely, laborious and time consuming. Mass screening methods should be identified to reduce the mortality and morbidity due to Thalassemia. However our study has some limitations like short duration and small sample size. Further studies on this issue should be conducted to establish a effective screening method for detection of Hb E carrier.

Conflict of interest

We have no conflict of interest

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