RESULTS

RESULTS

Five hundreds children were sampled. They were presenting at the Kaliobiya hospitals with irrelevant conditions. The already known thalassemic children were excluded. The age ranged from 2 to 14 years. The frequency distributions and ranges of age in all the examined groups, namely : non-microcytic group and total microcytic group which includes iron deficiency anemia, β-thalassemia trait, and non-iron deficiency non β-thalassemia groups are shown in Table (1). The heterogeneity of age among the groups was assayed (Table 15, 16 and 17) and it showed no significant variation.

Sixty eight children or 13.6% reported first cousin consanguinity among parents and thirty children or 6% reported second cousin consanguinity.

Male to female ratios are shown in Table (2). No sex predilection among the examined groups ($x^2 = 0.00$, $P > 0.05$ in iron deficiency anemia group versus β-thalassemia trait group, $x^2 = 0.63$, $P > 0.05$ in iron deficiency anemia group versus non-iron deficiency non β-thalassemia group, $x^2 = 0.26$, $P > 0.05$ in β-thalassemia trait group versus non iron deficiency non β-thalassemia group).

Hb concentration ranged from 7.8 to 16 g/dl in non microcytic group and from 6.5 to 11.9 g/dl in the microcytic group. The frequency distributions and ranges of Hb in the different groups under study are described in Table (3). The mean values of Hb of that groups are shown in Fig. (1).

The RBCs count distributions and ranges in all the groups are described in Table (4) and the mean RBCs counts of that groups are shown in Fig. (2).

The frequency distributions and ranges of HCT% in all the groups under study are described in Table (5) and the mean values of HCT% of that groups are shown in Fig. (3).

MCV ranged from 79 to 117 fl in non-microcytic group and from 54.9-77 fl in microcytic group. The frequency distributions and ranges are described in Table (6) and the mean MCV in different groups is shown in Fig. (4).

MCH ranged from 24 to 38 pg/cell in non-microcytic group and from 15.5 to 25.9 pg/cell in microcytic group. The frequency distributions and ranges are described in Table (7).

Table (8) shows the Retics % distributions and ranges in the microcytic groups.

The frequency distributions of HbA_2 % are described in Table (9), ranged from 3.6-5.3% in β-thalassemia trait group and from 0.7 to 2.5% in iron-deficiency anemia group and from 1.2-3% in non-iron deficiency non β-thalassemia group. Identification of children falling in the category of β-thalassemia trait group was performed according to the following criterion : any subject with microcytosis and HbA_2 equal to or greater than 3.5% is considered β-thalassemia carrier **[Benz and Shwartz, 1990]**.

The mean values of HbA_2 % of the microcytic groups are shown in Fig. (5). From that Fig. it could be noticed that; the HbA_2 % in the iron deficiency anemia group is the lowermost with highly significant variations. There is highly significant positive correlation ("r" = 0.59, $P < 0.01$) between serum iron and HbA_2 as shown in Fig. (9). This means that : iron deficiency leads to lowering the level of HbA_2 .

The serum iron ranged from 18 to 49 μg/dl in iron deficiency group and from 50 to 122 μg/dl in β-thalassemia trait group and from 50 to 131 μg/dl in non-iron deficiency non β-thalassemia group. The frequency distributions are described in Table (10) and the mean values of serum iron in the microcytic groups are shown in Fig. (6). The frequency distributions and ranges of total iron binding

capacity and transferrin saturation (which is calculated from S-iron and TIBC) are described in Tables 11 and 12 respectively. The mean values of TIBC and transferrin saturation in microcytic groups are shown in Fig. (7) and Fig. (8) respectively. Identification of children falling in the category of iron deficiency anemia was performed according to the following criteria :

- Serum iron < 50 µg/dl **[Nicholson and Pesce, 1992]**.
- Transferrin saturation < 15% **[Stockman, 1992]**.

Table (13) shows the mean of the various parameters in the different groups under study. From this table it could be noticed that :

- In iron deficiency anemia group : there is reduction in Hb, HCT%, MCV, MCH, serum iron and transferrin saturation.
- In β-thalassemia trait group : there is reduction in Hb, HCT %, MCV and MCH and there is elevated HbA_2 %.
- In non-iron deficiency non β-thalassemia group : There is reduction in Hb, HCT %, MCV and MCH.

The median values of the various parameters in that groups are described in Table (14).

The anemia of β-thalassemia trait is milder than that of iron deficiency. There is highly significant variation between the mean values of Hb in the two groups ("t" value = 2.4136, $P < 0.01$) and there is significant variation between the mean values of HCT ("t" value = 1.8001, $P < 0.05$). Table (15).

The mean of RBCs count is highly significantly higher ("t" value = 3.0213, $P < 0.01$) and the mean of MCV is significantly lower ("t" value = 1.6487,$P < 0.05$) in β-thalassemia trait group than in iron deficiency anemia group. (Table 15). So, the iron deficiency group is more anemic and less microcytic if compaired with β-thalassemia trait group.

By testing the mean values of different parameters under study in iron deficiency anemia and non-iron deficiency non β-thalassemia groups (Table 16), it could be noticed that; there is highly significant lowering in the values of Hb ("t" value = 5.5421, $P < 0.01$), RBCs count ("t" value = 5.2455, $P < 0.01$), and HCT % ("t" value = 4.1480, $P < 0.01$) in iron deficiency anemia group than in non-iron deficiency non β-thalassemia group, and the mean of MCV is highly significantly lower in non-iron deficiency non β-thalassemia group ("t" value = 2.4127, $P < 0.01$). The mean of HbA_2 % is highly significantly lower in iron deficiency anemia group ("t" value = 8.0255, $P < 0.01$).

Except for HbA_2 %, all the variation between the mean values of different parameters under study in β-thalassemia trait and non-iron deficiency non β-thalassemia groups are not significant (Table 17).

The summary of the results of testing the mean values of different parameter under study in the microcytic groups are described in (Table 18).

Iron deficiency anemia is the most common cause of microcytosis and the prevalence of β-thalassemia trait is 3.0 % among the studied group of children (500). The prevalence of microcytosis and its causes are shown in Fig. (10).

Table (1)

Age groups in the different groups under study

Age group (years)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
2-	15	4.0%	1	1.2%	0	0.0%	2	6.5%	3	2.3%
4-	71	19.1%	12	14.5%	3	20.0%	5	16.1%	20	15.5%
6-	90	24.3%	22	26.5%	5	33.3%	11	35.5%	38	29.5%
8-	89	24.0%	24	28.9%	3	20.0%	4	12.9%	31	24.0%
10-	66	17.8%	17	20.5%	2	13.3%	8	25.8%	27	20.9%
12-	27	7.3%	6	7.2%	2	13.3%	1	3.2%	9	7.0%
14	13	3.5%	1	1.2%	0	0.0%	0	0.0%	1	0.8%
Total	371	100.0%	83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range	2-14		3-14		4.5-12		3-13		3-14	

Table (2)

Sex distribution in the different groups under study

	Non-microcytic group (n=371)	Microcytic Group				Grand Total (n=500)
		(1) Iron deficiency anemia group (n=83)	(2) β-Thalassemia trait group (n=15)	(3) Non-iron deficiency non-β-Thalassemia group (n=31)	Total Microcytic group (n=129)	
Male	200	44	8	19	71	271
Female	171	39	7	12	58	229
Total	371	83	15	31	129	500
Male:Female ratio	1.2:1	1.1:1	1.4:1	1.6:1	1.2:1	1.2:1

Group (1) X (2) [X2 = 0.00 P>0.05]

Group (1) X (2) [X2 = 0.00 P>0.05]

Group (1) X (2) [X2 = 0.00 P>0.05]

Table (3)

Hemoglobin in the different groups under study

Hemoglobin (gm/dl)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<8	1	0.3%	4	4.8%	0	0.0%	0	0.0%	4	3.1%
8-	10	2.7%	26	31.3%	4	26.7%	2	6.5%	32	24.8%
10-	117	31.5%	53	63.9%	11	73.3%	29	93.5%	93	72.1%
12-	206	55.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
14-	36	9.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
16+	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	371	100.0%	83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range	7.8-16		6.5-11.7		8.5-11.8		9.1-11.9		6.5-11.9	

Table (4)

R.B.Cs. count in the different groups under study

R.B.Cs. Count/ mm3 (millions)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
2-	6	1.6%	2	2.4%	0	0.0%	0	0.0%	2	1.6%
3-	77	20.8%	22	26.5%	1	6.7%	1	3.2%	24	18.6%
4-	245	66.0%	54	65.1%	11	73.3%	18	58.1%	83	64.3%
5-	38	10.2%	5	6.0%	3	20.0%	12	38.7%	20	15.5%
6+	5	1.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	371	100.0%	83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range	2.6-7.0		2.7-5.2		3.8-5.4		3.9-5.4		2.7-5.4	

Table (5)

Haematocrit value in the different groups under study

Haematocrit value (%)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<20	0	0.0%	1	1.2%	0	0.0%	0	0.0%	1	0.8%
20-	28	7.5%	35	42.2%	4	26.7%	6	19.4%	45	34.9%
30-	246	66.3%	47	56.6%	11	73.3%	25	80.6%	83	64.3%
40-	88	23.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
50-	9	2.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	371	100.0%	83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range	21.1-57.8		19.6-36.0		24.6-37.8		24.7-38.2		19.6-38.2	

Table (6)

MCV in the different groups under study

MCV (fl)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<60	0	0.0%	2	2.4%	3	20.0%	3	9.7%	8	6.2%
60-	0	0.0%	19	22.9%	3	20.0%	9	29.0%	31	24.0%
70-	28	7.5%	62	74.7%	9	60.0%	19	61.3%	90	69.8%
80-	280	75.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
90-	52	14.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
100+	11	3.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	371	100.0%	83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range	76.0-117.9		57.5-76.6		54.9-77.0		54.9-75.5		54.9-77.0	

Table (7)

MCH in the different groups under study

MCH (Pg/cell)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<20	0	0.0%	7	8.4%	2	13.3%	5	16.1%	14	10.9%
20-	26	7.0%	45	54.2%	10	66.7%	17	54.8%	72	55.8%
25-	219	59.0%	31	37.3%	3	20.0%	9	29.0%	43	33.3%
30-	115	31.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
35+	11	3.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	371	100.0%	83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range	24.0-38.0		17.5-25.0		15.5-25.1		18.9-25.9		15.5-25.9	

Table (8)

Retics (%) in the different groups under study

Retics (%)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<0.5			8	9.6%	3	20.0%	2	6.5%	13	10.1%
0.5-			32	38.6%	6	40.0%	11	35.5%	49	38.0%
1.5-			36	43.4%	5	33.3%	16	51.6%	57	44.2%
2.5+			7	8.4%	1	6.7%	2	6.5%	10	7.8%
Total			83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range			0.2-3.1		0.2-3.0		0.3-2.5		0.2-3.1	

Table (9)

HBA2 in the different groups under study

HBA2 (%)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<1			2	2.4%	0	0.0%	0	0.0%	2	1.6%
1-			32	38.6%	0	0.0%	1	3.2%	33	25.6%
2-			49	59.0%	0	0.0%	28	90.3%	77	59.7%
3-			0	0.0%	9	60.0%	2	6.5%	11	8.5%
4+			0	0.0%	6	40.0%	0	0.0%	6	4.7%
Total			83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range			0.7-2.5		3.6-5.3		1.2-3.0		0.7-5.3	

Table (10)

Serum Iron level in the different groups under study

Serum Iron (µg/dl)	Non-microcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<20			3	3.6%	0	0.0%	0	0.0%	3	2.3%
20-			36	43.4%	0	0.0%	0	0.0%	36	27.9%
40-			44	53.0%	4	26.7%	8	25.8%	56	43.4%
60-			0	0.0%	8	53.3%	10	32.3%	18	14.0%
80+			0	0.0%	3	20.0%	13	41.9%	16	12.4%
Total			83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range			18-49		50-122		50-131		18-131	

Table (11)

TIBC in the different groups under study

TIBC (µg/dl)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<250			1	1.2%	0	0.0%	1	3.2%	2	1.6%
250-			3	3.6%	9	60.0%	16	51.6%	28	21.7%
300-			15	18.1%	5	33.3%	10	32.3%	30	23.3%
350-			38	45.8%	0	0.0%	4	12.9%	42	32.6%
400+			26	31.3%	1	6.7%	0	0.0%	27	20.9%
Total			83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range			228-440		258-400		249-390		228-440	

Table (12)

Transferrin saturation in the different groups under study

Transferrin saturation (%)	Non-micorcytic Group (n=371)		Microcytic Group							
			Iron deficiency anemia group (n=83)		β-Thalassemia trait group (n=15)		Non-iron deficiency non-β-thalassemia (n=31)		Total Microcytic group (n=129)	
	No.	%	No.	%	No.	%	No.	%	No.	%
<10			32	38.6%	0	0.0%	0	0.0%	32	24.8%
10-			51	61.4%	0	0.0%	0	0.0%	52	40.3%
15-			0	0.0%	6	40.0%	6	19.4%	13	10.1%
20-			0	0.0%	2	13.3%	9	29.0%	9	7.0%
25-			0	0.0%	3	20.0%	8	25.8%	11	8.5%
30-			0	0.0%	3	20.0%	5	16.1%	8	6.2%
35+			0	0.0%	1	6.7%	3	3.7%	4	3.1%
Total			83	100.0%	15	100.0%	31	100.0%	129	100.0%
Range			4.1-14.3		15.9-46.7		15.8-43.6		4.1-46.7	

Table (13)

Mean level of the various parameters in the different groups under study

	Non-microcytic Group (n=371)	Microcytic Group			
		Iron deficiency anemia group (n=83)	β-Thalassemia trait group (n=15)	Non-iron deficiency non-β-Thalassemia (n=31)	Total Microcytic group (n=129)
Age (years)	7.9	8.2	7.8	7.4	7.9
Hb (gm/dl)	12.4	10.0	10.7	10.9	10.3
R.B.Cs. (millions)/ mm3	4.79	4.21	4.61	4.73	4.38
HCT %	37.16	30.07	31.83	33.08	30.99
MCV (fl)	85.98	71.17	69.01	68.86	70.36
MCH (Pg/cell)	28.94	23.66	23.2	23.15	23.48
MCHC (g/dl)	33.73	33.4	33.99	33.46	33.48
Retics (%)		1.36	1.37	1.42	1.37
Hb A2 (%)		1.84	4.04	2.53	2.26
Serum Iron (µg/dl)		38.9	74.07	74.7	51.6
TIBC (µg/dl)		378.3	300.8	300.5	350.59
Transferrin satuation (%)		10.2	24.9	25.1	15.5

Table (14)

Median of the various parameters in the different groups under study

	Non-microcytic Group (n=371)	Microcytic Group			
		Iron deficiency anemia group (n=83)	β-Thalassemia trait group (n=15)	Non-iron deficiency non-β-Thalassemia (n=31)	Total Microcytic group (n=129)
Age (years)	8	8	7	7	8
Hb (gm/dl)	12.5	10.1	11.1	11	10.5
R.B.Cs. (millions)/ mm3	4.9	4.2	4.7	4.6	4.4
HCT %	36.4	30.2	33.1	33.7	31.2
MCV (fl)	85	71.4	71.2	70.5	71.1
MCH (Pg/cell)	28.8	24	23.8	23	23.9
MCHC (g/dl)	33.87	33.46	33.4	33.13	33.4
Retics (%)		1.5	1.3	1.5	1.5
Hb A2 (%)		2	3.9	2.6	2.1
Serum Iron (µg/dl)		41	73	71	47
TIBC (µg/dl)		391	293	294	366
Transferrin satuation (%)		10.5	21.9	25	12

Table (15)

Testing the mean values of different parameters under study in Iron-deficiency anemia and β-Thalassemia trait groups

	Iron-deficiency anemia (n=83)		β-Thalassemia trait (n=15)		"t" value	P	Significance
	Mean	S.D.	Mean	S.D.			
Age (years)	8.2	2.4	7.8	2.5	0.5217	>0.05	Not Significant
Hb (gm/dl)	10.0	1.1	10.7	1.1	2.4136	<0.01	Highly Significant
R.B.Cs. (millions)/ mm3	4.21	0.5	4.61	0.4	3.0213	<0.01	Highly Significant
HCT %	30.07	3.4	31.83	4.0	1.8001	<0.05	Significant
MCV (fl)	71.17	4.0	69.01	7.5	1.6487	<0.05	Significant
MCH (Pg/cell)	23.66	2.3	23.2	2.7	0.6854	>0.05	Not Significant
MCHC (g/dl)	33.4	3.1	33.99	3.7	0.6744	>0.05	Not Significant
Retics (%)	1.36	0.7	1.37	0.8	0.0846	>0.05	Not Significant
Hb A2 (%)	1.84	0.4	4.04	0.5	17.8265	<0.01	Highly Significant
Serum Iron (µg/dl)	38.9	8.7	74.07	19.1	11.5486	<0.01	Highly Significant
TIBC (µg/dl)	378.3	39.5	300.8	34.1	7.1270	<0.01	Highly Significant
Transferrin satuation (%)	10.2	2.1	24.9	8.2	14.2597	<0.01	Highly Significant

Table (18)

Testing the mean values of different parameters under study in Iron deficiency anemia, β-Thalassemia trait and Non-iron deficiency Non-β-Thalassemia trait groups

Parameter under study	(1) Iron-deficiency anemia (n=83)	(2) β-Thalassemia trait (n=15)	(3) Non-iron deficiency, Non-β-Thalassemia trait (n=31)	Results of Students "t" test					
				Group (1) X (2)		Group (1) X (3)		Group (2) X (3)	
	Mean±S.D.	Mean±S.D.	Mean±S.D.	"t" value	P value	"t" value	P value	"t" value	P value
Age (years)	8.2±2.4	7.8±2.5	7.4±2.4	0.5217	>0.05	1.4761	>0.05	0.5202	>0.05
Hb (gm/dl)	9.99±1.1	10.7±1.1	10.9±0.6	2.4136	<0.01	4.5421	<0.01	0.8552	>0.05
R.B.Cs. (millions)/ mm3	4.21±0.5	4.61±0.4	4.73±0.5	3.0213	<0.01	5.2455	<0.01	0.8524	>0.05
HCT %	30.07±3.4	31.83±4.0	33.08±3.6	1.8001	>0.05	4.1480	<0.01	1.0670	>0.05
MCV (fl)	71.17±4.0	69.01±7.5	68.86±5.8	1.6487	>0.05	2.4127	<0.01	0.0737	>0.05
MCH (Pg/cell)	23.66±2.3	23.2±2.7	23.15±2.5	0.6854	>0.05	1.0138	>0.05	0.0638	>0.05
MCHC (g/dl)	33.4±3.1	33.99±3.7	33.46±4.0	0.6744	>0.05	0.0881	>0.05	0.4327	>0.05
Retics (%)	1.36±0.7	1.37±0.8	1.42±0.7	0.0846	>0.05	0.3962	>0.05	0.1929	>0.05
Hb A2 (%)	1.84±0.4	4.04±0.5	2.53±0.4	17.8265	<0.01	8.0255	<0.01	11.0615	<0.01
Serum Iron (µg/dl)	38.9±8.7	74.07±19.1	74.7±18.7	11.5486	<0.01	13.9187	<0.01	0.1140	>0.05
TIBC (µg/dl)	378.3±39.5	300.8±34.1	300.5±36.7	7.1270	<0.01	9.5305	<0.01	0.0223	>0.05
Transferrin satuation (%)	10.2±2.1	24.9±8.2	25.1±7.4	14.2597	<0.01	16.7868	<0.01	0.0952	>0.05

Significant | Highly Significant

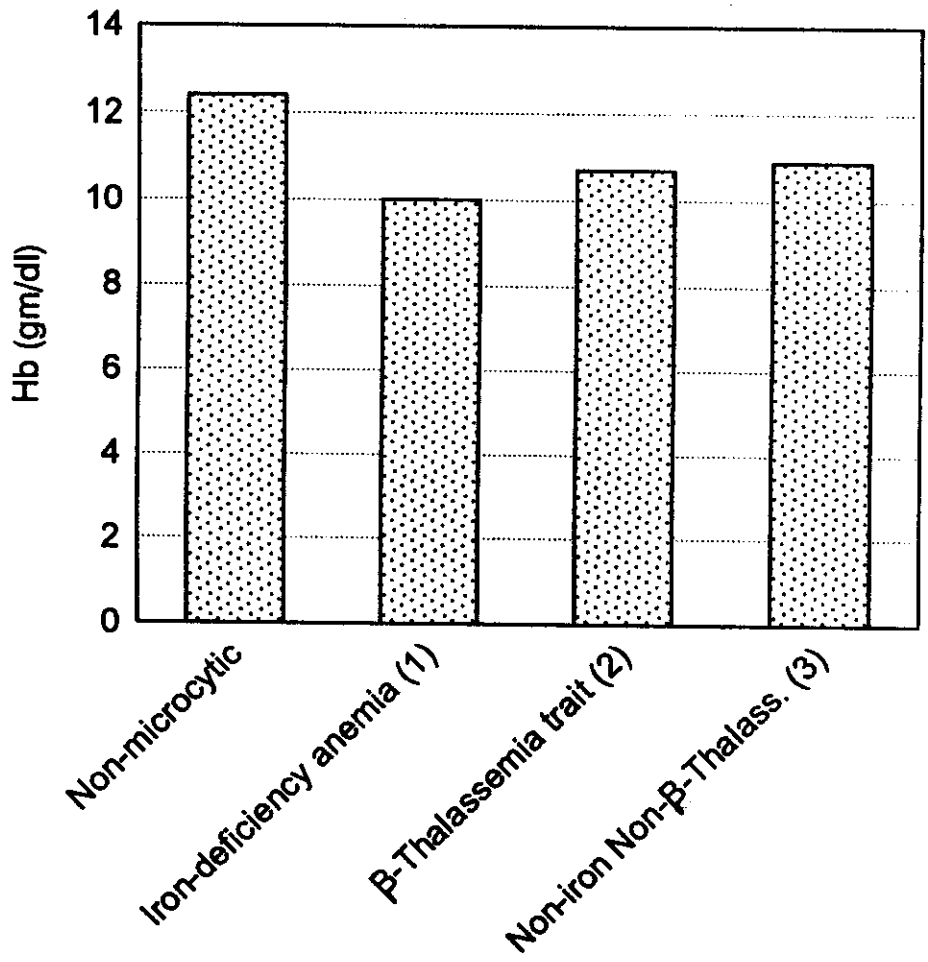

Fig. (1): Mean Hemoglobin level in the different groups under study

Group (1) X (2) ---> H.S., P<0.01
Group (1) X (3) ---> H.S., P<0.01
Group (2) X (3) ---> N.S., P>0.05

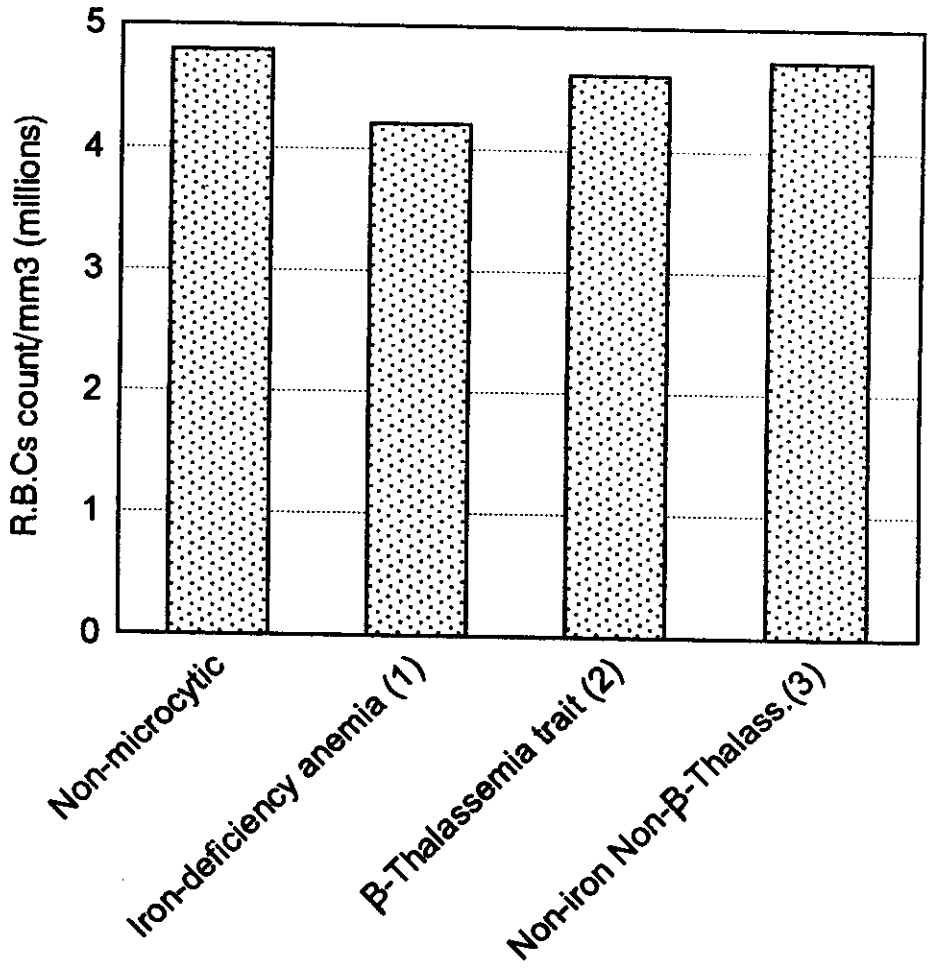

Fig. (2): Mean R.B.Cs. count in the different groups under study

Group (1) X (2) —> H.S., P<0.01
Group (1) X (3) —> H.S., P<0.01
Group (2) X (3) —> N.S., P>0.05

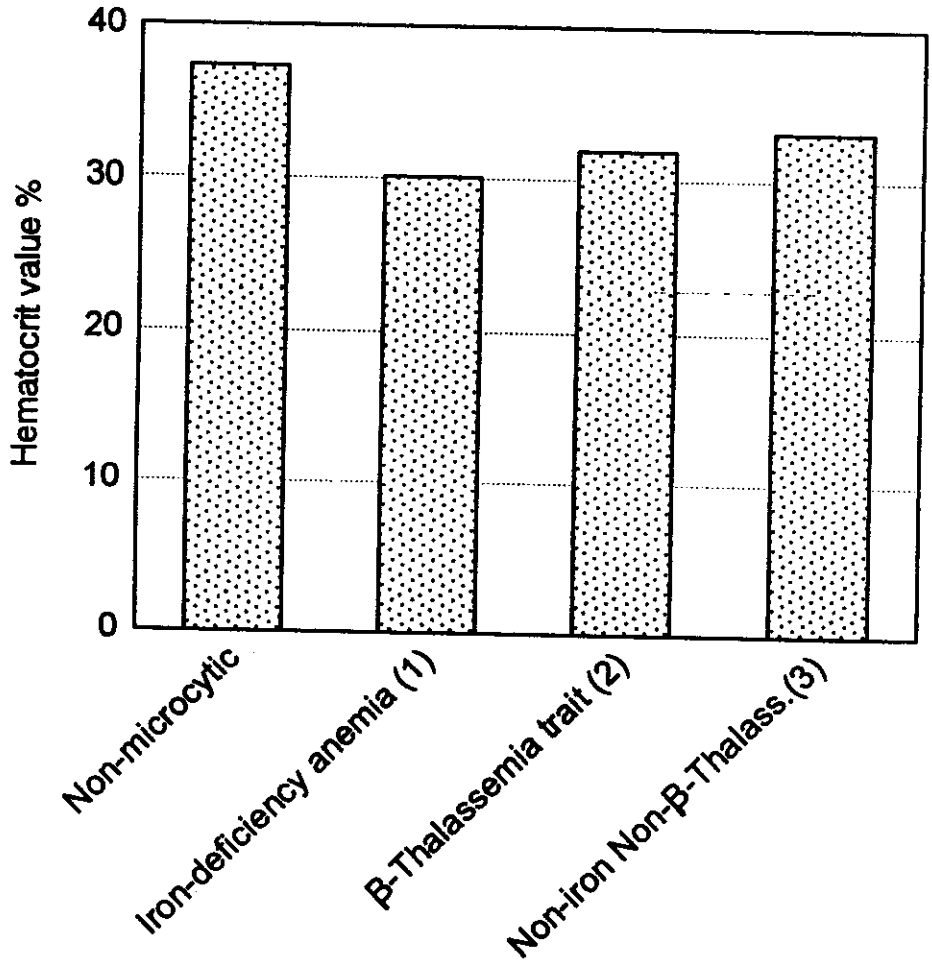

Fig. (3): Mean Hematocrit value in the different groups under study

Group (1) X (2) ---> S., P<0.05
Group (1) X (3) ---> H.S., P<0.01
Group (2) X (3) ---> N.S., P>0.05

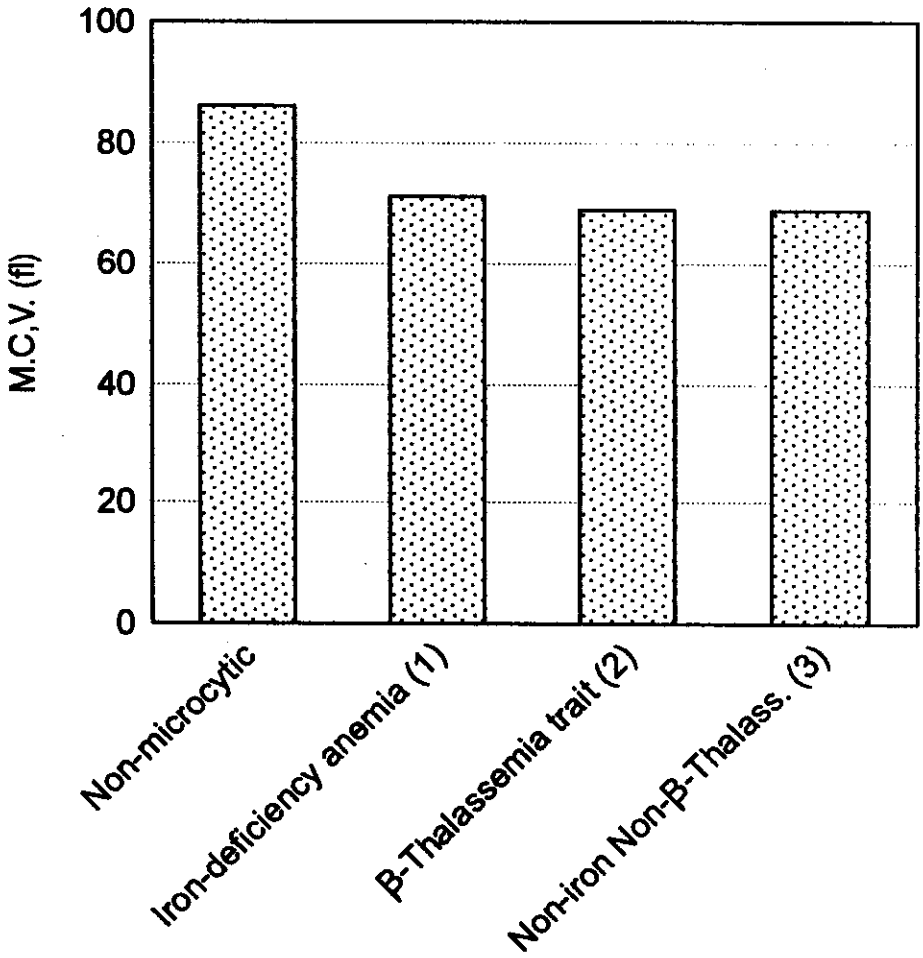

Fig. (4): Mean M.C.V. in the different groups under study

Group (1) X (2) ---> S., P<0.05
Group (1) X (3) ---> H.S., P<0.01
Group (2) X (3) ---> N.S., P>0.05

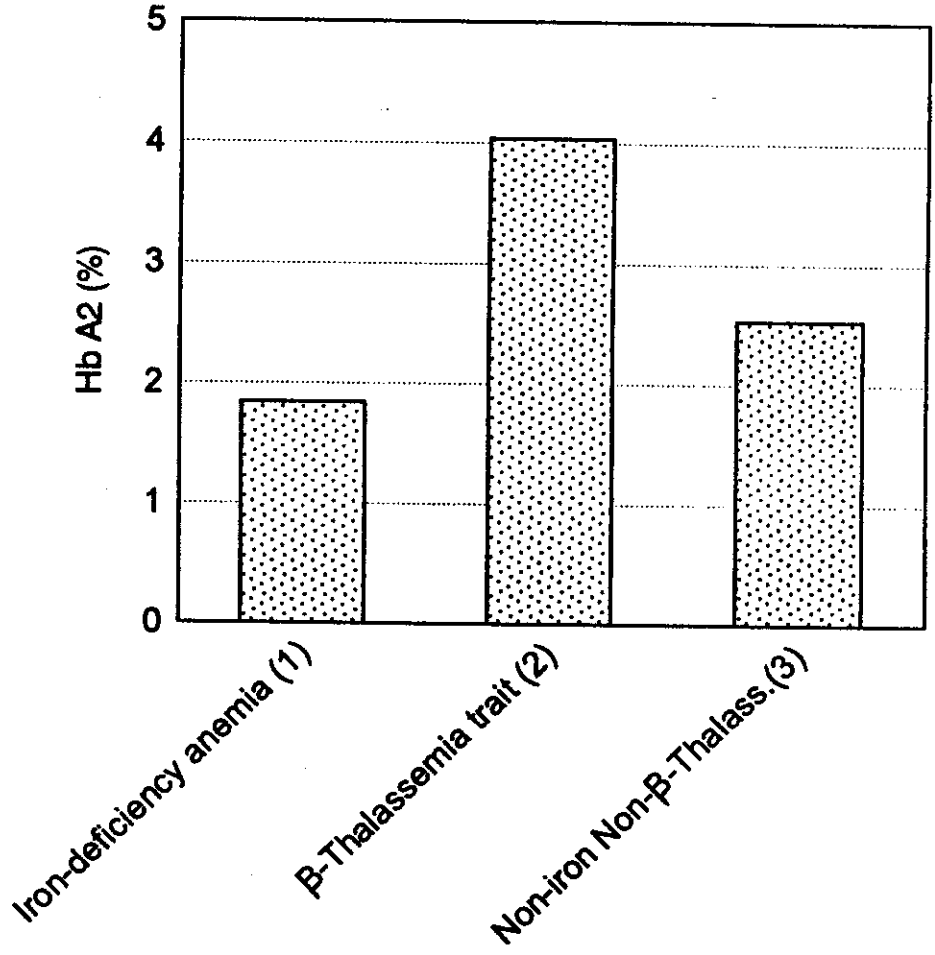

Fig. (5): Mean Hb A2 in the different groups under study

Group (1) X (2) ---> H.S., P<0.01
Group (1) X (3) ---> H.S., P<0.01
Group (2) X (3) ---> H.S., P<0.01

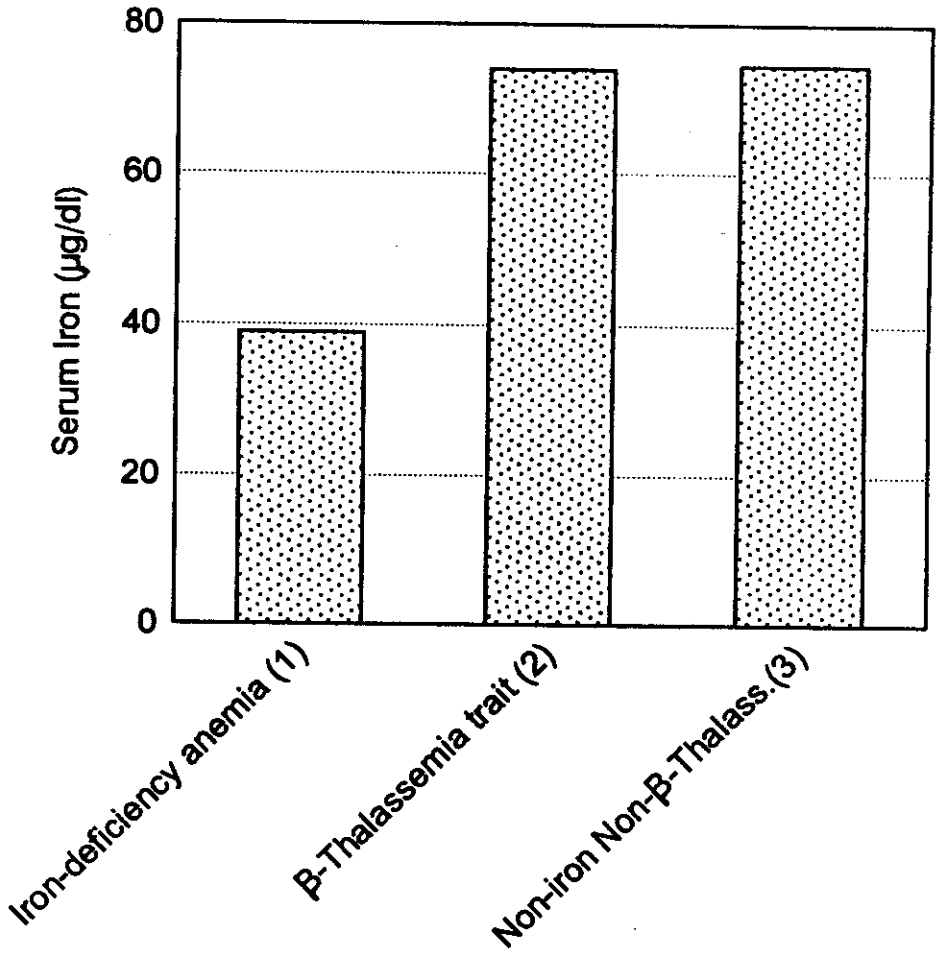

Fig. (6): Mean Serum Iron level in the different groups under study

Group (1) X (2) ---> H.S., P<0.01
Group (1) X (3) ---> H.S., P<0.01
Group (2) X (3) ---> N.S., P>0.05

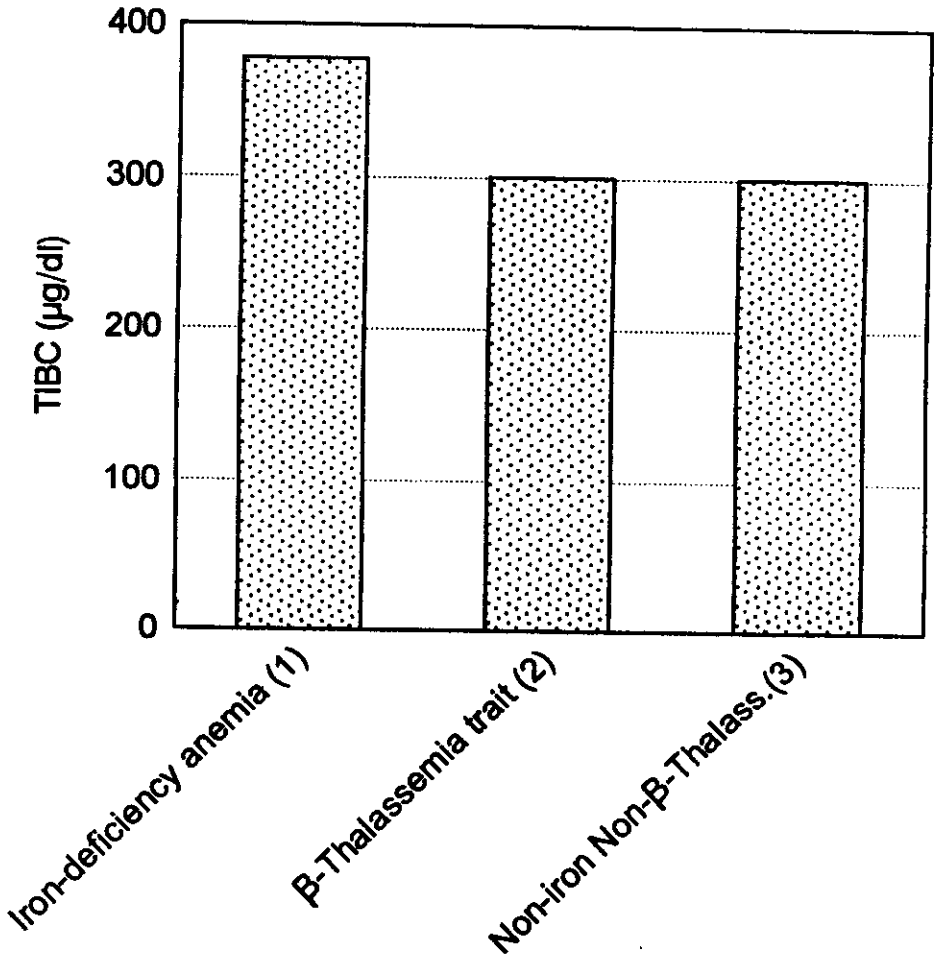

Fig. (7): Mean TIBC in the different groups under study

Group (1) X (2) ---> H.S., P<0.01
Group (1) X (3) ---> H.S., P<0.01
Group (2) X (3) ---> N.S., P>0.05

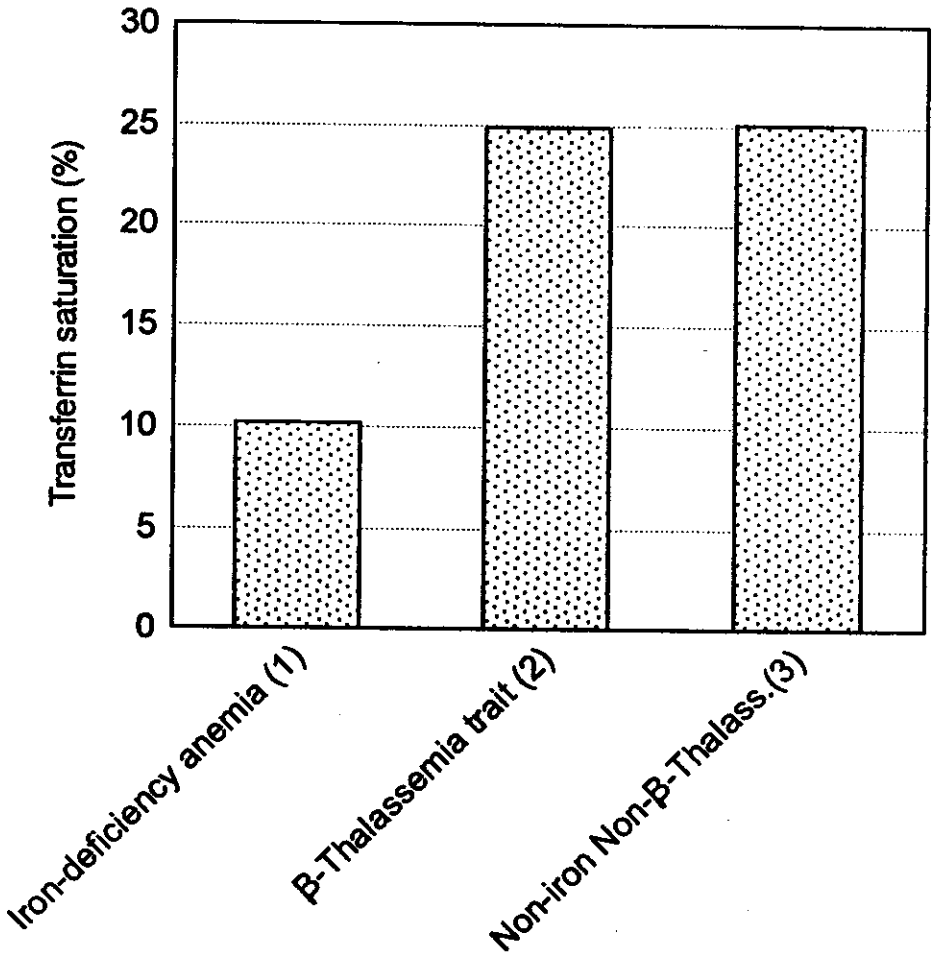

Fig. (8): Mean Transferrin saturation in the different groups under study

Group (1) X (2) ---> H.S., P<0.01
Group (1) X (3) ---> H.S., P<0.01
Group (2) X (3) ---> N.S., P>0.05

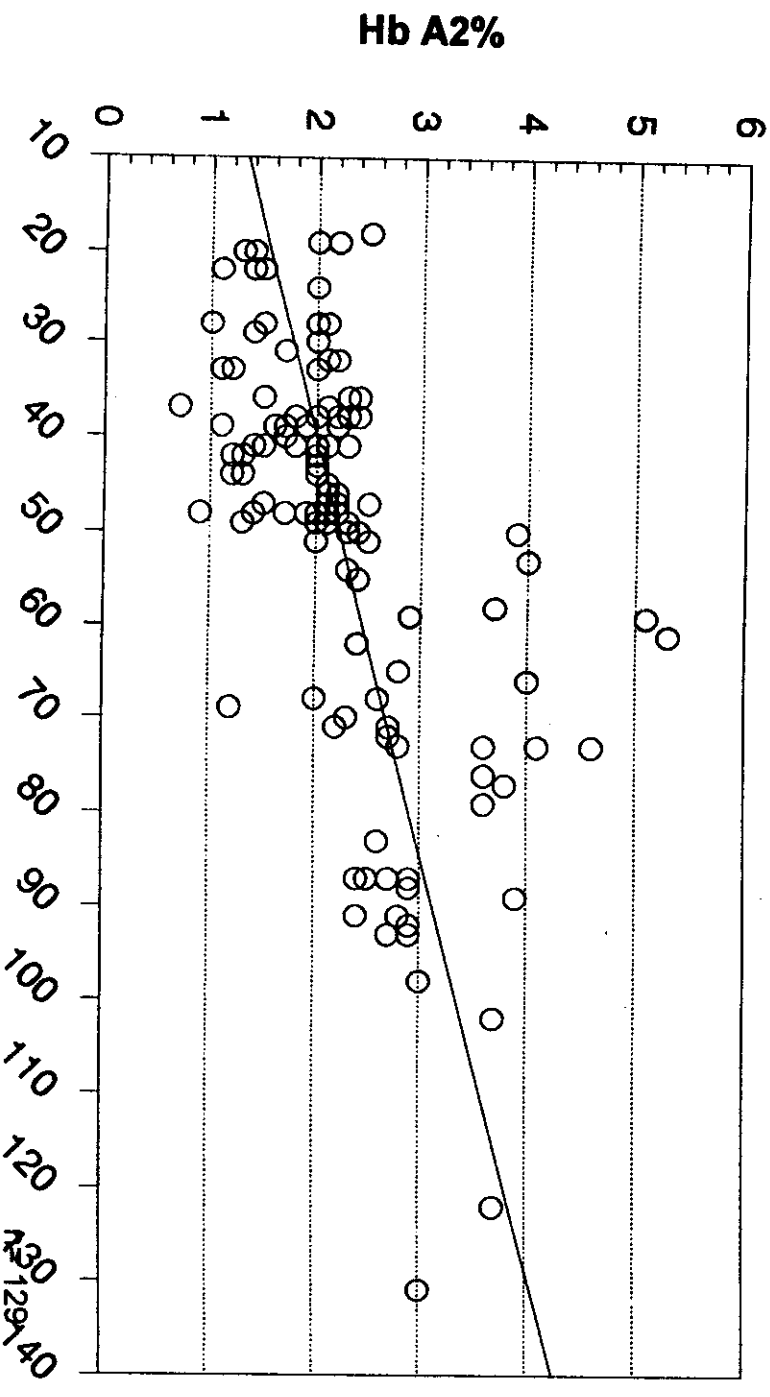

Fig. (9): Correlation between Serum Iron and Hb A2 in total microcytic anemia group

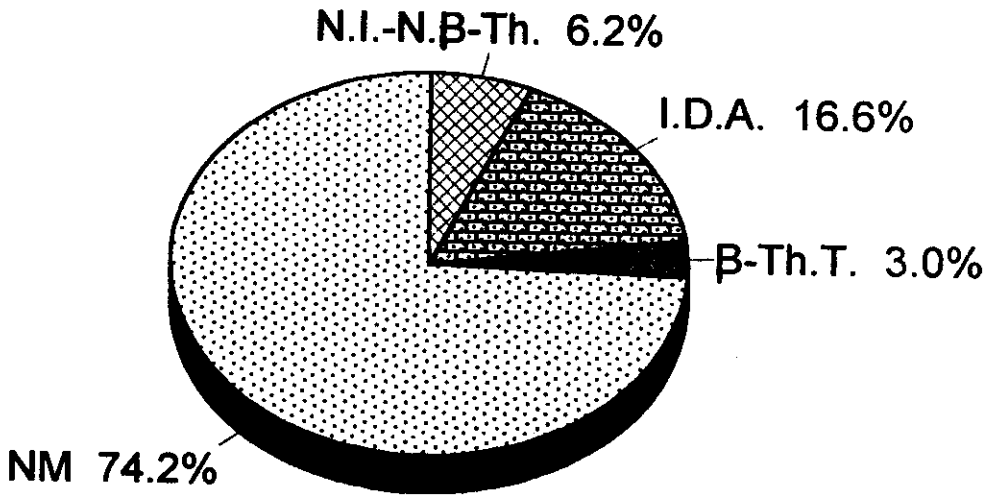

Fig. (10): Prevalence of Microcytosis

N.M. = Non-microcytic
β-Th. T. = β-Thalassemia Trait
I.D.A. = Iron deficiency anemia
N.I.N. β-Th. = Non-iron deficiency non-β-Thalassemia

N.I.-N.β-Th. Gr. may be due to:
* Alpha Thalassemia
* Sideroblastic anemias
* Lead poisoning
* Cupper deficiency
* Chronic diseases (usually normocytic, occasionally microcytic)