CORRELATION OF PERIPHERAL BLOOD FILM AND RED CELL INDICES, IN THE DIAGNOSIS OF MICROCYTIC HYPOCHROMIC ANEMIA IN CHILDREN OF OUR INSTITUTION.

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ABSTRACT:

Introduction: Microcytic hypochromic anemia is the most common type of anemia in pediatric age group. The differential diagnosis includes iron deficiency anemia, anemia of chronic disease, thalassemia and sideroblastic anemia. Iron deficiency anemia is a chief worldwide health issue as it causes anemia , impaired cognitive and motor development. Children present in the hospital either with symptoms and signs of anemia or with manifestations of other diseases screening for which reveals anemia. In this study we have compared the red cell indices with their respective peripheral smear findings particularly and analyzed their utility in diagnosing of microcytic hypochromic anemia in pediatric population.

Methodology: In the current study, 50 children in the age group between 6 months to 12 years, with microcytic hypochromic anemia, identified in the peripheral smear report as well as complete blood hemogram, were randomly selected and their red cell indices were correlated with Red cell distribution width and peripheral smear.

Results and Conclusion: Out of 50 cases all were IDA cases. In the differential diagnosis of microcytic hypochromic anemia, the correlative study revealed red cell distribution width

(RDW) to be sensitive in the diagnosis of iron deficiency anemia. There was also a statistically significant correlation between the RDW and different red cell indices. A low MCV and increased RDW with a cut off value of <15 in the highly prevalent areas to pick up more cases with increased sensitivity

KEY WORDS: Microcytic Hypochromic anemia, Red Cell Distribution indices.

INTRODUCTION

Anemia is a major health problem in developing countries and results in significant morbidity and mortality in infants and children[1]. Iron deficiency is the most commonly seen micronutrient nutritional deficiency among Indian children and has contributed significantly for increase in morbidity and mortality in our country[2]. The most severe consequence of iron deficiency seen is iron deficiency anemia

The etiology in most of the IDA is multi-factorial and usually IDA is attributed to inadequate iron intake, poor bioavailability of the iron that is taken or high nutritional requirements during childhood and during rapid growth, chronic intestinal blood losses due to helminth infections, or severe malarial infections in tropical countries[3]

Microcytic hypochromic anemia in children is most commonly due to iron deficiency anemia and less commonly due to thalassemia, sideroblastic anemia, lead poisoning and anemia of chronic disease. Global anemia prevalence estimates 47 percent of children younger than 5 years have anemia[4]. Of the various countries India has the highest prevalence of anemia .80 % of children under 2 years of age are anemic[5].In children aged 6-59 months in India,7 in 10 are anemic. About 10% of world's children are born with hemoglobinopathies every year.

Iron deficiency anemia produces spectrum of symptoms including weakness, fatigue, growth retardation, tachypnea, tachycardia, permanent reduction of cognitive functions and variety of behavioral disturbances like irritability, short attention span, and lack of interest in the surroundings[6].

The iron deficient subjects are unusually prone to infection related to defective cell mediated immunity and impaired bacterial killing by phagocytes. There have also been studies showing long term implication of IDA on the neurodevelopmental outcome. All of these behavioral disturbances are ameliorated with the initiation of iron therapy[7]. The high incidence of iron deficiency anemia in children emphasizes the need for early detection and prompt treatment of this easily treatable condition. An optimal non-invasive method for diagnosing iron deficiency anemia has eluded practitioners for many years.

Amongst various indices, MCV and RDW were important for interpretation of

morphology. The peripheral blood smear has been the main diagnostic aid in establishing the etiology of anemia. Examining the blood films routinely has facilitated interpretation of various hematological disorders. In this study we have compared the red cell indices with their respective peripheral smear findings particularly and analyzed their utility in diagnosing of microcytic hypochromic anemia in pediatric population.

MATERIAL AND METHODS

The present study was conducted on 50 randomly selected children admitted in the pediatric department, Saveetha Medical College, Thanadalam Chennai between January 2023 to June 2023. After getting informed consent, samples were collected in 5 ml EDTA tubes. It was used to estimate complete hemogram with the 6 part analyzer , peripheral smear and reticulocyte count.

Following red cell indices were obtained from the hematology analyzer. Mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and red cell distribution width (RDW). Peripheral smear was done to subtype the anemia.

In our study children from age 6 months to 12 years who are anemic (as per WHO cut off values)with microcytic hypochromia as per peripheral smear and red cell indices were included whereas New born children and age less than 6 month and those with macrocytic and normocytic anemia and markedly elevated reticulocyte counts in smear were excluded.

RESULTS

The age of 50 randomly selected cases in our study ranged from 6 months to 12 years. The mean age was 5.32 years. Number of cases with mild, moderate and severe anemia are 18, 25 & 7 respectively. Eighty percentage of cases in our study had RBC count less than 5 million.

Grading of microcytosis and hypochromia was done using Blood cell morphology grading guide by Gene Gulati using below table. In the peripheral blood film, 200 RBC's were counted to check for microcytic and hypochromic cells. In our study, out of 50 cases of anemia, following grade was seen with respect to microcytosis and hypochromia

Table 1: Grading of microcytic hypochromic cells

Grade	Range	No of smears	Percentage
1+ grade	<25 cells/100 RBC'S	15	30%
2+ grade.	25-50 cells/100 RBC'S.	20	40%
3+ grade.	50-75 cells/100 RBC'S	9	18%
4+ grade.	>75 cells/ RBC'S.	6	10%

In our study we next evaluated mean values of all parameters, the mean values of all parameters of red cell indices were as below: the red blood cells was 4.53 lakhs, mean Hb was 8.93, mean MCV was 74.75, mean MCH was 22.33 , mean MCHC was 29.40 and finally mean RDW was 16.68. In our study population all patients had microcytic hypochromic anemia .

Table 2 RBC indices

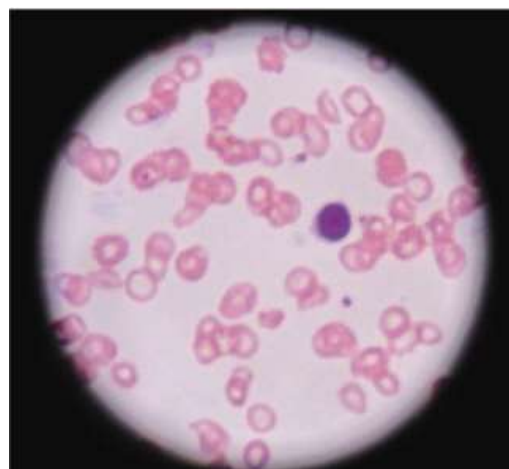| PARAMETER	MEAN	SD
RBC	453387	79350
HB	8.93	1.24
MCV	74.75	4.84
MCH	22.33	2.46
MCHC	29.40	1.74
RDW	16.68	3.23

Figure 1: Image of iron deficiency anaemia on peripheral smear

We also next analyzed the histogram of all patients and as all patients had microcytic

hypochromic anemia there was shift to left in all patients, Out of 50 cases of microcytic hypochromic anemia 3 (6%) cases were normal, 28 (56%) cases showed shift to left, 13 (26%) cases showed broad base curve, 3 (6%) cases showed bimodal curve and 3 (6%) cases showed short peak.
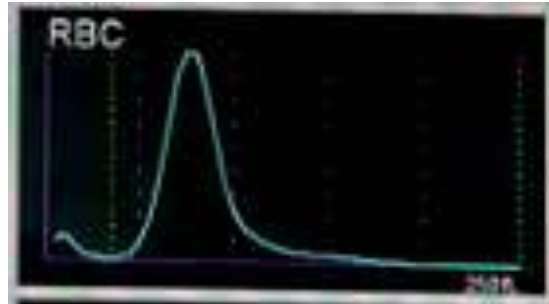

Fig 2: RBC Histogram -Shift to left

The correlation co-efficient (r) between RDW and other parameters were analysed. There is an increase in RDW and there is a fall in all other parameters. So this correlation was statistically significant.

Table 3: Correlation of RDW with Blood indices

PEARSON CORRELATION		
RDW Vs Hb	r = -0.04	P < 0.001
RDW VS RBC	r = 0.30	P < 0.001
RDW Vs MCV	r = -0.20	P < 0.001
RDW VS MCH	r = -0.28	P = 0.213
RDW VS MCHC	r = -0.16	P = 0.354

DISCUSSION

In our present study involving 50 randomly selected cases, the various red cell indices like hemoglobin, RBC count ,MCV, MCH and MCHC were obtained from the SYSMEX 3 part analyzer.,

In our present study, the predominant age group involved was 6 months to 3 years..In their study, Jain et al 2000[7] have reported high prevalence of anemia   between 1 to 2 years (59.9%).In the ICMR Study 1985[8], age group most involved was also between 1 to 3 years. (63%). The hospital based study in Nepal by Arnab et al [9] showed commonest age group between 1-6 years.[10.] Our study corresponds to the other studies in terms of predominant age group involved.

In terms of predominant sex involved, present study showed out of 50 children more males were involved than females. This corresponded to other studies also.Sunil et al[6]

found a 50% male children involved in their study. Santosh et al[8] and Roosy Aulakh et al[11] have reported a 60% and 70% of male involvement in their studies.

The mean values of various RBC parameters like mean Hb, mean MCH, mean MCV, mean RDW in our study were in coincidence with the other studies like Sazawal et al 2014[6] and Santosh et al 2013[8]. These parameters are compared to show that the mean values derived in our study and from the other studies were not significantly different to affect the study outcome.

According to Sezawal et al[6], the expensive investigations needed for the diagnosis of most common microcytic anemia, IDA such as iron status markers necessitates the use of cost effective tools. The increase in RDW may occur even before the decrease in MCV. They also conclude that RDW may very well be employed in large sample settings as a screening tool to identify iron deficiency anemia. They suggest a cut off value of RDW >15% and hemoglobin <10 g/dl. As seen in the observation and results, there was a statistically significant negative association between RDW and all other blood indices like hemoglobin RBC, MCV etc .

It is important to that iron deficiency anemia is treated adequately in young children. Often the clinical history, diet enquiry, physical examination of the child and the peripheral blood film along with the measurement of red cell indices leads to the correct diagnosis. In case of doubt, a therapeutic trial of iron may be given with dietary advice. If the hemoglobin concentration and red cell indices do not return to normal, then further investigation may be done[12].

CONCLUSION

Microcytic hypochromic anemia is mostly caused by iron deficiency. In the present study, Iron deficiency was found most commonly. The basic hematology data obtained from an automated hematology analyser such as MCV and MCH are helpful in classifying anemia into microcytic hypochromic or other categories. The RDW, which is a measure of anisocytosis is an early sign of iron deficiency and also a valid indicator.

In the present study, the RDW was found to be very sensitive in the early detection of iron deficiency. A low MCV and increased RDW with a cut off value of <15 in the highly prevalent areas to pick up more cases with increased sensitivity. The peripheral smear may be used to confirm the morphology as microcytichypochromic anemia

The calculation of various red cell indices could be easily made to detect iron deficient anemia. Lastly a reticulocyte count could be done not only to rule out hemolysis but also to assess the bone marrow response after a trial of oral iron therapy after 2weeks

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