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Hemoglobin and Ferritin Concentration in Cord Blood

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Abstract

Background: Neonatal anemia occurs when there is a decrease in the baby's red blood cell count before delivery. Fetal anemia is relatively rare but serious condition an Immune- Related cause is the most common involving red blood cell (RBC) alloimmunization followed by non-immune causes such as parvovirus B19 infection and other congenital infection. Other causes include genetic or metabolic syndromes and vascular tumors of the baby or placenta.

Patients and methods: This cross- sectional study is conducted on 200 Neonates, delivered by normal or cesarean section in Fayoum University Hospital & Fayoum General Hospital. Hemoglobin and Ferritin levels in cord blood are determined.

Results: The mean ± SD of HB & Ferritin was: 12.61 ± 2.44% and 104.96 ± 98.17 respectively. About one eighth 24 / 200 (12.0 %) of studied neonates had ferritin deficiency (FD).

Conclusion: In Our study, more than one third (39%) of study neonates had anemia. One eights 24/ 200 (12%) of neonates had Ferritin deficiency. 9.5% of study neonates had iron deficiency anemia (IDA). Prevalence of Iron deficiency anemia in males was higher than in females (12% Vs 7.7 %) with no statistical significance p= 0.301. Finally, we conclude that iron deficiency is important cause of anemia.

Key words: Neonatal anemia, Hemoglobin, Ferritin, cord Blood.

1. Introduction

Anemia is defined as a reduction of the red blood cell volume or hemoglobin concentration below the range of values occurring in healthy persons to meet the tissue demands for oxygen delivery (Glader, 2007).

Newborns have about 4.7 million red blood cells per cubic millimeter of blood and

women have about 4.7 million per cubic millimeter of blood (Karine, 2007).

The actual process of making red blood cells is called erythropoiesis. In Greek, erythropoiesis means "red," and poesies means "the making of things." So, Erythropoiesis is the process of manufacturing, recycling, and regulating the number of red blood cells (Van Meter, 2008). Most of the work of erythropoiesis occurs in the bone marrow it takes about 25 days. In children younger than 5 years old, the marrow of all the bones of the body is enlisted for producing red blood cells. EPO is a 30-39 kd glycoprotein that binds to specific receptors on the surface of erythroid precursors and stimulates their differentiation and clonal maturation into mature erythrocytes. The regulation of EPO gene expression involves an oxygen sensing mechanism, and both hypoxia and anemia stimulate erythropoiesis by stimulating mRNA transcription and EPO production (Glader, 2007).

2. Patients and Methods

This prospective cross- sectional study is conducted on 200 Neonates, delivered by normal or cesarean section in Fayoum University Hospital & Fayoum General Hospital from April 2018 to July 2018.

- Inclusion Criteria

- All neonates born either by vaginal delivery or by cesarean section.
- All neonate of both genders.
- Gestational age ≥ 37 weeks.

- Exclusion Criteria

- Any new born with major congenital anomalies or with major surgical conditions were excluded.

- **All cases are subjected to:**

1. Full history taking with focusing on history for maternal illness, maternal drugs, risk factors for Anemia e.g. RH or nutritional deficiencies iron, folate, vitamin B12.
2. Examination of the new born immediately after birth: general and systemic examination.
3. Laboratory investigation:

Hemoglobin and ferritin levels in cord blood are determined. Two milli liters of

blood is collected from the cord of each new born into EDTA bottle for hemoglobin analysis and another 2 mls into a plain bottle for serum ferritin assay.

- **Statistical Methods**

Data was statistically analyzed using standard computer program (SPSS) software package. Quantitative was presented as mean +/- SD or medium (range) when appropriate. Quantitative data was presented as number & percentages. Different methods of differences and association were used.

- **Ethical Consideration**

This study was reviewed by the faculty of Medicine Research Ethical Committee. We informed the parent of the new born about the objectives of the study, the examination, investigations that have been done. Also, the confidentiality of their information and their rights not to participate in the study.

3. Results

The study was conducted on 200 newborns delivered either by cesarean section or by normal vaginal delivery at Fayoum General Hospital & Fayoum University Hospital. We exclude babies with major congenital anomalies and babies with major surgical conditions.

Most of studied neonates were female 117/ 200 (58.5 %) while male constituted 41.5% of them. Neonatal Anemia was diagnosed by hemoglobin level less than 13 gm/ dl (Kirsten. Crowley, 2005). Iron deficiency anemia was diagnosed by hemoglobin level less than 13 gm/ dl (Kirsten. Crowley, 2005) and serum ferritin level below 25 ng/ ml (MelindRatini, 2017). Ferritin deficiency was diagnosed by serum ferritin level below 25 ng/ ml (MelindRatini, 2017).

According to this criterion, out of study neonates about more than one third (78/200) (39%) of study neonates had anemia. About one eighth (24/200) (12%) of study neonates had ferritin deficiency. About (19/200) (9.5%) had iron deficiency anemia (IDA).

Prevalence of Iron deficiency anemia (IDA) in males was higher than in females (12% vs 7.7 %) with no statistical significance p= 0.301. The prevalence of FD in males was higher than in females (14.5% vs 10.3%), with no statistical significance p= 0.368. The mean ± SD of HB and ferritin were: 12.61 ± 2.44 & 104.96 ± 98.7,

respectively. Mean ± SD of mother HB was lower in neonates with IDA than in those without (10.31 ± 1.18 vs 11.24 ± 1.60), with statistical significance p = 0.014. In Table (1) and figure (1) show that in our study group neonates, female was 117/200 (58.5%) while male constituted 41.5% of them.

Table (1): Sex characteristics of study neonates (N=200)

Variable	N	%
Male	83	41.5
Female	117	58.5

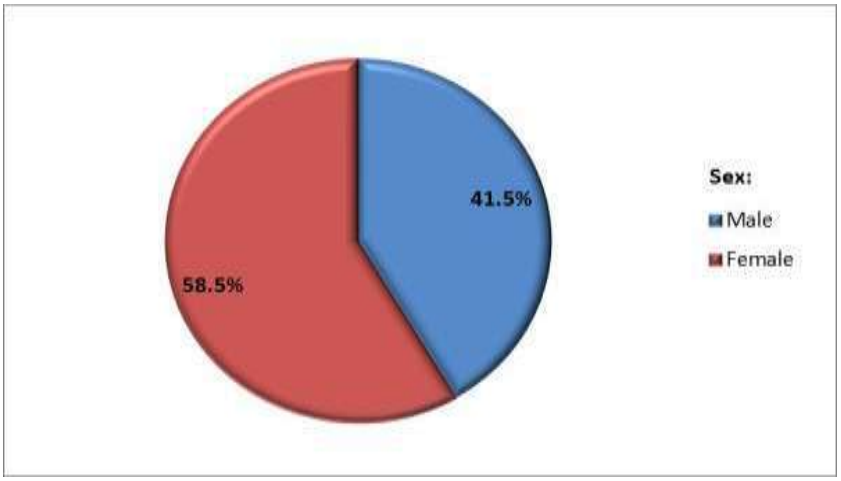

Figure 1: Sex characteristics of study neonates (N=200). It shows that in our study group neonates, female was 117/200 (58.5%) while male constituted 41.5% of them.

In Table (2) reveals that mean ± SD of HB and Ferritin were: 12.61 ± 2.44 and 104.96 ± 98.17, respectively.

Table (2): Hb and ferritin in study neonates (N=200)

Variable	Mean ± SD	Median (Range)
Hemoglobin	12.61 ± 2.44	12.2 (8.3-17.9)
Ferritin	104.96 ± 98.17	65.11 (7.49-507.68)

In Table (3) and Figure (2) Ferritin deficiency is diagnosed by serum Ferritin level below 25 ng/ml (MelindRatini, Do, Ms 2017). About one eighth of studied neonates 24/200 (12.0%) had Ferritin deficiency.

Table (3): Ferritin deficiency in study neonates (N=200).

Variable	N	%
New born with Ferritin deficiency	24	12.0
Normal	176	88.0

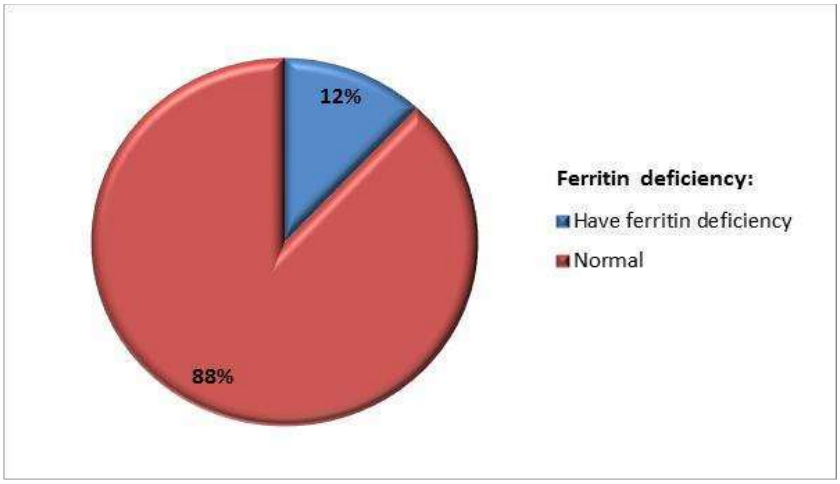

Figure (3): Ferritin deficiency in study neonates.

4. Discussion

Various factors influence the normal values of hematological parameters at the time of birth and during early weeks of life as treatment of umbilical vessels at the time of

delivery, gestational age of the infant and others should be considered in mind. (Kaushansky et al., 2010).

Most of studied neonates were female 117/ 200 (58.5 %) while male constituted 41.5% of them. The mean ± SD of HB and ferritin were: 12.61 ± 2.44 & 104.96 ± 98.7, respectively. Mean ± SD of mother HB was lower in neonates with IDA than in those without (10.31 ± 1.18 vs 11.24 ± 1.60), with statistical significance p = 0.014. This is similar to a study done by (Adewumi Adediran et al., 2013) and (Al- Hilli, 2010).

Mean ± SD of mother HB was lower in neonates with FD than in those without (10.36 ± 1.26 vs 11.26 ± 1.60) with a statistical significance p = 0.009. There was a positive significant correlation between HB of neonates and HB of the mother, r = 0.248 and p= 0.006.

There was a positive correlation between HB of mothers and ferritin of neonates with no statically significance.

This is similar to a study done by (Singala et al., 2008, Rumi Debbarma et al.,2015, Swetha et al., 2017, Agrawal & Srivastava P, 2017).

Prevalence of IDA in neonates from anemic mothers was higher than those from non-anemic mothers (15.2 % Vs 4.6%) with statistical significance p=0.011. This is similar to a study done by (Adewumi Adediran et al., 2013) and (Al- Hilli, 2010).

Similar to our results, A study was conducted in neonatal care unit of the tertiary hospital by (Swetha et al., 2017). This prospective study was conducted in a tertiary care institution of Andhra Pradesh from November 2014 to August 2016. Total 195 mothers and new born pairs are enrolled in the study. Male constituted 54.7% (94) and females constituted 45.3% (78) of the cases. In our study, male constituted 41.5% (83) while female constituted 58.5% (117). Significant positive correlation was found between maternal HB and neonatal Ferritin (Pearson's correlation coefficient = 0.26, P= 0.002). The mean HB and ferritin values were (14.5 ± 2.1 g/dl) & (128.9 ±80.7µg/dl).

5. Conclusion:

The percentage of neonatal anemia was 39%, out of them 12% had FD. Percentage of studied neonates having IDA was 9.5%. Iron deficiency anemia is important cause of anemia which affects roughly one-quarter of the world' population. It is now documented that even mild iron deficiency in the mother reduced iron stores

in the fetus, resulting in neonatal-Iron deficient condition.

6. Recommendations:

1. Optimization of maternal hemoglobin with good nutrition and iron supplementation.
2. This study shows direct correlation between maternal and fetal hemoglobin levels. We, therefore stress the importance of preventing maternal anemia and maintaining adequate Iron storage in mothers during pregnancy to ensure better maternal and fetal outcome.

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