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## Prevalence of pediatric anemia in Dharwad district

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Parvathi Suresh Jigalur\* and Sujata Giriyan

*Department of Pathology, Karnataka Institute of Medical Sciences, Hubballi, India*

### \*Correspondence Info:

Dr. Parvathi Suresh Jigalur

Assistant Professor,

Department of Pathology,

Karnataka Institute of Medical Sciences, Hubballi, India

E-mail: [spjigalur@gmail.com](mailto:spjigalur@gmail.com)

### Abstract

The present study was undertaken to find out the prevalence of anemia in paediatric age group. We also screened for beta thalassemia trait as consanguineous arranged marriages is a common practice in this region. A total of 1108 samples were analysed in department of Pathology KIMS HUBBALLI. Prevalence of anemia, as per WHO recommended cut off value of <11g/dl was 62.38% while screening for beta thalassemia trait by mentzer index was 15.27%. This is significant and the population of Dharwad district appears to be at risk of thalassemia disorder. An extensive screening followed by intervention with nutritional supplements and genetic counselling is needed to improve the health of children and prevent thalassemia homozygous condition.

**Keywords:** Anemia, Paediatric age, Dharwad district.

### 1. Introduction

Anaemia is defined as a reduction of the red blood cell volume or haemoglobin concentration and hematocrit below the range of values occurring in healthy persons or two standard deviation below the mean for the normal population, age & sex.[1] The recommended cut off values for the haemoglobin levels used to define anaemia however vary by age, race & physiologic status & adjustments for smoking and altitude have also been recommended.

Anaemia is the most common hematologic abnormality encountered in routine haemogram. Iron deficiency anaemia is one of the most common cause, but not the only cause of anaemia. Other causes include congenital, acquired, benign, malignant & other rare diseases.

Many studies have shown the deleterious effects of Iron deficiency anaemia or Iron deficiency without anaemia on the neurocognitive & behavioural development in children. Other complications can include congestive cardiac failure, hypoxia, hypervolemia[2], shock, seizure[3], stroke & acute silent cerebral ischaemic event.

Iron deficiency state even before causing anaemia adversely affects the immune system. Therefore is a risk factor for infections except malaria where it might confer protection<sup>4</sup> increased

susceptibility to infection, further increases the probability of malnutrition.

Prevalence of anaemia in children continues to remain high ranging between 80-90%. Beta thalassemia trait are usually asymptomatic & maybe unaware of their carrier state unless tested. Electronic cell counter have been used to determine red cell indices as a first indicator of Beta thalassemia trait.

The irreversible damage that anaemia can cause in childhood should be the main reason for screening of anaemia in children. Thalassemia homozygous condition can be prevented through the detection and education of heterozygous carriers'. Hence this extensive screening was conducted to assess the prevalence of anaemia in Dharwad district.

#### 1.1 Aims & objectives

The present study is undertaken to evaluate:

- 1) The prevalence & pattern of anaemia in Dharwad district.
- 2) To screen Beta thalassemia trait.

### 2. Materials & Methods

A total of 1162 samples were received in Department of pathology from children 0-12 years attending Primary & urban health centres in Dharwad district, North Karnataka. 144 samples which had incomplete data or clotted were excluded. Instrument

used was automated cell counter sysmex kx21. The children were divided into three groups.

Group 1:0-2 Years

Group 2:2-6 Years

Group 3:6-12years

**2.1 Sample collection**

Blood samples were collected by venepuncture into containers with Dipotassium EDTA at respective primary and urban health centre and were sent to department of pathology KIMS, HUBBALLI. All samples were analysed for haematological parameters using electronic automated cell counter.

**2.2 Inclusion criteria**

All children falling under the age group of 0-12 years.

**2.3 Exclusion criteria**

Clotted samples & cases with incomplete data.

**2.4 Criteria for diagnosis of anemia and beta thalassemia trait**

Anaemia was defined using WHO criteria. With this criteria the Hemoglobin cut off used to define anaemia in children between 0-12 years is <11gms/dl. Anaemia was further graded as mild (9.0-10.9gms/dl) moderate (HB 6-8.9gms/dl) & severe (HB <6.0g/dl) based on hemoglobin values.

Beta thalassemia trait was diagnosed by Mentzer index with formula MCV/RBC (MI < 13 indicates Beta thalassemia trait).[5]

**3. Results**

Haematological parameters in 1018 children attending primary & urban health centres between 0-12 years were evaluated in the present study. The children were categorised into 3 groups. [Table 1]

**Table 1: Groups in present study**

Groups	Group 1 (0-2) years	Group 2 (2-6) years	Group 3 (6-12) years
No of cases	362	651	05

**3.1 Sex distribution**

Among the study group 583(57.27%) were girls & 435(42.73%) were boys. (Table 2)

**Table 2: Sex Distribution**

Age Group	Girls	%	Boys	%
Group 1	213	58.84	149	41.16
Group 2	367	56.37	284	43.63
Group 3	03	60	02	40
Total	583	57.27	435	42.73

**3.2 RBC count**

30% of patients showed RBC COUNT less than normal limit (<3.6millions/cumm), while

majority of children aged between 0-12yrs had RBC counts within normal range (3.6-5.5millions/cumm).(Table 3)

**Table 3: RBC Count in the study groups**

Groups	Group 1	Group 2	Group 3	Total
RBC Count (x10 <sup>12</sup> /L)	<3.6 13 (3.59%)	17 (2.61%)	0	30 (2.94%)
	3.6-5.5 327 (90.33%)	597 (91.71%)	4 (80%)	928 (91.16%)
	>5.5 22 (6.08%)	37 (5.68%)	1 (20%)	60 (5.90%)

**3.3 Hematocrit (HCT):**

34.09% of patients had hematocrit less than 33.0% & 65.91% of patients had hematocrit more than 33%.(Table 4)

**Table 4: HCT values in the study groups**

Groups	Group 1	Group 2	Group 3	Total
HCT %	<33 150 (41.44%)	195 (29.95%)	2 (40%)	347 (34.09%)
	>33 212 (58.56)	456 (70.05%)	3 (60%)	671 (65.91%)

**3.4 Hemoglobin (Hb)**

62.38% of patients had hemoglobin <11g/dl, among which, mild degree of anaemia was most common followed by moderate degree, severe anaemia was seen in 19 cases [3%]. 37.62% of patients had hemoglobin greater than or equal to 11g%/dl. (Table 5)

**Table 5: Hb values in the study groups**

Groups	Group 1	Group 2	Group 3	Total
HB (g/dl)	<11 270 (74.58%)	362 (55.61%)	3 (60%)	635 (62.38%)
	>11 92 (25.42%)	289 (44.39%)	2 (40%)	383 (37.62%)

**Table 6: Hb values in the groups according to sex**

Group	Boys	Girls
Hb <11g/dl	266	369

**Table 7: Hb values in the study groups**

Groups	Group 1	Group 2	Group 3	Total
Hb (g/dl)	9.0-11.0 (mild) 186 (68.88%)	250 (69.06%)	2 (80%)	438 (68.97%)
	6.0-8.9 (Mod) 75 (27.78%)	102 (28.18%)	1 (20%)	178 (28.03%)
	<6.0 (severe) 09 (3.34%)	10 (2.76%)	0	19 (3%)

**3.5 Mean corpuscular volume (MCV)**

52.45% had MCV below 75fl (n=534) & 47.55% had MCV within normal range (75-100fl) (n=484).(Table 8)

**Table 8: MCV values in the study groups**

Groups	Group 1	Group 2	Group 3	Total
MCV(fl)	<75 221 (61.05%)	308 (47.31%)	5 (100%)	534 (52.45)
	>75 141 (38.95%)	343 (52.69%)	0	484 (47.55%)

### 3.6 Mean corpuscular hemoglobin (MCH):

82.1% of patients had MCH below 26pg (n=836), 17.58% had MCH within normal limits (26-34pg);(n=179)&0.3% had MCH more than 34pg(n=3).(Table 9)

**Table 9: MCH values in the study groups**

	groups	Group 1	Group 2	Group 3	Total
MCH (pg)	<26	320 (88.40%)	511 (78.50%)	5	836 (82.12%)
	26-34	42 (11.60%)	137 (21.04%)	0	179 (17.58%)
	>34	0	3 (0.46%)	0	03 (0.3%)

### 3.7 Mean corpuscular hemoglobin concentration (MCHC)

60.12% had MCHC below 31g/dl (n=612), 39.78% had normal range (31-37g/dl) (n=405) &0.1% had MCHC more than 37g/dl (n=01).(Table 10)

**Table 10: MCHC values in the study groups**

	Groups	Group 1	Group 2	Group 3	Total
MCHC g/dl	<31	258 (71.27%)	351 (53.92%)	3 (60%)	612 (60.12%)
	31-37	104 (28.73%)	299 (45.93%)	2 (40%)	405 (39.78%)
	>37	0	01 (0.15%)	0	01 (0.1%)

### 3.8 Red cell distribution width (RDW):

49.51% had RDW within the normal range (10.0-16.0%) [n=504], 50.49% had RDW>16.0% [n=514]. (Table 11)

**Table 11: RDW values in the study groups**

	Groups	Group 1	Group 2	Group 3	Total
RDW%	<16	143 (39.50%)	359 (55.15%)	2 (40%)	504 (49.51%)
	>16	219 (60.50%)	292 (44.85%)	3(60%)	514 (50.49%)

### 3.9 Mentzer Index (MI):

15.27% had MI less than 13(n=156) and 84.73% had MI above 13(n=862). (Table 12)

**Table 12: Mentzer index**

Mentzer index	No of patients	percentage
<13	156	15.27
>13	862	84.73

## 4. Discussion

The present study was undertaken to study the prevalence of anaemia and its predilection among paediatric age group attending primary & urban health centres in Dharwad district. Iron deficiency anemia and Beta thalassemia trait are the most common causes of microcytic anemias. Distinguishing Beta thalassemia trait & Iron deficiency anemia is important because each disease has entirely different cause, prognosis & treatment. Anemia in these children was defined and classified

using WHO criteria (HB<11g/dl). Beta thalassemia trait was detected by mentzer index. Two billion people worldwide are estimated to suffer from anaemia, approximately 50%of all anaemia's can be attributed to iron deficiency.[4] The prevalence of anaemia in developing countries is three to four times higher than that for developed countries. The problem is more extensive in South East Asia & Subtropical Africa where anaemia is linked to poverty. (WHO/UNICEF/UNU 2001). It is seen that SE Asian region accounts for about 50% of world's carriers of Beta thalassemia. The prevalence of Beta thalassemia trait is about 3.3% in India. The prevalence of Beta thalassemia trait is different in various parts India: varying from 3.5% in Bengal & 6.5% in Punjab. Beta thalassemia trait has a high prevalence in some communities namely Navbudha, Maratha and Muslim communities.[7] Anaemia among children is widespread throughout India.

The prevalence of anaemia varies from 38% in Goa to 78% in BIHAR .More than half of young children in 24 states have anaemia, including 11 states where more than two third of children are anaemic[9].

In NFHS2 prevalence of anaemia among 6-35 months was 74% and in NFHS3 is 79%.[8]

These surveys reveal there was an increase in the prevalence of mild anaemia (from 23%to 26% & moderate anaemia from 46% to 49%.

Various other studies on prevalence of anaemia among children show wide range of prevalence from 85% by Kumar *et al*[4], to 13.6% by Muthayya *et al*[12]. Higher prevalence of anaemia was seen in areas without community intervention. Low prevalence was seen in place where active measures for deworming coupled with nutritional supplements to achieve goal was undertaken. In the present study, prevalence of anaemia was 62.56% [Table 13]

**Table 13: Prevalence of Anaemia**

Gomber S <i>et al</i> [11]	76%
Sant-Rayn Pasiricha <i>et al</i> [20]	75.3%
Sireesha <i>et al</i> [10]	60.4%
Dongra AR <i>et al</i> [15]	78.2%
Kumar CS <i>et al</i> [21]	60.66%
NFHS 3[9]	79%
Our study	62.56%

In the present study, girls are found to be more anaemic when compared to boys; this could be due to more number of girls screened or due to our gender biased society.

## 5. Conclusion

The risk of anaemia is a complex issue related to various factors like nutrition, parasite,

genetics etc. Therefore the community needs nutritional & health education. Supplementation of iron, Vit A as Dongre *et al*[15], Gombre *et al*[11], & school based intervention as Muthayya *et al*[12] can be done. The prevention of Beta thalassemia homozygous condition can be achieved through the detection and education of heterozygous carriers by screening. For severe anaemia we should look into disease profile of children in their geographic location.

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