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Study on Children with Reference to Malnutrition and its Effect on Haematology and Serum Total Proteins

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Abstract

The study was conducted on 80 male children, divided into three age groups (5-7, 8-10 and 11-12 years). These children were graded into five grades of malnutrition including normal following the criteria of Jelliffe (Alleyne *et al*., 1977). The results revealed 47.22 per cent normal children while 16.66, 22.22, 11,11 and 2.77 percent were suffering from 1st, 2nd 3rd and 4th degree of malnutrition, respectively. Overall means of children categorized in various degrees of malnutrition showed non-significant difference in haemoglobin, RBC, PCV and erythrocytic indices. However, RBC, Hb and PCV value were less in children graded in 4th degree of malnutrition. Hb showed significantly lower ($p<0.05$) levels in children grade into 3rd than first degree of malnutrition of 8-10 years. However, RBC count was significantly higher ($p<0.05$) in 3rd and 2nd degree of malnutrition in children of 11-12 years, while PCV was relatively higher in the same subjects of this group. In overall, 45 percent of children had less than normal haemoglobin, RBC or both. Out of these, 19.44 percent showed normocytic hypochromic, 30.55 showed normocytic normochromic, 8.33 microcytic hypochromic, 13.88 microcytic normochromic, 13.88 macrocytic hypochromic and 13.88 percent showed macrocytic normochromic anaemia. Serum to proteins showed non-significant difference in children graded in various degrees of malnutrition, however, the values normal subjects were relatively lower than those graded into various degrees of malnutrition.

Introduction

Anaemia is usually characterized by a reduction of the heamoglobin concentration, red cell count or haematocrit in the peripheral blood below normal levels (Hardisty *et al*., 1974). Anaemia can be attributed to the loss of function of blood forming tissues or acute or chronic haemmorrhage or because of toxic factors and enzymes deficient erythrocytes which cause hemolysis (Harper *et al*., 1979). Failure to produce adequate number of normal red cells is most commonly caused by impaired haemoglobin synthesis due to iron deficiency. Impaired haemoglobin synthesis whether due to iron deficiency, abnormal haem synthesis or thalassemia invariably results in a hypochromic microcytic anaemia (Hardisty *et al*., 1974). Many cases of mild iron deficiency anaemia are without symptoms. The common occurrence of iron deficiency is among infants, young children and females of child bearing age (Turner, 1981). It is the most common nutritional disorder in the world and is also common in Pakistan, where a total of 9.0 million children are anaemic (Anonymous, 1998).

Between 30-40 percent of children in Pakistan (6.2-8.3 millions) have low height for age (i.e., stunting) and over 14 per cent have low weight for height (Anonymous, 1994). The rate of stunting reflects the cumulative effect of undernutrition. Inadequate proteins and total calorie intakes causes stunting of growth. Under-weight is expressed as weight for age. A heigh rate of Pakistani children is under weight ranging from 34 percent for urban boys and 45 percent for rural boys. This reflects acute malnutrition and is often amenable to nutritional interventions (Anonymous, 1998).

An effort was required to pin point the prevalence, extent and nature of anaemia in younger children, so that this problem can be eradicated by making proper prevent measures. The area selected for this purpose was a Deeni Madrasa in Faisalabad. Which was a neglected area, fact the common problems such as lack of education. In calorie intake, low living standard and no health facilities The study was conducted to achieve the following objectives.

1. To assess the degree of malnutrition in children of Deeni Madrasa anthropometerically.
2. To measure various haematological parameters a serum total proteins in children for determining 1 extent and nature of anaemia.

Materials and Methods

A total of 80 male children from Deeni Madrasa in Faisalabad (during Summer, 1997) were randomly selected having age between 5-12 years, They were divided in three age groups, i.e., 5-7, 8-10 and 11-12 years. Each child was weighed in kg using an ordinary weighing machine. The height of these children was also measure. The children were classified as malnourished into four categories (Table 1) according to Jelliffes classification (Alleyne *et al*., 1977).

Blood samples of about 4 mL were collected from all the children under study, 3 mL was allowed to clot to obtain serum for protein estimation while the remaining 1 mL weight used for the estimation of haematological values. The estimation of Hb was made by cyanomethemoglobin method (Dacie and Lewis, 1991). The PCV was determined by microhaematocrit method (Baker and Silverton, 1976). RI count was made by improved Neubaur haemocytome

method (Baker and Silverton, 1976). The total serum proteins were estimated by the method of Oser (1976). Erythrocytic indices were also worked out (Coles, 1986).

Table 1: Classification of children into various groups of malnourishment according to Jelliffes

Weight of the children as percent weight for age medium (WAM) =	Degree of malnutrition
Above 90 percent	Normal
81-90 percent	1st
71-80 percent	2nd
61-70 percent	3rd
60 percent and below	4th

The data thus obtained was subjected to one way analysis of variance technique and means were compared by using confidence interval test using Minitab software release 10.2 (Anonymous, 1994).

Results

Blood studies on 80 male children revealed less than normal Hb in 23.75 percent of children and less than normal RBC in 8.75 percent children while less than normal, both Hb and RBC in 12.50 percent children (Table 2) following WHO criteria of anaemia in children of 5-12 years of age (Anonymous, 1994).

In overall, 45 percent (n = 36) of the children were having less than normal values of Hb alone, RBC alone or of both. Out of these children (n = 36), 17 (47.22%) were normal, six (16.66%) were graded in 1st degree of malnutrition, eight (22.22%) in 2nd, four (11.11%) in 3rd and one 12.77%) in 4th degree of malnutrition. Out of the anaemic children, 19.44 percent showed normocytic hypochromic, 30.55 percent normocytic normochromic, 8.33 percent microcytic hypochromic and 13.88 percent each microcytic normochromic, hypochromic and macrocytic normochromic anaemia.

Overall, children categorized in different degrees of malnutrition showed non-significant difference in Hb, PCV, RBC and erythrocytic indices. However, Hb, RBC, PCV values were less in children graded into severe degrees of malnutrition (Table 2). Haemoglobin showed significantly lower level in children graded into 3rd degree of malnutrition ($p<0.05$) in children of 8-10 years of age. Similarly, the values of MCHC were lower ($p<0.05$) in these subjects. RBC count was higher ($p<0.05$) in children graded into 3rd than 2nd degree of malnutrition in children of 11-12 years of age. While PCV was relatively higher in same subjects of this age group.

Serum total protein also showed non-significant difference in children graded into various degrees of malnutrition (Table 3). However, in overall, the values of total proteins were relatively lower in normal subjects than those having different degree of malnutrition in children of 8-10 and 11-12 years of age. Serum total proteins were relatively higher in children having 2nd and 3rd degree of malnutrition, respectively.

Discussion

Blood studies on 80 male children from 5-12 years of age divided into three groups, revealed anaemia in 45 percent of the children. Out of these 52.77 percent were malnourished while 47.22 percent were normal nourished on the basis of weight to height criteria (Alleyne *et al*., 1977).These findings were almost similar to that of Yepez *et al*. (1988) in their study on 50 apparently healthy school children and have reported anaemia in 72 percent of the children.

During present study no statistical differences were observed between children showed different degrees of malnutrition, however, the values of RBC, PCV and Hb were relatively lower in severely malnourished children. Margo *et al*. (1976) reported 27.6 percent malnutrition and 13.3 percent as nutritional anaemia in black children. They related anaemia to iron deficiency. Similarly, Wadsworth (1975) reported iron along with folic acid and cyanocobalamine as cause of malnutrition anaemia. Rajasuriya *et al*. (1962) found proteins and vitamin deficiency, worm infestation and liver damage secondary to malnutrition as a contributing factor for anaemia. Macrocytic anaemia was observed in 27.77 percent cases during present study and is a responsive type of anaemia (Coles, 1986). The microcytic hypochromic anaemia observed in 8.33 percent cases have previously been related to iron deficiency. In the present study, 22.22 percent children showed microcytic, while 50 percent normocytic anaemia. The former type is reported to be either responsive or non-responsive, while the later is non-responsive type of anaemia. However, the cause of anaemia is diverse and many factors/causes can lead to development of these types of anaemias. Macrocytic normochromic and microcytic hypochromic anaemia have been related with nutritional (iron and cobalt, respectively) deficiency/utilization. Significantly higher ($p<0.05$) values of RBC in children having 3rd degree of malnutrition in 8-10 years of age with relatively higher PCV in the same subjects than children having 2nd degree of malnutrition observed in the present study is probability due to haemoconcentration. Serum total proteins showed relatively higher values in malnourished than normal children. These findings were not in line with those of Bondestam *et al*. (1988) who reported significantly lower mean serum values for albumin. However, present findings agreed with those of Ahmad and Gilani (1988), they also reported non-significant difference in serum total proteins between malnourished and normal children.

Table 2: Mean ± SD of haematological parameters between different degrees of malnutrition in children of different groups

Age	Degree of malnutrition					
Years	1	2	3	4	Normal	Reference value
Hb (g/dL)						
5-7	9.62 ± 3.82	14.60 ± 2.26	-	-	13.07 ± 1.68	(11.5-1)
8-10	13.90 ± 2.03A	11.79 ± 2.55AB	10.05 ± 1.03B	10.10 ± 0.00AB	12.80 ± 2.57AB	
11-12	12.93 ± 1.72	11.55 ± 1.06	15.70 ± 0.00	-	12.50 ± 2.88	
Overall	12.68 ± 2.80	12.18 ± 2.45	11.18 ± 2.68	10.10 ± 0.00	12.72 ± 2.56	
RBC (10^6/pL)						
5-7	4.40 ± 0.82	5.50 ± 0.14			4.20 ± 0.75	(4.0-5)
8-10	4.77 ± 0.85	4.17 ± 0.87	3.85 ± 0.54	3.70 ± 0.00	4.40 ± 1.11	
11-12	4.54 ± 0.59AB	3.25 ± 0.49B	5.80 ± 0.00A	-	4.18 ± 0.80AB	
Overall	4.61 ± 0.75	4.23 ± 0.97	4.24 ± 0.99	3.70 ± 0.00	4.29 ± 0.95	
PCV (%age)						
5-7	36.40 ± 2.79	37.00 ± 0.00			36.50 ± 2.38	(35-4)
8-10	35.72 ± 2.90	33.88 ± 3.82	35.75 ± 2.06	34.00 ± 0.00	34.10 ± 4.71	
11-12	35.37 ± 1.06	32.00 ± 1.41	40.00 ± 0.00	-	35.28 ± 3.00	
Overall	35.70 ± 2.34	34.07 ± 3.47	36.60 ± 2.60	34.00 ± 0.00	34.81 ± 3.94	
MCV (fL)						
5-7	83.08 ± 9.06	66.75 ± 1.06			88.95 ± 17.72	(77-5)
8-10	75.95 ± 12.,01	85.04 ± 17.16	94.35 ± 15.95	91.80 ± 0.00	79.13 ± 20.69	
11-12	77.86 ± 10.45	99.90 ± 19.52	68.70 ± 0.00	-	85.91 ± 20.36	
Overall	78.07 ± 10.86	84.52 ± 17.90	89.22 ± 17.95	91.80 ± 0.00	82.75 ± 20,12	
MCH (pg)						
5-7	27.94 ± 9.54	26.30 ± 3.67			31.52 ± 8.11	(25-3)
8-10	28.53 ± 7.19	27.91 ± 7.61	26.52 ± 5.60	27.20 ± 0.00	28.66 ± 9.61	
11-12	28.58 ± 6.83	36.20 ± 8.76	26.90 ± 0.00	-	28.09 ± 11.12	
Overall	28.42 ± 6.35	28.93 ± 7.54	26.60 ± 4.85	27.10 ± 0.00	28.76 ± 9.68	
MCHC (%age)						
5-7	33.78 ± 5.65	39.40 ± 6.08			35.20 ± 2.99	(31-3)
8-10	36.93 ± 6.53AB	32.41 ± 4.51AB	28.22 ± 3.75B	29.70 ± 0.00AB	37.21 ± 7.24A	
11-12	36.67 ± 4.78	36.00 ± 1.70	39.20 ± 0.00	-	39.20 ± 16.79	
Overall	36.19 ± 5.71	34.03 ± 4.93	30.42 ± 5.88	29.70 ± 0.00	37.74 ± 11.43	

Values in a row with different capital letters are statistically significant at $p < 0.05$, Reference values were obtained from Nelson Text Book of Pediatrics (Behrman *et al*., 1992)

Table 3: Comparison of mean ± SD of serum total proteins (g/L) between different degrees of malnutrition children of different age groups

Age	Degree of malnutrition				
Years	1	2	3	4	Normal
5-7	7.60 ± 0.76	7.20 ± 0.28			8.23 ± 1.25
8-10	7.72 ± 1.06	9.56 ± 4.02	7.85 ± 0.63	8.50 ± 0.00	7.28 ± 0.83
11-12	7.66 ± 0.52	7.00 ± 0.14	8.00 ± 0.00	-	7.45 ± 0.92
Overall	7.67 ± 0.81	8.74 ± 3.43	7.90 ± 0.45	8.50 ± 0.00	7.43 ± 0.91

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