Peripheral Smear Studies in Paediatric Anaemia

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I. Introduction

Anemia is a decrease in number of red blood cells (RBCs) or reduced quantity of hemoglobin in the blood.[9][10]However, it can include decreased oxygen-binding ability of each hemoglobin molecule due to deformity or lack in numerical development as in some other types of hemoglobin deficiency. Because hemoglobin (found inside RBCs) normally carries oxygen from the lungs to the capillaries, anemia leads to hypoxia (lack of oxygen) in organs[4]. Since all human cells depend on oxygen for survival, varying degrees of anemia can have a wide range of clinical consequences. Anemia is the most common disorder of the blood[5][6]. The several kinds of anemia are produced by a variety of underlying causes. It can be classified in a variety of ways, based on the morphology of RBCs, underlying etiologic mechanisms, and discernible clinical spectra, to mention a few. The three main classes include excessive blood loss (acutely such as a hemorrhage or chronically through low-volume loss), excessive blood cell destruction (hemolysis) or deficient red blood cell production (ineffective hematopoiesis[7][8]..

Anaemia Can Be Classified Into: Mild, Moderate And Severe Depending Upon The Hemoglobin Content In Table 2.

➢ Hb value = 8 – 10 g/dl indicates mild anaemia
➢ Hb value = 6 – 8 g/dl indicates moderate anaemia
➢ Hb value = <6 g/dl indicates severe anaemia

Anaemia Is Classified Based On The Mcv, Mch, Mchc Levels Into:

• Normocytic, microcytic or macrocytic
• Normochromic or hypochromic
• Anisocytosis and/or poikilocytosis (by peripheral smear study) in Table 5.

II. Methodology

Anemia is a common cause of morbidity in pediatric age group. The common causes of anemia has been studied in 30 children by assessing the hematological parameters. The complete hemogram was studied in all cases to assess the type of anemia. The automated analyzer which is used in our government hospital is Sysmex – (KX-21). Peripheral smear was reviewed for the cause of anemia.

Study Size
30 cases of children with anemia who have their haemoglobin less than their age appropriate Hb level was studied.
Study Material
Complete hemogram and peripheral smear in children having reduced Hb level were assessed.
Study Centre
Department of Paediatrics, Tirunelveli Medical College Hospital, Tirunelveli.
Duration Of Study
 August & September 2013.
Inclusion Criteria
Includes the children who are less than 12 years who have reduced age appropriate hemoglobin level.
Exclusion Criteria
Patient more than 12 years and children with normal hemoglobin levels.

III. Results

Peripheral smear and complete blood count has been studied for 30 cases. In complete blood count, Hb level of less than 10g/dl were studied by classifying it into mild (8-10g/dl), moderate(6-8g/dl) and severe (<6g/dl) anemia in which 60% had mild anemia, 23% had moderate anemia and 17% had severe anemia. In Peripheral smear study 17% had normocytic normochromic smear, 3.3% had dimorphic smear i.e. smear showing both microcytic and macrocytic RBCs, and the rest 80% had microcytic hypochromic RBCs (Figure 1) in the peripheral blood smear. This microcytic hypochromic smear may be indicative of iron deficiency anemia, thalassemia, chronic blood loss. Of this 16.7% is due to chronic blood loss, 3.3% due to thalassemia, rest 80% due to iron deficiency which is a Nutritional deficiency. Age statistics shows that anemia is prevalent among

27% of infants, 50% of preschool children and 23% of children between 6 – 12yrs, from which the common age group prone to get anemia is the preschool children (*below 5 yrs*) and according to the study undertaken in 30 cases, the most common cause of anemia in pediatric age group (below 12 yrs), is iron deficiency.

IV. Discussion

In controlled trials and time-series studies, screening and treatment for iron deficiency anemia can reduce the prevalence of iron deficiency anemia in high-risk populations, but there are no data that directly link screening with better neurodevelopmental outcomes. Iron supplementation for infants aged 3–6 months improves growth and weight gain in anemic, malnourished children aged 7–10 years in developing countries.In cross-sectional and longitudinal cohort studies, iron deficiency anemia as an infant is associated with long-term psychomotor and cognitive abnormalities, poor school performance, and mental retardation. However, confounding due to environmental, socioeconomic, and other nutritional factors cannot be excluded. Iron deficiency anemia is a serious problem worldwide. Although it is less common in developed countries such as the United States and Canada, where the use of iron supplemented formula is widespread, within these countries it is still a major concern among vulnerable populations, particularly in recent immigrants, native Americans, and poor African-American communities. While iron deficiency anemia in infancy is a marker for poor neurocognitive development subsequently, screening and early treatment have not consistently improved these outcomes. Two leading hypotheses have been advanced to explain these disappointing results. One is that prevention of neurodevelopmental consequences of iron deficiency anemia may require acting to prevent iron deficiency in the first place rather than detection and treatment of existing iron deficiency. At present there is little evidence to support this hypothesis, but additional studies, particularly in developing countries, may confirm it. The second hypothesis is that prevention of neurodevelopmental consequences may require screening and early treatment of multiple nutritional deficiencies, rather than iron deficiency anemia alone. About 30 cases of pediatric anemia has been studied from which it was found out that anemia is more prevalent among preschool children, and about 90% had symptoms of tachycardia, tachypnea, and less than 10% had systolic murmur. Peripheral smear studies shows 80% of microcytic hypochromic RBCs. Nutritional deficiency anemia was found to be the most common anemia according to the study undertaken here in 30 cases of pediatric anemia. According to this study conducted in 30 children who are below 12 yrs, the most common affected age group is below 5 yrs (preschool children).

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Table 1

AGE	NO. OF CASES	PERCENTAGE
New born up to 1 Year	8	26.7%
Preschool Children(below 5 yrs)	15	50%
6 – 12yrs	7	23.3%

Table 2

TYPES OF ANEMIA	NO. OF CASES	PERCENTAGE
Mild anemia	18	60%
Moderate anemia	7	23.3%
Severe anemia	5	16.7%

Table 3

AGE	Male	Percentage	Female	Percentage
0 – 1 yrs	6	31.5%	1	9%
1 – 5 yrs	10	52.6%	6	54.5%
6 – 12 yrs	3	15.7%	4	36.3%

Table 4

Types of anemia	No. of cases	Percentage
Iron deficiency anemia	22	73%
Hemolytic anemia	2	6.7%
Anemia due to blood loss	5	16.7%
Aplastic anemia	1	3.3%

Table 5

TYPES OF ANAEMIA	NO. OF CASES	PERCENTAGE
NORMOCYTIC NORMOCHROMIC	5	16.7%
NORMOCYTIC HYPOCHROMIC	-	-
MICROCYTIC HYPOCHROMIC	18	60%
MACROCYTIC	-	-
DIMORPHIC	1	3.3%
MICROCYTIC HYPOCHROMIC WITH ANISOCYTOSIS , POIKILOCYTOSIS	2	6.7%
MICROCYTIC HYPOCHROMIC WITH INCREASED NEUTROPHILS	3	10%
MICROCYTICHYPOCHROMICWITH ANISOPOIKILOCYTOSIS WITH INCREASED NEUTROPHILS	1	3.3%