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MENTZER INDEX - A SIMPLE TOOL TO DIFFERENTIATE BETA THALASSAEMIA TRAIT FROM IRON DEFICIENCY ANAEMIA , A REVIEW

Pathology

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ABSTRACT

Most frequent types of microcytic anaemia in Indian patients are Iron Deficiency Anaemia (IDA) and Beta Thalassemia Trait (BTT).We retrospectively judged the reliability of Mentzer index for differential diagnosis of microcytosis

Methods. A total of 33 randomly selected patients with different age group were evaluated. We calculated 6 discrimination RBC indices in all with consideration of RBC histogram. All the samples were also tested for HbA2,serum iron, TIBC and Iron saturation.

Results: Mentzer index showed GOOD sensitivity.

KEYWORDS:

MCV, RBC count, BTT, IDA, MENTZER INDEX.

INTRODUCTION :

Iron deficiency anaemia (IDA) and Beta Thalassaemia Trait (BTT) are two different types of anaemias, where both show microcytic morphology of RBC. BTT is a haemoglobinopathy, a congenital disease whereas IDA is an acquired disease, which is mainly due to dietary deficiency of iron. BTT can't be prevented or cured but iron deficiency anaemia can be prevented and cured by supplementing iron. Both the disease have different diagnostic, prognostic and treatment protocol. Confirmatory test for BTT is HbA2 level more than 3.5% and for IDA is low Iron, high TIBC and low Iron saturation. But these tests are expensive in Indian context. So, in order to differentiate IDA from BTT, different Red Cell indices are taken into account.

TABLE 1 : TABLE SHOWING RELATION OF MCV WITH RDW IN DIFFERENT TYPES OF ANAEMIA

Low MCV RDW Normal	Low MCV RDW High	Normal MCV RDW Nomal	Normal MCV RDW High	High MCV RDW Nomal	High MCV RDW High
Thalassemia Minor	Iron Deficiency	Normal	Regeneration	Refractory Anemia	B12, Folate Deficiency
Anaemia Chronic Disease	HbS/Thal HbH	Renal Chemotheraphy	Early Iron Def.	Prelukemia	AIHA
Normal Children (1-8 yrs	Fragment Anaemias (MHA)	Aplasia Heterozygote Hemoglobinopathy (AS, AC)	Siderob lastic	Liver Disease	
		Acute Blood Loss	Hemolysis - G6PD		

Their treatment protocol is also totally different. So, it is important to differentiate BTT from IDA by a simple routine test. Confirmatory test in cases of BTT is done by Haemoglobin electrophoresis and HPLC; in cases of IDA by serum iron, TIBC, serum Ferritin estimation. Over the years, many scientists have come out with different indices to differentiate BTT from IDA.

Basic critreria of difference between BTT and IDA, as given by the earlier scientists, was that in BTT, MCV is never less than 70fl, RBC count is normal and Hb% is around 10 gm% whereas in IDA, MCV is much lower, RBC count is low and Hb% is also low. Later on, with the introduction of CBC, RDW was also incorporated.

TABLE 2: TABLE SHOWING COMMON INDICES THAT ARE IN USE -

NAME OF INDEX	FORMULA	CUT OFF VALUE
1.MENTZER INDEX	MCV/RBC	<13
2.SRIVASTAVA	MCH/RBC	<3.8
3.ENGLAND AND FRASER	MCV-(5xHb)-RBC-3.4	<0
4.SHINE AND LAL	MCVxMCVxMCH/100	<1530
5.GREEN AND KING	MCVxMCVxRDW/Hbx100	<72
6.RICERCA	RDW/RBC	<3.3
7.RDWI	MCVxRDW/RBC	<220

MATERIALAND METHODS :

The investigations were conducted at the Haematology Laboratory, RIMS, Ranchi where patient's consent was taken for each patient. Approval by the local ethics committee was taken. There was no conflict of interest. Whole blood samples of 33 patients were used. The samples, collected in vials containing (EDTA-K3), were analysed within two hours of collection, using Haematology Analysers, Sysmex Corporation, Japan. Only the RBC parameters were noted. Histograms were taken into consideration. For each sample, a blood smear was prepared and stained manually, using Leishman stain. Every sample was tested for serum iron and TIBC, colorimetrically.

Each and every sample was rendered for HbA2 estimation using Agarose gel electrophoresis and Elution method at alkaline pH.

We calculated MENTZER index for every sample.

OBSERVATIONS :

SAMPLE	RBC X106/mL	Hb% g/dL	MCV fL	MCH Pg	MCHC g/dl	RDW %	MENTZER INDEX
01	5.38	11.3	66.5	21	31.6	15.1	12.36*
02	4.31	9.6	69.8	22.3	31.9	14	16.19
03	5.82	10.5	59.3	18	30.4	17	10.18*
04	4.93	9.6	65.1	19.5	29.9	17.2	13.20
05	4.11	9.5	74	23.1	31.3	13.9	18.00
06	5.43	9.5	57.8	17.5	30.3	18.1	10.64*
07	4.91	9.8	64.8	20	30.8	17.2	13.19
08	4.61	9	65.1	19.5	30	17.7	14.12
09	4.33	9.9	70.9	22.9	32.2	12.9	16.3
10	4.5	11.0	72.4	24.4	33.7	13.9	16.08
11	4.07	9.3	74.4	22.9	30.7	16.4	18.28
12	5.18	9	59.5	17.4	29.2	17	11.48*
13	4.43	10.9	73.6	24.6	33.4	14.2	16.61
14	5.49	10.9	64.3	19.9	30.9	16.7	11.71*
15	5.2	10.2	64.6	19.6	30.4	16.5	12.42*
16	5.5	10.7	63.1	19.5	30.8	16.1	11.47*
17	4.22	8.8	69.2	20.9	30.1	14.4	16.39
18	4.95	10.4	67.9	21	31	15.9	13.71
19	5.12	12.4	74.8	24.2	32.4	14.7	14.60
20	4.89	11.3	72.2	23.1	32	15.1	14.76
21	5.41	8.3	57.3	15.3	26.8	22.6	10.59*

22	4.74	9	64.1	19	29.6	18	13.52
23	5.1	10.6	66.9	20.8	31.1	16.7	13.11
24	5.4	9.8	58.7	18.1	30.9	17.9	10.87*
25	2.37	4.4	52.3	18.6	35.5	41.7	22.06
26	3.72	8.8	72.3	23.7	32.7	14.5	19.43
27	4.71	11.2	73.5	23.8	32.4	18.3	15.60
28	4.82	11.7	72.6	24.3	33.4	15.1	15.06
29	4.33	11	75.1	25.4	33.8	14.9	17.34
30	4.84	12	73.6	24.8	33.7	14.4	15.20
31	5.74	8.4	54.9	14.6	26.7	20.6	9.56*
32	4.64	10	70.3	21.6	30.7	14.2	15.15
33	4.76	10.5	67.9	22.1	32.5	14.5	14.26

(*Marked patients are MENTZER INDEX positive)

Randomly selected data of 33 patients were taken out of which 10 patients were of Mentzer index positive

RESULT :

We found 3 cases of True Positive for BTT out of 10 MENTZER positive patient. This shows a good sensitivity of MENTZER index

DISCUSSION :

There is a natural desire to use the several possible combinations of MCV, MCH, MCHC, RBC count, RDW etc to arrive at possible diagnoses of anaemias, but this practice may produce errors and must never substitute more specific laboratory investigations, including the analysis of peripheral blood slides.

Finally it is a better index for differentiation of BTT from IDA, since it can be easily calculated, correlates well, can be automated, is cost effective and gives accurate results with high specificity and sensitivity.

It can be used for screening purpose in the society, as the sensitivity is high and the cost per test is low.

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