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Research Article

Assessment of Hematological Findings of Patients with Thalassemia in the North of Jordan

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ABSTRACT:

Background: thalassemia is considered as a set of disorders that are characterized by inherent hemoglobin defects and associated with lowered synthesis of globin chains resulting in abnormal production of globin which determines how much severe is the thalassemia. **Study objectives**: the main objective of this study was to examine the patterns of hematological findings in a group of patients with thalassemia treated in Princess Rahma Hospital, Jordan. **Methods and subjects**: a retrospective study design was conducted to collect data from patients with thalassemia. A total of 117 files of thalassemia patients were reviewed. Demographic and hematologic parameters were identified for each patient. Data were collected and entered into excel sheet. After data collection had been finished, data were entered into SPSS version 21 for statistical analysis. Data were presented as frequency and percentages for categorized variables such as gender, and as means and standard deviations for remaining hematological parameters and age. The relationship between variables was computed using T test and Pearson correlation. Significance was considered at $\alpha<0.05$.**Study findings**: the mean age of participants was 17.82±8.28 years, and about 52% of participants were males. The mean levels of WBCs and RBCs were normal. The mean level of hemoglobin was 8.25±1.75 (g/dl), and the mean level of HCT was 23.85±6.11 (%). In general, hematological parameters associated with thalassemia indicated that patients had thalassemia intermedia. The results also showed significant and positive correlations between age and hematological parameters. **Conclusions:** The findings of the present study showed that patients had thalassemia intermedia and age was associated significantly and correlated positively and significantly with hematological parameters.

Keywords: thalassemia, hemoglobin, red blood cells, hematocrit, mean corpuscular hemoglobin

[I] NTRODUCTION

Thalassemia is considered as a set of disorders that are characterized by inherent hemoglobin defects and associated with lowered synthesis of globin chains resulting in abnormal production of globin which determines how much severe is the thalassemia (Karim et al., 2016). Thalassemia includes subtypes such as beta-thalassemia that is caused by alterations in synthesis of beta globulin chain and may vary from minor to major forms (Omar et al., 2005; Desouky et al., 2009). Beta-thalassemia major is considered an important blood disease because patients who have this disease lack the ability to make appropriate amounts of good red blood cells which makes them dependent on blood transfusion as they are living (Ferdaus et al., 2010).

Beta-thalassemia major has been linked to a variety of adverse complications such as growth

retardation (Low, 2005), alterations of endocrine function (Gulati et al., 2000), hypothyroidism (Al-Samarrai et al., 2008), hepatic dysfunction (Ambu et al., 1995), and defects in renal system (Widad et al., 2003).

From epidemiologic point of view, beta-thalassemia is predominant in large areas including Mediterranean countries, the Middle East, Central Asia, India, Southern China, and the Far East (Galanello and Origa, 2010). It has been reported that Cyprus has the highest rate of thalassemia (14%), and Sardinia (10.3%) (Flint et al., 1998; Vichinsky, 2005).

From a clinical point of view, thalassemia major can occur in an infant less than two years of age accompanied by severe microcytic anemia, mild jaundice and hepatosplenomegaly. Thalassemia intermedia may present at a later age with similar picture and milder clinical findings (Galanello and Origa, 2010).

From a hematologic point of view, RBC indices indicated to microcytic anemia. Patients with thalassemia have the a hematologic picture including lowered hemoglobin level (<7 g/dl), mean corpuscolar volume (MCV) ranges between 50 to 70 fl and mean corpuscolar Hb (MCH) ranges between 12 and 20 pg. On the other hand, in cases of patients with thalassemia intermedia, Hb level ranges between 7 and 10 g/dl, MCV between 50 and 80 fl and MCH between 16 and 24 pg (Galanello et al., 1979).

The main objective of this study was to examine the patterns of hematological findings in a group of patients with thalassemia treated in Rahma Princess Hospital.

[II] MATERIALS AND METHODS

2.1. Study design: a retrospective study was conducted to collect data from the medical archives of patients with thalassemia.

2.2. Study sample: the study included files of 117 patients with thalassemia treated in Princess Rahma Hospital, Jordan.

2.3. Study variables: two main types of variables were involved. Demographical variables included age and gender. Hematological variables included: white blood cells (WBCs), red blood cells (RBCs), hemoglobin (HGB), hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), platelets count, Red cell distribution width (RDW), mean platelet volume (MPV), platelet large cell ratio (P-LCR), plateletcrit (PCT), nucleated RBCs (NRBC), neutrophils, lymphocyte, monocytes, and immature granulocytes (IG).

2.4. Data collection and analysis:

Files of patients with thalassemia were reviewed and the data was collected from each file and entered into excel sheet, and then all data were entered into SPSS version 21 for statistical analysis. Data were presented as means and standard deviation for all variables except genders which was presented as frequency and percentages because it is a categorized variable. The relationships between variables were computed based on T test and Pearson correlation. Significance was considered at alpha level <0.05.

[III] RESULTS

3.1. General characteristics of participants

Table 1 showed that the mean age of participants was 17.82±8.28 years, and about 52% of participants were males.

Variable	Description
Age (M±SD)	17.82±8.28
Gender (N, %)	
Males	61 (52.1%)
Females	56 (47.9%)

Table 1: General characteristics of participants

3.2. Hematological profile of thalassemia patients

As indicated in table 2, hematological findings for patients with thalassemia were reported. The mean of WBCs was 10.21±6.33 (103/ul), the mean of RBCs was 5.13±22.09 (103/ul), the mean level of HGB was 8.25±1.75 (g/dl), and the mean level of HCT was 23.85±6.11 (%). Other indices included MCV (75.86±5.62 fl), MCH (27.11±5.56 pg), MCHC (53.91±96.48 g/dl), platelets

(451.60±292.51 103/ul), RDW-SD (45.56±18.66 fl), RDW-CV (17.73±4.88%), MPV (11.22±2.99 fl), P-LCR (30.64±10.04%), PCT (2.03±11.33%), NRBC (8.76±20.44 103/ul), neutrophils (4.93±2.89 103/ul), lymphocytes (3.88±3.04 103/ul), monocytes (0.91±0.77 103/ul), and IG (0.14±0.17 103/ul).

Hematological test	Mean (M)	Standard deviation (SD)
WBCs (10^3/ul)	10.21	6.33
RBCs (10^6/ul)	5.13	22.09
HGB (g/dl)	8.25	1.75
HCT (%)	23.85	6.11
MCV (fl)	75.68	5.62
MCH (pg)	27.11	5.56
MCHC (g/dl)	53.91	96.48
Platelets (10^3/ul)	451.60	292.51
RDW-SD (fl)	45.56	18.66
RDW-CV (%)	17.73	4.88
MPV (fl)	11.22	2.99
P-LCR (%)	30.64	10.04
PCT (%)	2.03	11.33
NRBC (10^3/ul)	8.76	20.44
Neutrophils (10^3/ul)	4.93	2.89
Lymphocyte (10^3/ul)	3.88	3.04
Monocytes (10^3/ul)	0.91	0.77
IG ((10^3/ul))	0.14	0.17

Table 2: Hematological profile of thalassemia patients

3.3. The relationship between age and hematological parameters.

As seen in table 3, the relationships between age and all hematological findings were statistically significant ($p<0.001$), except the relationship between age and RDW-CV was not statistically significant ($p>0.05$).

3.4. Correlation between age and hematological findings of patients with thalassemia.

As revealed by table 4, age was positively and significantly correlated with WBC (0.313, p=0.001), RDW-SD (0.211, p=0.027), RDW-CV (0.255, p=0.007), MPV (0.233, p=0.042), NRBC (0.191, p=0.039), neutrophil (0.200, p=), lymphocyte (0.294, p=0.001), monocytes (0.280, p=0.002), and basophils (0.329, p=0.000).

Variable	M	SD	P value
Age – WBCs	17.82 10.21	8.63 6.33	<0.001
Age- RBCs	17.82 5.13	8.63 22.1	<0.001
Age – HGB	17.82 8.25	8.63 1.76	<0.001
Age- HCT	17.82 23.85	8.63 6.11	<0.001
Age – MCV	17.82 75.69	8.63 5.62	<0.001
Age – MCH	17.82 27.12	8.63 5.56	<0.001
Age- MCHC	17.82 53.91	8.63 96.48	<0.001

Age- Platelets	17.82 451.60	8.63 292.51	<0.001
Age- RDW-SD	17.82 45.56	8.59 18.67	<0.001
Age- RDW-CV	18 17.73	8.76 4.89	>0.05
Age- MPV	17.24 11.23	8.58 2.99	<0.001
Age – P-LCR	17.24 30.63	8.58 10.04	<0.001
Age- PCT	17.24 2.03	8.58 11.33	<0.001
Age- NRBC	17.82 8.76	8.62 20.44	<0.001
Age- Neutrophils	17.82 4.93	8.62 2.89	<0.001
Age – Lymphocytes	17.82 3.88	8.62 3.02	<0.001
Age- Monocyte	17.82 0.92	8.62 0.77	<0.001
Age- Eosinophil	17.82 0.30	8.62 0.29	<0.001
Age- Basophil	17.82 0.10	8.62 0.11	<0.001
Age- IG	17.60 0.14	8.33 0.17	<0.001

Table 3: The relationship between age and hematological parameters.

Variable 1	Variable 2	Correlation	Significance
Age	WBC	0.313	0.001
Age	RDW-SD	0.211	0.027
Age	RDW-CV	0.255	0.007
Age	MPV	0.233	0.042
Age	NRBC	0.191	0.039
Age	Neutrophil	0.200	0.031
Age	Lymphocyte	0.294	0.001
Age	Monocyte	0.280	0.002
Age	Basophils	0.329	0.000

Table 4: Correlation between age and hematological findings of patients with Thalassemia

[IV] DISCUSSION

The present study was conducted to study hematological findings in a group of patents with thalassemia. The results of the present study showed that the levels of WBCs and RBCs were within normal range, it is consistent with other studies that showed thalassemia does not influence the frequency of WBCs and RBCs because hemoglobin is the targeted structure (Omar et al., 2005; Desouky et al., 2009; Karim et al., 2016).

The mean of hemoglobin level and HCT was 8.25 g/l and 23% respectively. We think that the patients in this study have thalassemia intermedia, because the hemoglobin level in this type ranges between 7 and 10 g/dl (Galanello et al., 1979; Galanello and Origa, 2010). The mean level of MCV is about 76 fl, which is close to thalassemia intermedia (Galanello et al., 1979; Galanello and Origa, 2010). The mean levels of the remaining parameters prefer the diagnosis of thalassemia intermedia.

Hematologic parameters had significant relationships and positive correlations with age ($p<0.001$), except RDW-CV ($p>0.05$). These

findings do agree with other studies in which age was the strongest predictor of thalassemia (Greenwalt and Zelenski, 1984; Thompson et al., 2010).

[V] CONCLUSION

The findings of the present study showed that patients had thalassemia intermedia and age was associated significantly and correlated positively and significantly with hematological parameters.

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