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Original Research Article

To Study the Clinico-Hematological Profile of Hemolytic Anaemia at Jawaharlal Nehru Medical College, Bhagalpur, Bihar

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Abstract:

Background: Red cell (membrane) breakdown exceeds red cell synthesis at a greater pace, resulting in hemolytic anemia. It can either be inherited or acquired. Defects in enzymes and membranes are the primary causes of membrane deterioration. A complete blood count test, a urine test, etc., can be used to diagnose HA. The purpose of this study is to examine the pathological and clinical characteristics of hemolytic anemia.

Methods: From May 2022 to April 2023, 150 participants with HA were enrolled in this trial. Each patient's clinico-hematopoietic profile was documented.

Results: According to the present study, sickle cell anemia affected 18.7% of participants, beta thalassemia affected 167.7%, malaria affected 12%, sickle beta thalassemia affected 4.7%, and sickle cell trait affected 39.33%. In male patients, HA was more common (59%). Mean hemoglobin was highest in sickle cell trait (9.2gm/dl) and lowest in thalassemia major (5.2gm/dl). Beta thalassemia major patients had mean total blood bilirubin levels that were highest (1821.4ng/dl), and they also frequently experienced jaundice (57%), splenomegaly (47%) and hepatomegaly (34%).

Conclusion: Younger males are more likely to have HA, with beta thalassemia trait and sickle cell anemia being the most common types. Malaria is the main cause of HA, excluding inherited factors.

Keywords: Hemolytic anemia, thalassemia, hepatomegaly, splenomegaly.

Introduction

The blood's decreasing hemoglobin levels are what cause anemia. The World Health Organization (WHO) defines anemia as having a hemoglobin level of less than 12 g/dL in women and less than 13 g/dL in males. A form of low hemoglobin caused by the breakdown of red blood cells (RBC), increased hemoglobin catabolism, and increased efforts of the bone marrow is known as hemolytic anemia (HA). The mean corpuscular volume (MCV) of hemolytic anemia (HA), which ranges from 80 to 100 fL, is considered to be normocytic anemia. [1] Based on the symptoms and underlying causes, several forms of hemolytic anemia are classified. Known categories of HA include those that are immunological, non-immune mediated, intravascular, extravascular, inherited, acquired, intracorpuscular, and extracorpuscular.

RBC internal abnormalities are intracorpuscular causes. Internal cell damage can result from diminished metabolic capacity (enzymopathy), altered membrane or cytoskeleton structure (membranopathy), or changes in hemoglobin solubility (hemoglobinopathy). Thalassemia and sickle cell disease (SCD) are hemoglobinopathies; SCD is brought on by a mutation in the beta-globin gene. Thalassemia, which is characterized by a partial or complete lack of synthesis of the alpha or beta globin chains of hemoglobin, is primarily responsible for hereditary hemolytic anemia (HA) [2].

The non-spherocytic HAs such G6PD (process the carbs) deficit and pyruvate kinase deficiency (PKD) are caused by RBC enzymopathies, which change the structure of RBCs. [3] The goal of this study is to describe the hematological and clinical characteristics of hemolytic anemia patients who receive care at the JLNMCH in Bhagalpur, Bihar.

Materials and Methods

From May 2022 to April 2023, the current observational study was carried out at the pathology department of the Jawaharlal Nehru

Medical College and Hospital in Bhagalpur, Bihar. 150 participants with HA were included in the trial overall. The hemoglobin estimation, peripheral blood smear, reticulocyte count, serum bilirubin, and serum ferritin tests were performed on all of the individuals. Specific tests such the G6PD screening test, the osmotic fragility test, and the sickling test. To look for organomegaly, gallstones, or any other abnormalities, an abdominal ultrasound was performed. Malaria rapid diagnostic testing was also carried out. CT scans, hepatitis indicators, antinuclear antibodies, and other secondary examinations were also taken into consideration. Hepatomegaly, splenomegaly, hemolytic facies, jaundice, anthropometric measures, a history of blood transfusions, and consanguinity were all noticed during the physical examination.

The data analysis was done with SPSS version 20. The tables were created using cross tabulation and frequency distribution. While categorical data is expressed as a number and a percentage, quantitative data was expressed as mean. There was no more statistical investigation done.

Result

We have tracked the demographic information and outcomes of several clinical-hematological tests for each of the 150 participants in this study. The most prevalent documented HA was Beta Thalassemia Trait, which affected 39.33% of participants. Sickle Cell Anaemia (18.67%), which is more common in female subjects, was followed by Beta Thalassemia (major and intermedia), which affected 16.67% of subjects (Tables 1 and 2). Out of 150 individuals, 81 (54%) were between the ages of 0 and 15 years, followed by 57 (38%) who were between the ages of 16 and 30.

Our findings indicate that HA is more common in younger people (those under the age of 15) than in older people. With advancing age, HA incidences decrease (Table 1). With the exception of sickle cell anemia, which was reported in 61% females, male predominance was noted in the majority of HA types. Overall, there were 41% female respondents and 59% male subjects. Thalassemia major was found to have the lowest mean hemoglobin (5.2gm/dl), followed by autoimmune hemolytic anemia (6.8gm/dl), thalassemia intermediate (6.9gm/dl), and sickle cell trait (9.2gm/dl). The most frequent observation was jaundice (57%) and it was followed by splenomegaly (47%), hepatomegaly (34%), gallstones (15%), and growth retardation (12%). Only AIHA was detected by the Direct Coomb's Test.

Table 1: Haemolytic Anaemia distribution according to age

HA Diagnosis	Age group in years				Total	Percentage
	0-15	16-30	31-45	46-60		
Beta Thalassemia Trait	46	11	2	0	59	39.33%
Beta Thalassemia	17	8	0	0	25	16.67%
Sickle Cell Anaemia	8	16	3	1	28	18.67%
Sickle Beta Thalassemia	1	4	1	1	7	4.67%
Sickle Cell Trait	1	1	1	0	3	2.00%
Autoimmune HA	2	1	1	0	4	2.67%
G6PD deficiency	4	1	1	0	6	4.0%
Malaria	2	15	1	0	18	12.0%
Total	81	57	10	2	150	100%
Percentage	54.0%	38.0%	6.67%	1.33%	100%	

Table 2: Haemolytic Anaemia distribution according to Sex

HA Diagnosis	Sex				Total	Percentage
	Male	Percentage	Female	Percentage		
Beta Thalassemia Trait	38	64.41%	21	35.59%	59	29.33%
Beta Thalassemia	14	56.0%	11	44.00%	25	16.67%
Sickle Cell Anaemia	11	39.29%	17	60.71%	28	18.67%
Sickle Beta Thalassemia	4	57.14%	3	42.86%	7	4.67%
Sickle Cell Trait	1	33.33%	2	66.67%	3	2.00%
Autoimmune HA	3	75.00%	1	25.0%	4	2.67%
G6PD deficiency	6	100.0%	0	0.00	6	4.00%
Malaria	12	66.67%	6	33.33%	18	12.00%
Total	89		61		150	100.00%
Percentage	59.33%		40.66%		100%	

The subjects' haematological characteristics from the current investigation are listed in Table 3. The mean total blood bilirubin level was 3.75 mg/dl in patients with beta thalassemia major and 3.35 mg/dl in those with G6PD HA. Similar to this, beta thalassemia major (1821.4ng/dl) had the highest

mean S. ferritin level, followed by sickle cell anemia (1386.2ng/dl) and malaria (1110.6ng/dl). Beta thalassemia had the lowest mean Hb at 5.26 gm/dl, followed by Autoimmune HA at 6.9. Patients with sickle cell trait have significantly higher mean hemoglobin levels of 8.9 mg/dl. The haemoglobin levels in two-thirds of the cases ranged from 5.2 to 8.2 g/dl, with 25 patients having low levels (less than 5 g/dl) and 10 registering higher levels (over 8.5 g/dl). Jaundice (56%), splenomegaly (48%), hepatomegaly (36%), gallstones (13%), haemolytic facies (2%), growth retardation (9%) and edema (5%), among other clinical manifestations, are also present. Each and every beta thalassemia patient had splenomegaly. The study did not report any fatalities.

Table 3: Mean Haematological parameters distribution of various types of HA

Diagnosis	Total Serum Bilirubin (mg/dl)	Serum Ferritin (ng/dl)	Hb (mg/dl)
Beta Thalassemia Trait	2.1	569.9	7.15
Sickle Cell Anaemia	3.05	1400	8.18
Beta Thalassemia	3.75	1825	5.25
Sickle Beta Thalassemia	3.1	209.9	6.95
Sickle Cell Trait	1.75	280.9	8.9
Autoimmune HA	2.15	704	6.9
Malaria	2.85	1109.9	7.65
G6PD deficiency	3.35	136	7.78

Discussion

India has an inconsistent prevalence of hemolytic anemia, which may be related to factors including geography and population. In comparison to the southern regions of India, the incidence of HA is higher in the western and eastern regions.

Patients with anemia in central and northern India had a 7–8% frequency of HA. [4] The male to female ratio in the current study was 1.45 (with 59% men and 41% women), although Chatopadhyay et al. found a similar sex ratio of 1.51 (with 179 men and 118 women). [5] Another study by Anusha R. et al. revealed a 0.9 male to female ratio, which may have been affected by the sample size and study design. [6]

A similar observation was found in the study of Venkateshwary et al., who reported thalassemia trait in 28.26% and thalassemia major in 16.45%. The current study noted the common HA's as beta thalassemia trait in 39.33%, followed by sickle cell anemia in 18.7% and beta thalassemia 16.67% patients. [7] Similar findings were obtained in a another study by Ambekar SS et al., where beta thalassemia trait was the most prevalent HA.8 In a related study, Shivashankara et al. identified HA as the most prevalent form of beta thalassemia, followed by the thalassemia trait, sickle cell trait, and sickle cell thalassemia. [9]

The results of the current investigation are comparable to those of Venkataswamy et al., who noted mean Hb and HbA2 of 13.3gm/dl and 6.2%, respectively, among beta thalassemia trait HA patients. The current study recorded the mean Hb as 7.2gm/dl and mean HbA2 of 6%. [7] Most of the patients' serum bilirubin levels were found to be increased, which is in line with Preethi et al.'s findings. [10] Compared to Venkataswamy et al.'s observation of 5.6%, 18.7% of participants in the current study had sickle cell anemia. This difference could be explained by the number of subjects in each age group. [7]

Beta thalassemia had a prevalence of 16.7%, with mean hemoglobin and HbF of 5.25 gm/dl, and 91% of the observations recorded by Preethi et al., where the Hb varied from 3 to 8.2 gm/dl and the HbF mean was 75.2%, were identical. The study's total serum bilirubin level, which was 3.75 mg/dl, was greater than the level of 2.7 mg/dl noted by Anusha R et al. [6] With a mean Hb of 9.1 gm/dl in the current study, sickle cell trait patients constituted 2% of the total. Sickle cell trait made up 1.55% of all cases in Venkataswamy et al, with mean Hb levels of 10.8gm/dl. The reported mean HbS was 41.2%, which is comparable to the 40% found by Venkataswamy et al. [7] six cases of G6PD and four cases of autoimmune HA were detected in the current investigation based on peripheral smear findings and the G6PD estimate assay.

The most frequent acquired HA in the current study was malaria, with a mean Hb malarial subject level of 7.65 gm/dl across 18 (12%) individuals. Anusha R et al. made nearly identical observations, reporting that 21.9% of their patients had malaria and that their average hemoglobin level was 6.3 gm/dl. [6]

Conclusion

According to the results of the current study, beta thalassemia trait and sickle cell anemia are the two forms of HA that are most common among younger males. Malaria is the primary contributor to acquire HA, excluding inherited factors. The fact that HA can be found by routine hematological tests is not widely known. Medical professionals should raise awareness of HA and conduct tests on patients with

hematological anemia to determine their risk of developing the disease.

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