Original Article

Hereditary Haemoglobin Disorders of Anaemic Patients Attending in a Rural Tertiary Level Hospital

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Abstract

Background: *Regularly patients attending in the hospital with severe illness for medical treatment. A large number of patients came with features of anaemia. Many of them show hereditary haemoglobin disorders.*

Objective: *This study was done to find out the pattern of hereditary haemoglobin disorders of anaemic patients attending in the hospital for medical treatment in a tertiary level rural hospital.*

Method: *This descriptive type of retrospective study was performed with 151 cases of anaemic patients whose whole blood show abnormality in haemolobin on capillary haemoglobin electrophoresis. Haemoglobin as well as haematocrit and red blood cells indices were performed by using fully automated haematology lab automation (Sysmex XN-1000). Then haemoglobin electrophoresis was performed to see haemoglobin disorder by using Capillary-2 Haemoglobin Electrophoresis, Sebia, France.*

Results: *All of the 151 cases of hereditary haemoglobin disorders were categorized into four groups. Of those Haemoglobin-E ß thalassaemia was 64.90%, ß thalassaemia minor was 17.22%, Haemoglobin-E haemoglobinopathies was 11.92% and ß thalassaemia major was 5.96% of cases. Among 151 patients; 106 (70.20%) patients were severely anaemic, 30 (19.87%) patients were moderately anaemic and 15 (9.93%) patients were mildly anaemic. Among 98 patients of haemoglobin-E ß thalassaemia, 87 (88.76%) patients were severely anaemic.*

Conclusion: *All anaemic patients especially who suffers from anaemia for a long period of time should be checked for haemoglobin disorders by routine haematological investigation and peripheral blood film examination. The patients with persistent anaemia and whose blood shows hypochromic microcytic anaemia should be advised for haemoglobin electrophoresis.*

Key words: *Anaemia, hereditary haemoglobin disorders & haemoglobin electrophoresis.*

Introduction

Haemoglobin (Hb) abnormalities are the most frequent genetic disease, affecting approximately 7 per cent of the world population[1]. The hereditary disorder of haemoglobin classified into, haemoglobinopaties and thalassaemias. The haemoglobinopaties are characterized by the production of structurally defective haemoglobin due to abnormality in formation of globin moiety of the molecule. The thalassaemias are characterized by a reduced rate of production of normal haemoglobin due to absent or decreased synthesis of one or more types of globin polypeptides chains[2]. The thalassaemia are a family of inherited disorder of globin synthesis, of which 6th most important are the beta thalassaemia[3]. At the severe end of the spectrum are patients whose clinical course is characterized by profound anaemia, who present to medical attention in the first year of life, and who subsequently require regular transfusions for survival- the condition known as ß-thalassaemia major. But many patients with inheritance of two mutant beta alleles have a milder illness, with a broad range of severity including, at least in early childhood, a virtually asymptomatic state. Patients in this group who present to medical attention in later childhood and remain largely transfusion-free are said to thalassaemia intermedia. Globally, the

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intermediate forms of beta-thalassaemia do not cause a major public health problem[4], except for the cause of haemoglobin E beta-thalassaemia[5]. World wide, haemoglobin E thalassaemia is one of the most important varieties of thalassaemia[6,7]. The condition results from co-inheritance of a beta-thalassaemia allele from one parent, and the structural variant haemoglobin E from the other. Haemoglobin E results from a G→A substitution in beta codon #26 which, as well as producing a structurally abnormal haemoglobin[8].

In all cases of haemoglobin disorder, besides haemoglobin, a first essential test that need to be performed is a complete blood cell count (CBC) looking mostly for anaemia, microcytosis and hypochromasia. For detections of haemoglobin disorders, now a day several methods are available, such as cation-exchange high performance chromatography (CE-HPLC) or more recently capillary electrophoresis are generally employed. Nevertheless, electrophoretic studies [cellulose acetate electrophoresis or isoelectric focusing (IEF)] are still performed in many laboratories[9]. In some developing countries, the Naked Eye Single Tube Red Cell Osmotic Fragility Test (NESTROFT), which is a cost effective, rapid and reliable screening test for detection of ß-thalassaemia trait, is largely used as first approach[10]. Data collected over recent years indicates that haemoglobin E beta-thalassaemia is causing an increasingly severe public health problem throughout the Indian subcontinent and parts of Southeast Asia. In Thailand, it is estimated that nearly 3000 children are born with this condition each year and there are approximately 100000 affected patients in the population[11]. In Bangladesh particularly who live in rural area suffering from anaemia for years to years without medical treatment. When patients are unable to perform regular work and became severely ill they usually come to doctors for medical treatment. Routine haematological investigation and haemoglobin electrophoresis are performed with the advice of medical consultant. This study was done to find out the pattern of hereditary haemoglobin disorders of anaemic patients attending in the hospital for medical treatment in a tertiary level rural hospital.

Materials and method

This descriptive type of retrospective study was carried with patients attending in Khwaja Yunus Ali Medical College Hospital during the period between January' 2010 to December' 2014. One hundred and fifty one patients were selected for the study purposively those who were meet the inclusion criteria. All anaemic patients whose whole blood shows abnormality in haemolobin on capillary haemoglobin electrophoresis were included in this study. Patients with hypochromic microcytic anaemia but on capillary haemoglobin electrophoresis show no abnormalities in haemoglobin were excluded from the study. Samples were collected in the laboratory and routine haematological investigations were performed. Haemoglobin as well as haematocrit and red blood cells indices were performed by using fully automated haematology lab automation (Sysmex XN-1000). In all cases peripheral blood film examination were also performed and most cases reveal hypochromic microcytic anaemia. Large numbers of cases also reveal features of haemolysis (Figure-2 & 3). Then haemoglobin electrophoresis (Figure-4) was performed to see haemoglobin disorder by using Capillary-2 Haemoglobin Electrophoresis, Sebia, France.

Observation & Result

A total of 151 patients were included in this study on the basis of inclusion criteria. Age distribution ranged from 5 months to 55 years. The patients are divided into nine age groups which are shown in table I.

Table I: Distribution of patients according to age.

Age in Years	Number of cases	Percentage (%)
<1year	7	4.63
1-5	16	10.60
6-10	47	31.13
11-15	12	7.95
16-20	15	9.93
21-25	13	8.61
26-30	18	11.92
31-35	10	6.62
> 36	13	8.61
Total	151	100

In this study among 151 patients, 100 (66.23 %) patients were male and other 51 (33.77 %) patients were female. This is illustrated in figure 1.

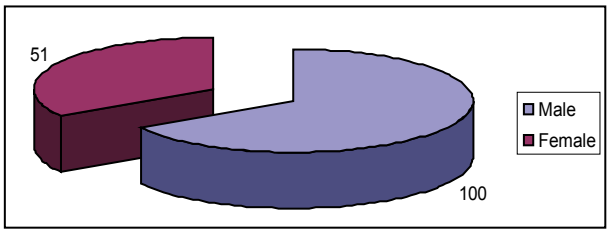

Figure 1: Sex distribution of the patients (n=151).

Haemoglobin disorder

All of the 151 cases of haemoglobin disorders were categorized into four groups on the basis of haemoglobin electrophoresis findings as ß thalassaemia major, ß thalassaemia minor, Haemoglobin-E ß thalassaemia and Haemoglobin-E haemoglobinopathies. These findings are shown in table -II.

Table II: Haemoglobin disorders of 151 cases.

Haemoglobin disorders	Number of cases	Percentage (%)
ß thalassaemia major	9	5.96
ß thalassaemia minor	26	17.22
Haemoglobin-E ß thalassaemia	98	64.90
Haemoglobin-E haemoglobinopathies	18	11.92
Total	151	100

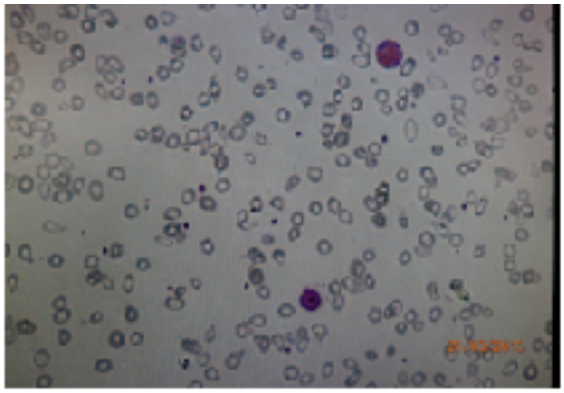

Figure 2: Peripheral blood film of a thalassaemia patient (200 X).

Individual haemoglobin disorders in different age groups are shown in different tables. 9 cases of ß thalassaemia major in table III, 26 cases of ß thalassaemia minor in table IV, 98 cases of haemoglobin-E ß thalassaemia in table V and 18 cases of haemoglobin-E haemoglobinopathies in table VI are shown.

Table III: ß thalassaemia major in different age group.

Age in Years	Number of cases	Percentage (%)
<1year	3	33.33
1-10	1	11.12
11-20	3	33.33
21-30	2	22.22
>31	0	0
Total	9	100

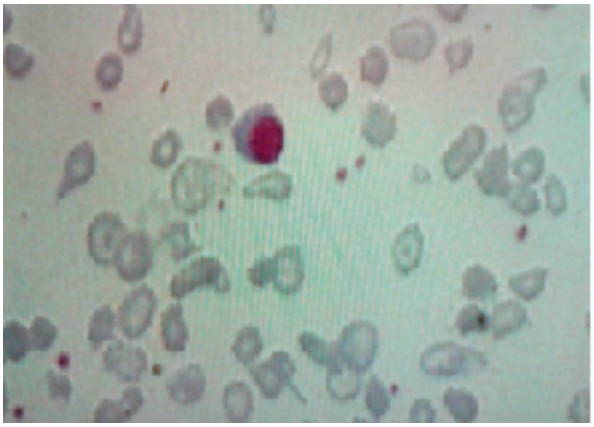

Figure 3: Peripheral blood film of a thalassaemia patient (400 X).

Table IV: ß thalassaemia minor in different age groups

Age in Years	Number of cases	Percentage (%)
<1year	1	3.85
1-10	9	34.62
11-20	2	7.69
21-30	7	26.92
>31	7	26.92
Total	26	100

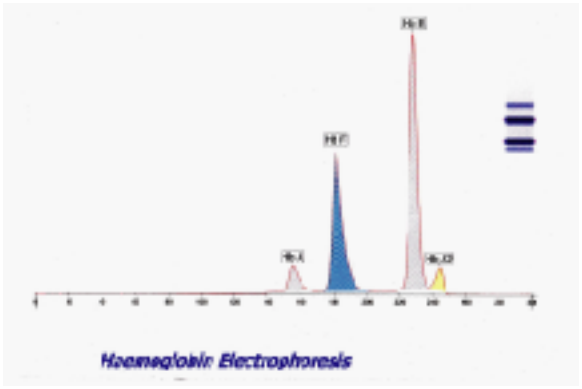

Figure 4: Haemoglobin-E ß thalassaemia

Table V: Haemoglobin-E ß thalassaemia in different age group

Age in Years	Number of cases	Percentage (%)
<1 year	3	3.06
1-10	50	51.03
11-20	19	19.38
21-30	16	16.32
>31	10	10.21
Total	98	100

Table VI: Haemoglobin-E haemoglobinopathies in different group.

Age in Years	Number of cases	Percentage (%)
<1 year	0	0
1-10	3	16.67
11-20	3	16.67
21-30	6	33.33
>31	6	33.33
Total	18	100

Haemoglobin level were categorized on the basis of severity of anaemia as mild anaemia (Hb= >10.0 gm/dl), moderate anaemia (Hb=7.0 - 10.0 gm/dl) and severe anaemia (Hb= < 7.0 gm/dl). Haemoglobin level in different haemoglobin disorders are shown in table VII.

Table VII: Haemoglobin level in different haemoglobin disorders.

Haemoglobin disorders	Haemoglobin level (gm/dl)			Total
	<7.0	7.0 -10.0	>10.0	
ß thalassaemia major	3	4	2	9
ß thalassaemia minor	12	8	6	26
Haemoglobin -E ß thalassaemia	87	10	1	98
Haemoglobin -E haemoglobinopathies	4	8	6	18
Total	106 (70.20%)	30(19.87%)	15(9.93%)	151(100%)

Discussion

In the present study, haemoglobin disorders were found in 66.23 % of male patients and in 33.77 % of female patients. Uddin Mk et al[12] found in their study, male 51.43 % and female 48.57 % and Hasan MK et al[13] found in their study, male 56.67 % and female 43.33 %. All of these studies show male are more sufferer than female with haemoglobin disorders. In this study also shows highest group of patients between <1 year to 10 years age which was 46.36 %. Uddin Mk et al[12] also found most of the patients between this age group which was 31.89 %. In our study, haemoglobin-E ß thalassaemia found in 64.9 % of cases. Rahman SA et al.[14] found in their study in 67 % cases and Khan WA[15] in his study from Dhaka Shishu Hospital found in 85 % of cases. All of these studies show highest percentage of haemoglobin disorders was haemoglobin-E ß thalassaemia. But Uddin Mk et al.[12] and Hasan MK et al.[13] found in their study were 30.47 % and 23.33 % respectively. These variations may be due to differences in age of the patients, geographical area and sample size. Individual haemoglobin disorders when compared with different age groups, present study shows ß thalassaemia major found highest in < 1 year of age which was 33.33 % and it is consistent with refrence book[2]. Both ß thalassaemia minor and haemoglobin-E ß thalassaemia found highest in 1-10 years age groups which were 34.62 % and 51.03 % respectively. Whereas haemoglobin-E haemoglobinopathies found highest in more than 21 years age groups which was 66.66 %. Haemoglobin disorders when compared with severity of anaemia, in this study it was found that among 151 patients; 106 (70.20%) patients were severely anaemic, 30 (19.87%) patients were moderately anaemic and 15 (9.93%) patients were mildly anaemic. Hasan MK et al.[13] found in their study 50% were moderately anaemic, 40% were severely anaemic and 10% were mildly anaemic. This variation may be due to high percentage of haemoglobin-E ß thalassaemia patients in this study. In the present study among 98 patients of haemoglobin-E ß thalassaemia, 87 (88.76%) patients were severely anaemic.

Conclusion

All anaemic patients especially who suffers from anaemia for a long period of time should be checked for haemoglobin disorders by routine haematological investigation and peripheral blood film examination. The patients with persistent anaemia and whose blood shows hypochromic microcytic anaemia should be advised for haemoglobin electrophoresis. Thalassaemia campaign is usually based on urban area which should be disseminated in rural area so that awareness will be build up early in population. It will help in early diagnosis of haemoglobin disorders and will reduce patients' morbidity by taking appropriate measure.

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