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Hematological abnormalities in young children with Tuberculosis

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ABSTRACT:

The diagnosis of tuberculosis in children is problematic. The purpose of this study was to evaluate hematological changes in tuberculous children 6-59 months old and compare those with non-tuberculous children. A cross sectional comparative study was conducted at a Pediatric Clinic at Liaquatpur (Pakistan) in children presenting with a suspicion of tuberculosis. There were 367 children who qualified for the study, 72 with "probable tuberculosis" and 295 with "no tuberculosis". There was insignificant difference of erythrocyte sedimentation rate and all other hematological parameters except monocyte count between the two groups. The mean ± standard deviation of absolute monocytes count/cubic mm was 222.69±310.78 for group A and 115.40 ±215.30 for group B (p value 0.0006).

The conclusion of the study is that erythrocyte sedimentation rate as well as other hematological parameters has no role in the diagnosis of tuberculosis in children under 5 years of age.

KEYWORDS: Childhood tuberculosis; Erythrocyte sedimentation rate; complete blood picture.

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INTRODUCTION:

Childhood tuberculosis is an important cause of morbidity and mortality in developing countries (1, 2). In 1989 the World Health Organization (WHO) estimated that there was an annual global incidence of 1.3 million children with tuberculosis, leading to 450 000 deaths in children under 15 years of age(3, 4). The highest case burden, an estimated 95% of all TB cases, is found in developing countries (2). Symptoms of childhood tuberculosis are non-specific, and up to 50% of children may be asymptomatic in the early stages of the disease (5). Diagnosis of tuberculosis among children poses technical and operational challenges because of vague and non-specific symptomatology, difficulty in getting sputum sample for testing, complexities in the interpretation of tuberculin test result and chest X-ray, and the lack of single simple cheap and reliable test for making a diagnosis (6). There is need to develop other diagnostic approaches for diagnosis. The purpose of this study to is to evaluate hematological changes in tuberculous child 6-59 month old and compare those with non-tuberculous children.

SUBJECTS AND METHODS:

This is a cross sectional comparative study conducted at a Pediatric Clinic at Liaquatpur (Pakistan) from October 2006 to July 2008.The study was approved by the review committee of the institute.

Children 6-59 months of age presenting on each Friday with a suspicion of tuberculosis based on one or more than one of the following complaints(7), were recruited after the informed consent of the parents/guardians:

1 Fever lasting more than 3 weeks.

2 Cough with fever lasting more than 3 weeks.

3 Recent unexplained loss of weight and appetite. If previous record was available then weight loss may be defined as the loss > 10% of previous maximum weight.

4 Cases of severe protein-energy malnutrition (Kwashiorkor and children weighing < 60% of the 50th centile for that age).

5 Unexplained poor weight gain or poor weight gain following measles/ pertussis. If previous record was available then poor weight gain may be defined as no weight gain over the last 2 months.

6 History of contact. The contact is defined as any child who lives in a household with an adult taking anti-tuberculous therapy or has taken such a therapy in the past 2 years.

7 Failure of therapeutic response to an appropriate and adequate antibiotic trials with 2 different antibiotics in a symptomatic child.

The children were assessed with regard to their history and clinical features. Past history of treatment of tuberculosis was taken. On examination the weight for age, sex, peripheral lymphadenopathy, respiratory signs, temperature, hepatosplenomegaly, ascites, signs of meningeal irritation and conscious level were documented. All the children were subjected for X-ray chest (PA view), the complete blood counts, hemoglobin level, platelet counts and erythrocyte sedimentation rate (which were performed manually by a qualified health technician), and a tuberculin test with 2 units of PPD. Parents were asked to revisit after 48 hours to read the induration of tuberculin test. An induration more than 10mm, except in cases of severe protein energy malnutrition where it was >5mm, were taken as positive. X-ray chest was examined by a radiologist and a diagnosis of "probable tuberculosis" (8) was made if one or more than one of the following criteria were present

1 Positive tuberculin test

2 Positive chest radiograph (showing unequivocal mediastinal lymphadenopathy or miliary TB; having an appearance suggestive of TB e.g. non-resolving lobar or segmental opacification, cavitation or pleural effusion)

3 Favourable response to specific antituberculous therapy.

In the absence of above mentioned criteria the diagnosis of "no tuberculosis" was made.

Children serious enough needing hospitalization, children with HIV, children with some known systemic illness, children who have completed anti-tuberculous drug therapy and children needing other investigations like biopsy for diagnostic purposes were excluded from the study. The children qualifying for the study were divided into two groups: Group A (probable tuberculosis) and Group B (no tuberculosis). The age, weight and sex distribution as well as different hematological values were compared between the two groups

STATISTICAL METHODS:

The results were compared by using Fischer's exact test for categorical data and student's test for continuous data. P-values < 0.05 were considered to be statistically significant. Online computer programs "GraphPad Software" available at and "Standard Deviation Calculator" available at were used for statistical analysis.

RESULTS:

367 children qualified for the study, 72 with "probable tuberculosis" (group A) and 295 with "no tuberculosis" (group B). The comparison of mean age, weight and sex distribution among the two groups did not show any statistically significant difference (as shown in table-I) while different hematological parameters were compared in table-II. The only parameter which was significantly different among the two groups was monocyte count.

DISCUSSION:

This study did not find any difference in the hematological abnormalities between cases of "probable tuberculosis" and 'no tuberculosis" except difference in the monocyte count. There was tendency of increased monocyte count in cases of" probable tuberculosis". Wessels et al (9) showed that lower mean haemoglobin (Hb 10.2 vs. 10.8 g/dl) was the only significantly different haematological parameter in "children with tuberculosis" compared with the "no tuberculosis" group but they did not find any differences in median total white cell count, neutrophils, lymphocytes, monocytes and platelets.

So erythrocyte sedimentation rate and complete blood counts have no diagnostic predictive value when investigating a child for TB.

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Table I. Demographic Data

Variable	Group ATotal children 72	Group B Total children 295	P value
Age in months Mean ± SD	22.21 ± 13.01	22.13 ± 13.08	0.965
Weight in Kg Mean ± SD	8.89 ± 4.2638	9.57± 3.12	0.1311
Female children (%)	28 (38.9%)	125 (42.37%)	0.689

Table II. Hematological changes

Parameter	Group A	Group B	P value
Erythrocyte sedimentation Rate (mm at the end of First hour)			
Mean ± SD	38.49 ± 15.44	33.87 ±20.4	
Range	10-75	8-90	0.0733
Hemoglobin (gm %)			
Mean ± SD	8.87 ±1.66	8.56 ±2.09	0.2419
Range	5.2-11.9	2 – 12.4	
Total leucocytes count (per mm3)			
Mean ± SD	11291.53 ± 5813.98	10631.08 ± 7048.08	0.4621
Range	3540 - 24500	2450-88200	
DLC			
Neutrophils (%)			
Mean ± SD	48.21 ± 14.78	45.59±13.99	0.16
Range (%)	23-81	11-87	
Lymphocytes (%)			
Mean ± SD	49.03 ±14.23	52.01 ± 13.65	0.1006
Range	19-75	13-81	
Monocytes (%)			
Mean± SD	1.91±2.30	1.08±1.36	<0.0001
Range	0-8	0-7	
Basophils (%)			
Mean ± SD	0.04±0.18	0.03 ±0.15	0.5911
Range	0-1	0-1	
Eosinophils(%)			
Mean± SD	0.84±1.15	0.78 ±1.28	0.7005
Range	0-4.5	0-7	

Parameter	Group A	Group B	P value
Absolute neutrophils count (per mm3)			
Mean ± SD	5342.87 ± 3240.66	4871.06 ±.3440.89	0.2922
Range	1005-16038	690- 27375	
Absolute lymphocytes count (per mm3)			
Mean ± SD	5275.22 ±3361.08	5667.47± 5199.4	0.4967
Range	1290-15576	1404-67914	
Absolute monocytes count (per mm3)			
Mean ± SD	222.69±310.78	115.40 ±215.30	0.0006
Range	0-1408	0-2646	
Absolute basophils count (per mm3)			
Mean ± SD	4.19±18.88	2.87±16.41	0.5527
Range	0-75	0-123	
Absolute eosinophils count (per mm3)			
Mean ± SD	89.22 ±139.25	79.43 ±145.42	0.6060
Range	0-653	0-1002	
Platelet count (per mm3)			
Mean x103± SD	258.82±151.74	226.17±132.13	0.0689
Range x103	60-700	75-800	