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A Study of Hemoglobin E Disorders with Special Reference To Iron Status At Silchar Medical College And Hospital, Silchar

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Abstract:
Background: *Hemoglobinopathies constitutes a imperative causative factor for anaemias of childhood and adults, of which HbS, HbC, HbE, HbD (Punjab) and β Thalassemia are common. HbE Ddisorders are the most prevalent form in north-east India, where its prevalence can reach upto30-40%. It is observed that, often the patients with anemia is treated with iron supplements without any investigations which is hazardous in Hemoglobinopathies due to risk of tissue iron toxicity. Serum ferritin estimation is single most sensitive and non-invasive method of iron status evaluation. The study was done to evaluate the iron status in patients with various HbE Disorders.*
Materials and methods*:It is a type of observational study conducted in the Department of Pathology, Silchar Medical College and Hospital for a period of 1 year with 120 cases including both male and female of any age with various HbE disorders and fulfilling the inclusion and exclusion criterias. The blood samples collected were run for Complete Blood Count(CBC), Capillary electrophoresis. Leishman stained Peripheral blood smears were also prepared. Iron profile studies were carried out in all the patients.*
Results: *The datas obtained were enterd in computer and were analysed using frequency distribution tables and charts. By using various statistical formulas, mean, median, mode, percentage, standard deviation were calculated.The incidence of HbE Trait, HbE Disease avd HbE β Thalassemia was 48.33, 30%, 21.67% respectively. Maximum patients are from the age group of 10-29 years. The mean hemoglobin concentration in the patients with HbE trait, HbE disease and HbE β thalassemia was 11.7, 9.45and 3.65 gm/dl respectively. The mean serum ferritin, s. iron, TIBC and % transferrin saruration were with in the normal range in patients with HbE Trait and HbE Disease, whereas, in patients with HbE β Thalassemiathe mean serum ferritin was too high (1838.05 µg/L)*
Conclusion: *HbE Disorders may mimic or associated with iron deficiency anemia but indiscriminate use of iron supplements without knowing iron status is hazardous (especially inHbE β Thalassemia). Therefore, we recommend the proper estimation of iron status in all patients with various hemoglobinopathies.*
Key words: *HbE trait, HbE disease, HbE β thalassemia, serum ferritin,*

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I. Introduction

Hemoglobinopathies constitutes a imperative causative factor for anaemias of childhood and adults. They usually inherited as autosomal co-dominant trait and range in severity from asymptomatic laboratory abnormalities to death in utero.[1,2]The common hemoglobinopathies as per WHO (1972) report includes-*Hemoglobin S (HbS) , hemoglobin C (HbC), hemoglobin D(Punjab) and hemoglobin E(HbE).Beta thalassaemia* is also prevalent throughout the world in variable frequency.[3]HbE disorders are the most prevalent form in north-east India, where its prevalence can reach upto 30-40%. They may mimic nutritional anemia but refractory to the usual corrective measures.[4,5]It is observed that, often the patients with anemia is treated with iron supplements without any investigations which is hazardous in Hemoglobinopathies due to risk of tissue iron toxicity. Serum ferritin estimation is single most sensitive and non-invasive method of iron status evaluation.Therefore, our aim is to study the iron status, clinical presentation and hematological correlation of patients with various hemoglobin E disorders.

II. Materials and methods

It is a type of observational study conducted in the Department of Pathology, Silchar Medical College and Hospital for a period of1 year with 120 cases including both male and female of any age.
Study Design: observational study
Study Location: Department of Pathology,Silchar Medical College and Hospital, Cachar, Assam, India.
Study Duration: 01/07/2020 to 30/06/2021
Sample Size: 120 cases

Subject selection-The cases, who were suspected of having hemoglobinopathies in CBC & PBF, were selected and taken up for capillary electrophoresis. According to electrophoresis report, the patients having different HbE Disorders (120) were selected as cases for the study.

Inclusion criteria:

1. Patients showing various stigma of HbE Disorder in complete blood count and peripheral blood film like decrease in RBC indices, microcytosis, target cells, unexplained anemia, nucleated RBC's etc.
2. Patients of both sexes, all religion and all age group were included.

Exclusion criteria

1. Patients having other hemoglobinopathies.
2. Patient with HbE Disorder with history of

Recent blood transfusion.
HIV positive cases.
Chronic liver disease.
End-stage renal disease.
Malignancy.
Sepsis.
Complete general physical examination, systemic examination, CBC and Iron Profile Study (Serum Ferritin, Serum Iron, TIBC & % Transferrin) were carried out in all patients.

Procedure methodology: 4 to 6 ml of venous blood was collected from antecubital vein and was divided into two vials: one in potassium EDTA vial and one in a clot activated vial. The sample in EDTA was allowed to run in a 6 part automated analyzer (Sysmex XT-4000i) which works on the principle of impedance and optical methods. It dispenses a 26 parameter report. A drop of blood from the same vial was used to make a smear for Peripheral blood study by staining with Leishman stain. The sample was made to run in a capillary electrophoresis machine**.** Hemoglobin electrophoresis was done in all cases by fully automated Sebia Capillary Electrophoresis machine which can differentiate between 24 different hemoglobin variants

The sample in clot vial was used to do the iron profile study which included serum ferritin, serum iron, serum Total Iron Binding Capacity and serum Transferrin saturation.

Statistical Analysis: Significant data were entered into a computer. Descriptive statistical analysis has been carried out in the present study. The results were summarized in frequency distribution tables and were interpreted based on the study objectives. The Results on continuous data collected are presented as Mean±SD and results of categorical data are presented in number (%). **Statistical software:** SPSS version 18 were used for analysis of data and Microsoft Excel and Word have been used to generate graphs and table.

III. Results and observation

A total of 336 cases suspected to have hemoglobinopathy on the basis of complete blood count and peripheral blood smear were taken up for capillary electrophoresis. A total of 162 cases were found to have abnormal hemoglobins. Among the 162 cases of having abnormal hemoglobin, 58 (35.8%) patients have Hb E Trait, while 36 patients (22.2%) have Hb E Disease 26 patients (16.04%) have HbE-β thalassemia and remaining 42 cases have other forms of abnormal hemoglobin.

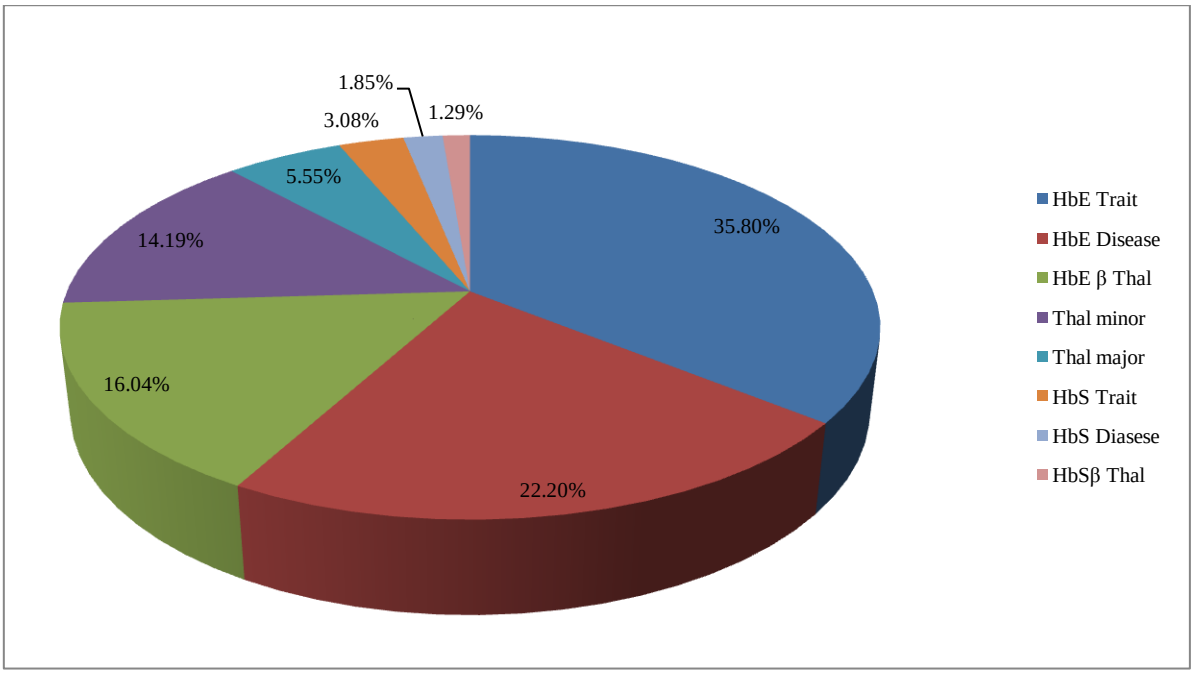

Figure 1: Distribution of Different Abnormal Hemoglobins**.**

The mean age of the patients with HbE trait, HbE disease and HbE β thalassemia is 29.51±9.9 years, 17.43±8.51 years and 12.41±8.37 years respectively, ranged from 6 months (HbE ds) to 56 years (HbE trait).

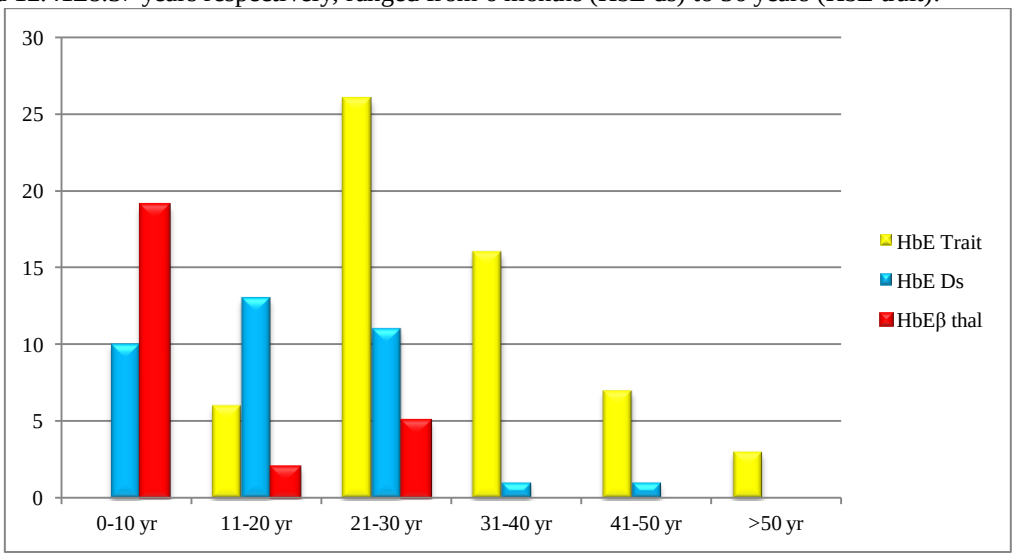

Figure 2: Histogram showing age distribution in years

The percentage of cases in males was 51.6% and in females it was 48.4%. Among the HbE Trait cases 60.4% were male and 39.6% were female. Among the HbE disease cases 41.7% were male and 58.3% were female. HbE-β thalassemia cases consisted of 46.2% males and 53.8% females.

Table 1: Gender Distribution of Different Hemoglobin E Disorders

Hemoglobinopathies	**Male**		**Female**	
	Number	**%**	**Number**	**%**
HbE Trait	35	60.4%	23	39.6%
HbE Disease	15	41.7%	21	58.3%
HbEβ Thalassemia	12	46.2%	14	53.8%
Total	**62**	**51.6%**	**58**	**48.4%**

HbE was detected maximally in the Bengali Hindus, followed by Bengali Muslims (35 cases), Tea tribe (31 cases), Assamese (4cases), Manipuri (3cases), and Morag (1 case)

Table 2: Hemoglobin E Disorders in Different Ethnic Community

Caste	HbE Trait	HbE Disease	HbEβ Thalassemia
Assamese	1	2	1
BengaliHindu	23	8	11
BengaliMuslim	15	11	9
Manipuri	3	0	0
Boro	1	2	0
Tea Tribe	13	13	5
Deuri	1	0	0
Morag	1	0	0

Generalized weakness with easy fatiguability was the commonest presenting symptom, being present in all (100%) of the patients with HbE Disorder. pallor was the commonest sign and was present in 95 cases (79.16%) out of 120 patients followed by icterus. Spleenomegaly was present in 100% patients of HbE β Thalassemia.

The mean rbc count was 4.7±1.1 million/µl, 4.6±0.8 million/µl and 2.3±0.7 million/µl in HbE trait, HbE disease and HbE β Thalassemia respectively. The mean hemoglobin concentration in HbE trait, HbE disease and HbE β Thalassemia were 11.7±1.6, 9.4±1.6 and 3.6±1.7 gm/dl respectively. The mean MCV and MCH was reduced in all 3 disorders. The mean RDW-CV was normal in HbE trait(13.4±0.5%), whereas, it is increased in HbE disease(15.1±1.4%) and HbEβ thalassemia (21.7±2.6%) cases.

Table 3 : Showing hematological parameters among different HbE Disorders.

	RBC count (million/µl)	Hemoglobin (g/dl)	HCT (%)	MCV (fl)	MCH (pg)	MCHC(g/dl)	RDW-CV(%)
HbE Trait	4.7±1.1	11.7±1.6	37.1±5.3	67.01±5.1	22.7±2.7	34.2±1.2	13.4±0.5
HbE Disease	4.6±0.8	9.4±1.6	29.2±5.1	57.8±2.5	20.2±1.6	33±1.6	15.1±1.4
HbE β Thal	2.3±0.7	3.6±1.7	14.4±3.7	56.1±3.6	15.1±3.4	27.3±3.9	21.7±2.6

Iron profile studies showed high iron load in HbEβ thalassemia. The cases with HbE trait, HbE disease had a normal iron profile. The mean serum ferritin level was 44.8±9.2, 46±11.3 and 1838±840.2 ng/ml respectively.

Table 4: Showing Iron profile studies among various HbE Disorders.

	Serum Ferritin (ng/ml)	Serum Iron (µg/dl)	TIBC (µg/dl)	Trasferrin saturation (%)
HbE Trait	44.8±9.2	87.9±27.8	332.1±60.7	25.4±10.6
HbE Disease	46±11.3	93.8±25	309.1±43.9	29.3±3.1
HbE β Thal	1838±840.2	213.8±42.6	325.9±49.9	69.2±27.1

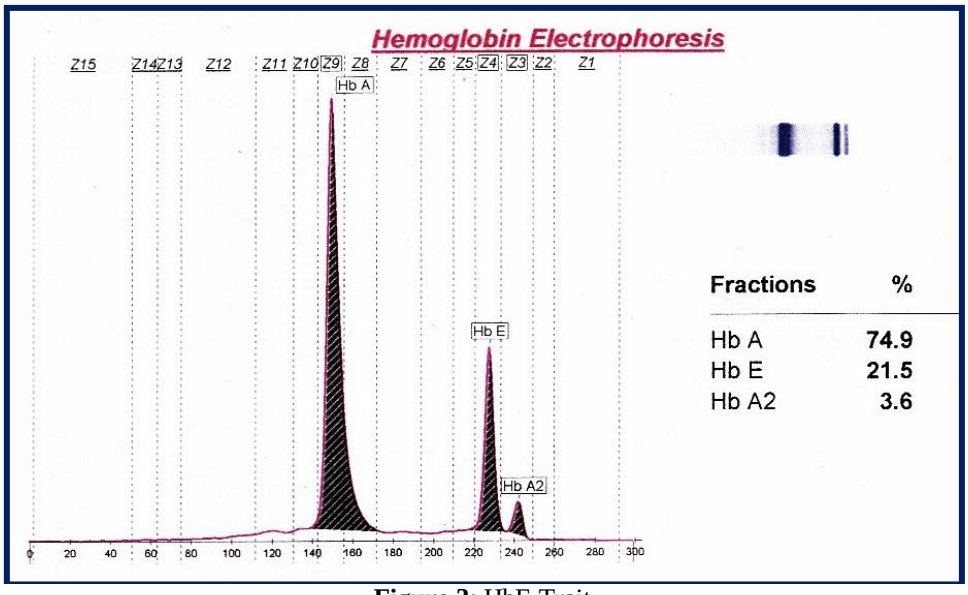

Figure 3: HbE Trait

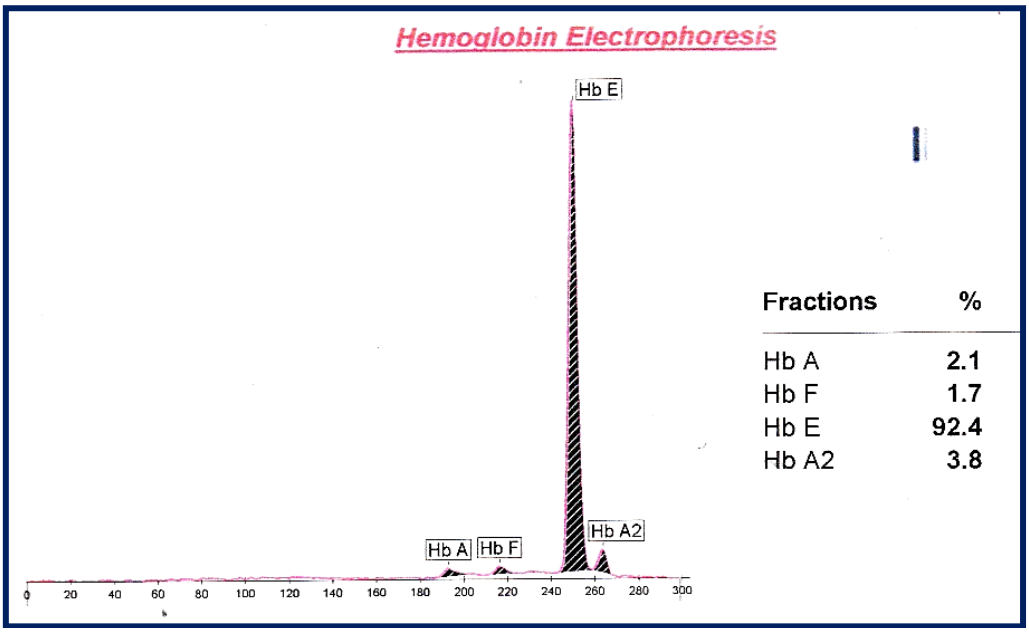

Figure 4: HbE Disease

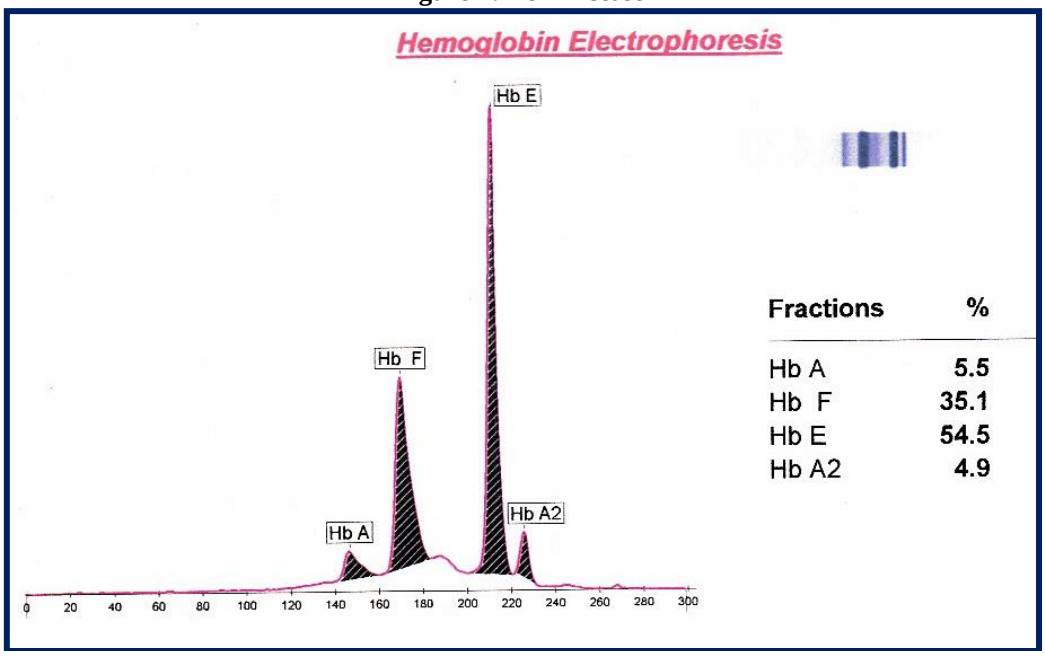

Figure 5: HbEβ Thalassemia

IV. Discussion

In the present study, among the 120 cases of having hemoglobin E Disorder, 58 (48.33%) patients have Hb E Trait, while 36 patients (30%) have Hb E Disease and 26 patients (21.67%) have Hb E- β thalassemia. In a study done by *Kakati et al*[1] , the incidence of HbE Trait, HbE Disease and HbE β Thalassemia is 42.55%, 47.5% and 10% respectively. *Sengupta et al.* found HbE was found to be of highest frequency in the tribal population of Tripura.[22] In another study done by *Baruah et al.*[10] *and Pathak et al.*[8] the highest incidence was found to be of HbE.

In this study the mean age of the patients with HbE trait is 29.51±9.9 years , HbE disease is 17.43±8.51 years, whereas, in HbE β thalassemia the mean age is 12.41±8.37 years with the range of 9 months to 29 years. According to a study done by *S. Aggarwal et al.*, 2011, the mean age of presentation was 15 years in Hb E disease,(Range- 2-40yrs), 13.2 years in Hb E trait (Range of 5- 30 yrs) and 4.42 years (Range 2-20 yrs) in Hb E thalassemia.[14] *Balgair RS et al,* in their study has found the second highest prevalence of hemoglobinopathies in the age group 0-15 years.[15]

The percentage of cases in males was 51.6% and in females it was 48.4%. In a study done by *Hazarika D et al.* 55.15% cases were males and 44.84% cases were females.[12] In another study by *Shah SJ et al*. 74.3%

were males and 25.7% were females.[16] *Jain BB et al*. has found 32.04% of the males and 26.81% of the female.[13] Whereas, according to *Balgair RS et al* 52.3% were males and 47.7% were females.[15]

In the study conducted by *Maishnam Rustam Singh et al*.[17] the greatest frequency of allele Hb βE, 0.101, is found among the Meitei population of Manipur. The prevalence of HbE was also found to be high among the Tripuris and the highest frequency was found among the Mareks.[11] *Kakati et al*[1] found that most of the patients of HbE disorders were belonging to Ahom (60%) and by Kochari (12.5%) ethnic group. *Hazarika D et al* has also found the prevelance of HbE disorder among tea tribes.[12] In our study, the highest prevelance of HbE Disorder among Bengali Hindus, followed by Bengali muslims and tea tribes may be due to the distribution of population in the catchment area.

The hematological findings are well correlated with *Pathak M et al*[8], *Baruah M et al*[10], *Mondal SK et al*[9] *and Das et al*[1].

Iron profile studies showed high iron load in HbEβ thalassemia. The cases with HbE trait, HbE disease had a normal iron profile. The mean serum ferritin level was 44.8±9.2, 46±11.3 and 1838±840.2 ng/ml respectively. In the study conducted by *kakati et al*[1], the mean serum ferritin in HbE β thalassemia , HbE disease and HbE trait was 1012.38±369.70 ng/ml, 175.29±60.38 ng\ml and 28.68±10.2 ng\ml respectively. Various studies by *Oluboyede et al,*[18] *Ayindo KY et al,*[19] *Cunningham MJ et al.*[20] have found that the mean ferritin value is very high (mean 1786 ng/ml, 3265 ng/ml). Iron overload is common in HbE/β thalassemia and has been stated by *Pootrakul et al.*[21] as early as in 1981.

V. Conclusion

Serum Ferritin estimation is effective for evaluation of Iron status. HbE Disorders may mimic or associated with iron deficiency anemia but indiscriminate use of iron supplements without knowing iron status is hazardous (especially inHbE β Thalassemia). Therefore, we recommend the proper estimation of iron status in all patients with various hemoglobinopathies.

References

[1]. Das Umesh, Kakati Sanjeeb, Gogoi Nath Girindra A clinical study ofhemoglobin E with specialreference to serum ferritin level IP: 157.42.216.240]

[2]. Weatherall DJ, Clegg JB.The Thalassemia syndrome,3rd ed.oxford:Blackwell scientific publication;2001.p.303

[3]. Weatherall DJ,Clegg JB,Higgs DR, Wood WG.The hemoglobinopathies.In: Scriber CR,BeauderAL,Sly WAS,Vale D,Child's B,Kinzler Kw,et al.editors.The metabolic and Molecular basis of inheritance disease.8th Ed.New York:McGraw Hill;2001;lll.p.4571-36

[4]. Modell B, Darlison M. Global epidemiology of haemoglobin disorders and derived service indicators. Bulletin of the World Health Organisation. Volume 86, Number 6, June 2008, 480-487.

[5]. Balgir RS. The burden of hemoglonopathies in India and challenges ahead. Curr Sci, 2000; 79(11):1536- 1547.

[6]. Das BM, Deka R, Das R. Hemoglobin E in six populations of Assam. J Indian Anthropol Soc 1980;15:153-156

[7]. Das BM, Chakravarti MR, Delbruck Hemoglobin, Fltaz G. High Prevalence of Haemoglobin E in Two Populations in Assam. Humangenetik 12, 264--266 (1971).

[8]. Pathak MS, Borah MS, Kalita D: Disorders of haemoglobin variants in pediatric patients attending in a tertiary care hospital of North East India. Int J Biol Med Res. 2014; 5(1): 3841-3846.

[9]. Mondal SK and MandalS: Prevalence of thalassemia and hemoglobinopathy in eastern India: A 10-year high-performance liquid chromatography study of 119,336 cases, Asian J Transfus Sci. 2016 Jan-Jun; 10(1): 105–110.

[10]. Baruah MK, Saikia M, Baruah A: Pattern of hemoglobinopathies and thalassemias in upper Assam region of North Eastern India: high performance liquid chromatography studies in 9000 patients. Indian J Pathol Microbiol. 2014 Apr-Jun; 57(2):236-43.

[11]. Das SK, De M, Sengupta B, Das N, Bhattacharya DK, Talukder G. High incidence of Hemoglobin E in Tribal populations of Tripura, North East India. Chapter 7, Anthropologist Special Issue No. 1: 105-108 (2002).

[12]. Hazarika D, Nath AK, Biswanath P, Borah A, Patir J. A Retrospective study on patterns of Thalassemia and other Hemoglobinopathies in paediatrics age group using High Performance Liquid Chromatography in Jorhat District Of North East India. J. Evolution Med. Dent. Sci. Vol. 05/ Issue 56/ July 14, 2016, page 3818-3822.

[13]. Jain BB, Roy RN, Ghosh S, Ghosh T, Banerjee U, Bhattacharya SK. Screening for Thalassemia and Other Hemoglobinopathies in a Tertiary Care Hospital of West Bengal: Implications for Population Screening. Indian Journal of Public Health, Volume 56, Issue 4, October-December, 2012. 297-300.

[14]. Aggarwal S, Saluja S, Bhasin S, et al. HbE variantsretrospective analysis in a tertiary care centre. Journal Indian Academy of Clinical Medicine 2011; 12(4):263-5.

[15]. Balgir RS (2006) Scenario of haemoglobin variants in Central-East coast of India. Curr Sci 90:1651–1657

[16]. Shah S, Chauhan S, Rathod HK, Patel AB, Sharma VY. A profile of cases of hemoglobinopathies at a Medical College. National Journal of Medical research. Volume 2, Issue 2, Apr – June 2012. Page 137-130.

[17]. Maisham Rushtam Singh, Bapukan Choudhury and T Shyamacharan Singh. Hemoglobin E distribution in four endogamous populations of Manipur. Eurasian Journal of Anthropology 2010;1(2):109-117

[18]. Ray D, Mondal R, Chakravarty UK, Burman DR. Assessment of Iron Status in Patient of Sickle Cell Disease and Trait and its Relationship with the Frequency of Blood Transfusion in Paediatric Patients Attending at B.S. Medical College & Hospital, Bankura, WestBengal, India. International Journal of Scientific Study. July 2014. Vol 2. Issue 4. 37-39.

[19]. Aydino KY, Darcan S, Polat A et al. Endocrine complications in patients with beta thalassaemia major. Journal of Tropical Paediatric, 2002; 48(1): 50 – 54.

[20]. Cunningham MJ, Mackin EA, Nenfeld EJ, et al. Complications of beta thalassemia major in North America. Blood , 2004; 104(1); 34 – 39.

[21]. ZakeriniaM, Ayatollahi M, Rastegar M, Amanat Sh, Askarinejad AR, Amirghofran S et al. Hemoglobin D (HbD Punjab/Los Angeles and HbD Iran) and Co- Inheritance with Alpha- and Beta- thalassemia in southern Iran. Iranian Red Crescent medical Journal. 2015. P 2074-1804.
[22]. Sengupta B, De M, Dasgupta I, Poddar S, Chakrabarti S, Talukder G et al. Comparative Study of Haemoglobinopathies in Tribal Populations of Arunachal Pradesh and Tripura (North East India). Int J Hum Genet, 2 (3): 169-172 (2002)

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