# PREVALENCE OF IRON DEFICIENCY ANAEMIA IN CHILDREN OF THE URBAN SLUMS OE KARACHI

Pages with reference to book, From 118 To 121

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## ABSTRACT

A preliminary baseline survey was conducted to estimate the prevalence of anaemia in a group of 391 children aged 6-60 months, randomly selected from three urban slums of Karachi. Haemoglobin and the red cell indices including haematocrit, MCV, MCH, MCHC, ABC and red cell distribution width (RDW) were estimated for each of the selected children. Ferritin estimation was done on 354 (9 1%) children to assess the iron storage status. According to WHO criteria, the accepted cut-off point for anaemia screening in children is set at 11 gm/dl, 70 fI and 20 pg for haemoglobin, MCV and MCH respectively. Following these criteria, 118 (30%) children were classified as normals (Hg = >11 gm/dl) and 273 (70%) as anaemic (Hg = <11 gm/dl). Of the 354 ferritin estimations, 225 (64%) children had ferritin levels lower than normal (<11 ng/ml) and 128 (36%) had ferritin levels within normal limit (11-120 ng/ml). From this group, a total of 61% (214/354) children were classified as microcytic hypochromic (MIH) and 11% (39/354) of which had normal ferritin levels suggesting the presence of thalassemia minor trait. The overall results obtained indicate that iron deficiency anaemia is highly prevalent among these children (JPMA 42:118,1992).

## INTRODUCTION

Global prevalence of anaemia is estimated to be about 30% and almost 51% of the young children are affected due to anaemia[1]. Iron deficiency anaemia is the foremost nutritional deficiency disease in the tropics including SouthAsia andAfrica. In South India about 76% of the school children suffer from anaemia[2]. At Ibadan Nigeria, anaemia was reported to occur in 31.5% of children aged between one and ten years attending the University College Hospital[3]. Iron deficiency is the result of an iron imbalance, i.e., the amount absorbed by the intestine may not be satisfactory to meet body requirements. However, if the supply of haemopoietic nutrients is inadequate, the bone marrow is dysfunctional and the levels of haemoglobin will be subnormal and a state of anaemia will set in. Iron requirements depend on age, sex, race, pregnancy, lactation and altitude[4]. Because of the different contributing factors for the development of anaemia in children, information of its prevalence, distribution and aetiology are important for adopting appropriate measures for its prevention and control. In Pakistan nutritional anaemia has been recognized to be. the most common type of malnutrition present in children. According to the 1977 micronutrient survey of Pakistan, about 38% of the population was identified to be anaemic[5]. According to 1988 National Nutrition Survey of Pakistan 65% of the children aged 7-60 months were found to be anaemic[6]. Studies by Karim et a! reported association between presence of anaemia and socioeconomic status of pregnant women[7,8]. In a separate study by Jalil and Khan9. 83%of the children between 1-5 years of age were found to suffer from iron deficiency anaemia. Although the prevalence rate of anaemia in children is somewhat known in Pakistan, to our knowledge no well defined epidemiological prospective study has been documented yet. ‘the purpose of the present study is to describe the pattern of childhood anaemia prevalent in three urban slums of Karachi, in order to identify which public health measures may be applied to control anaemia in these communities.

## SUBJECTS AND METHODS

The study was carried out during February, 1989 to March, 1990, at the clinical laboratories of the Aga Khan University Medical Centre (AKUMC), Karachi. The study was approved by the Ethical Review Committee of the AKU and Harvard University. Informed consent was obtained from the parents or the guardians of the ëhildren. Using cluster sampling design 391 children aged 6-60 months were selected randomly from three urban slums: Issa Nagri, Chanesar Goth and Azam Basti of Karachi. The survey team consisted of the principal investigator, a pediatrician, a community health worker (CHW) and a nutritionist. The pediatrician and the CHW were the primary data collectors, who visited each of the households, conducted thorough physical examination, carried out the anthropometric measurements including body weight, height, mid-arm circumference and withdrew blood samples for biochemical analysis. Information were recorded on socioeconomic status, number of household members, weaning age of the children prior to the start of field work. The nutritionist trained the pediatrician to conduct dietary interview with caretaker of the study children. At regular intervals the principal investigator visited the field area and regularly supervised the staff collecting data. About 3 milliliters of venous blood samples were collected in two different tubes (placed in ice flask) containing EDTA and no anticoagulant. The tubes were transferred to the AKU within 3-4 hours of collection. Haemoglobin and red cell indices including HCT, MCV, MCHC, RBC and RDW were estimated using EDTA sample in Coulter S + IV autoanalyzer, on the same day of sample collection. Serum ferritin was estimated on stored serum samples using radioimmunoassay technique[10], at a later date, usually within 3 months of collection The two tailed 't' test was used to examine the differences in the mean values of the outcome variables evaluated. Correlation coefficients were calculated to find out the association between haemoglobin and the variables. Analysis of data was done by using SPSS packaged programme utilizing IBM personal computer system.

## RESULTS

According to WHO criteria[11] for screening anaemia for the children aged 6-60 months, the accepted values for haemoglobin, MCV and MCH are 11 gm/dl, 70 fi and 20 pg respectively. Haemoglobin and red cell indices were estimated in all the 391 children, but adequate blood was available only from 354. (91%) for the estimation of serum ferritin.

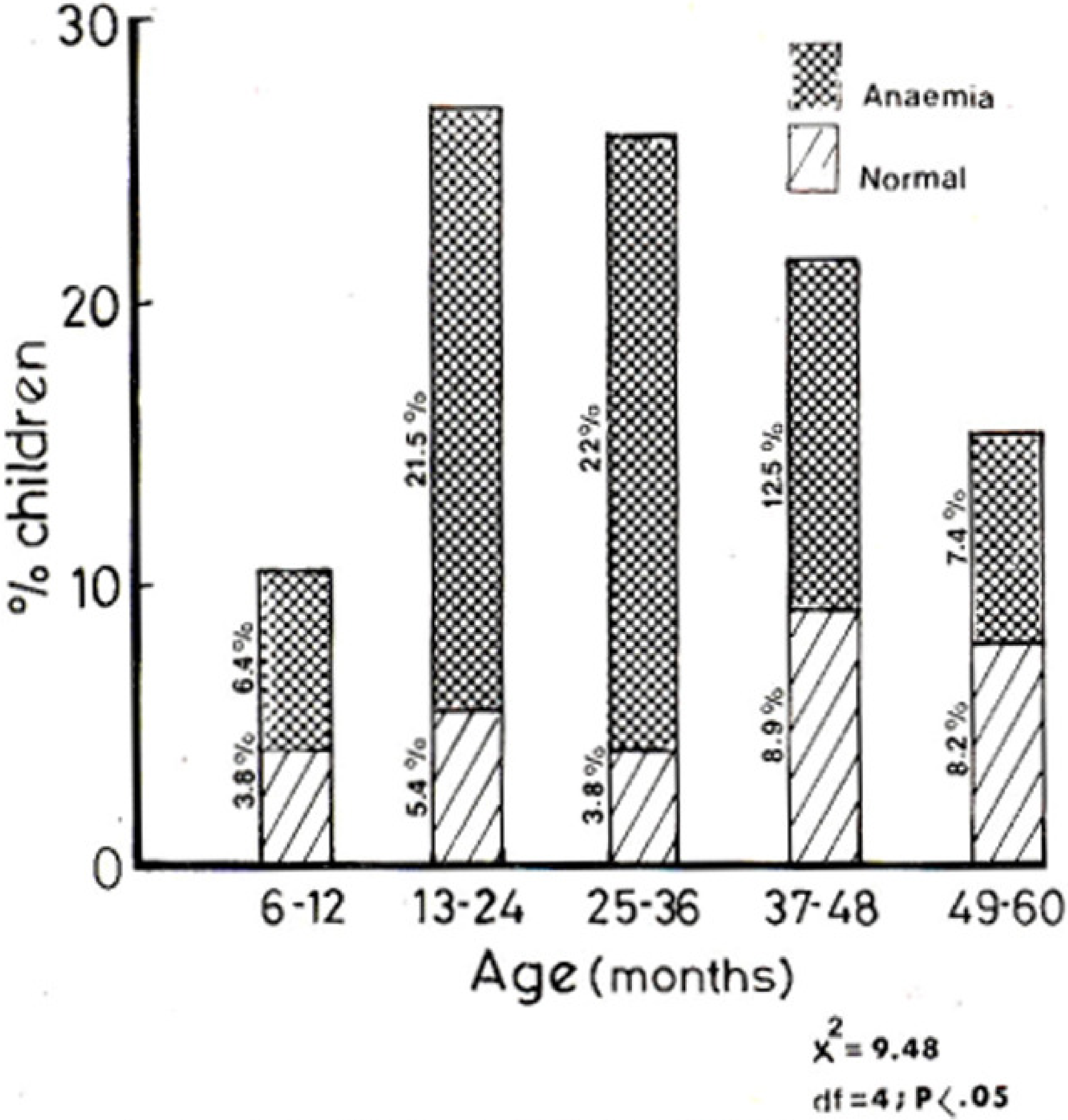



**Figure 1. Distribution of normal and anaemic children in different age groups.**

Figure 1 presents percentage distribution of the normal and anaemic children stratified into age groups. Highest number of the anaemic children were obtained in the 13-36 months age category. A significant association x2 =9.48; P< 0.05 with 4 d.f.) was obtained between anaemia and the ages of the children. Distribution of male and female children in the normal and morphologically different types of anaemia group is presented in Table I.

**TABLE I. Distribution of normal and different types of anaemia among male and female children.**

| Children | Male (No.) | Female (No.) | Total (No.) | (%) |
|---|---|---|---|---|
| Normals (Hb = >11 gm/dl) | 66 | 52 | 118 | (30) |
| Anaemia (Hb = <11gm/dl) | | | | |
| Microcytic hypochromic (MIH)* | 137 | 90 | 227 | (58) |
| Normocytic Normochromic (NN)** | 21 | 24 | 45 | (12) |
| Normocytic hypochromic (NH) + | 1 | - | 1 | (0.3) |
| Macrocytic (MAC) | - | - | - | |
| All (%) | 225 (58) | 166 (42) | 391 | (100) |

*MIH (Microcytic hypochromic); Hb < 11gm/dl; MCV < 70fl; MCH < 20 Pg

**NN (Normocytic Normochromic); Hb < 11gm/dl; MCV ≥ 70fl; MCH ≥ 20 Pg

+ NH (Normocytic hypochromic); Hb < 11gm/dl; MCV ≥ 70fl; MCH < 20 Pg

Overall 30% children (118/391) were normal having more than 11 gm/dl of haemoglobin levels and 70% (273/391) were anaemic with less than 11 gm/dl of haemoglobin levels. Of the total anaemic children 227 (58%) were microcytic hypochromic (MIH), 45 (12%) were normocytic normochromic (NN) and only 1 (0.3%) was normocytic hypochromic (NH). None of the children had macrocytic anaemia. Distribution of ferritin and haemoglobin values are presented in Table II.

**TABLE II. Distribution of ferritin in microcytic hypochromic normocytic normochromic and normal children.**

| Children (morphological classification) | Ferritin values (ng/ml) <11 low | 11-20 normal | >120 high | Total (%) |
|---|---|---|---|---|
| Normal (>11 gm/dl) | 32* | 67 | - | 99 (28) |
| MIH (<11 gn/dl) | 174** | 39 + | 1 | 214 (61) |
| NN (<11gn/dl) | 18 + + | 22 | - | 40 (11) |
| NH (<11gn/dl) | 1 | - | - | 1 (0.3) |
| ALL (%) | 225 (64) | 128 (36) | 1 (0.3) | 354 (100) |

* Latent iron deficiency

**Iron deficiency

+ Thalassemia minor

+ + Stage prior to developing MIH

About 32% (32/99) of the children with normal haemoglobin level had low ferritin values suggesting that these children may have been suffering from latent iron deficiency. In the MIH group 18% children (39/214) with less than 11 gm/dl of haemoglobin had normal ferritin level suggesting that possibly this group has been suffering from thalassemia minor trait.

**TABLE III. Haemoglobin levels according to degree of nutritional status.**

| Nutritional status (No.) | Wt/age % median | Hb level (g/dl) Mean ± SD | Median | Lower limit |
|---|---|---|---|---|
| Severe (11) | <60 | 8.2 ± 2.8 | 8.4 | 3.4 |
| Moderate (94) | 60-74 | 9.3 ± 2.6 | 9.8 | 3.5 |
| Mild (213) | 75-85 | 9.6 ± 2.5 | 10.1 | 3.8 |
| Normal (73) | ≥ 90 | 9.9 ± 2.2 | 10.4 | 5.2 |

In Table III mean, median and the lower limits of the haemoglobin values are presented for all the children stratified into different degrees of nutritional status (wt/age, % median). Children with severe degree of malnutrition had the lowest mean and median haemoglobin values as compared to the values for the moderate, mild or normally nourished children. These data suggest that presence of anaemia in these communities probably is due to lack of dietary iron in general and not secondary to protein energy malnutrition. Distribution patterns of haemoglobinvalues among the normals and MIH group are presented in Figures 2 and 3 respectively.

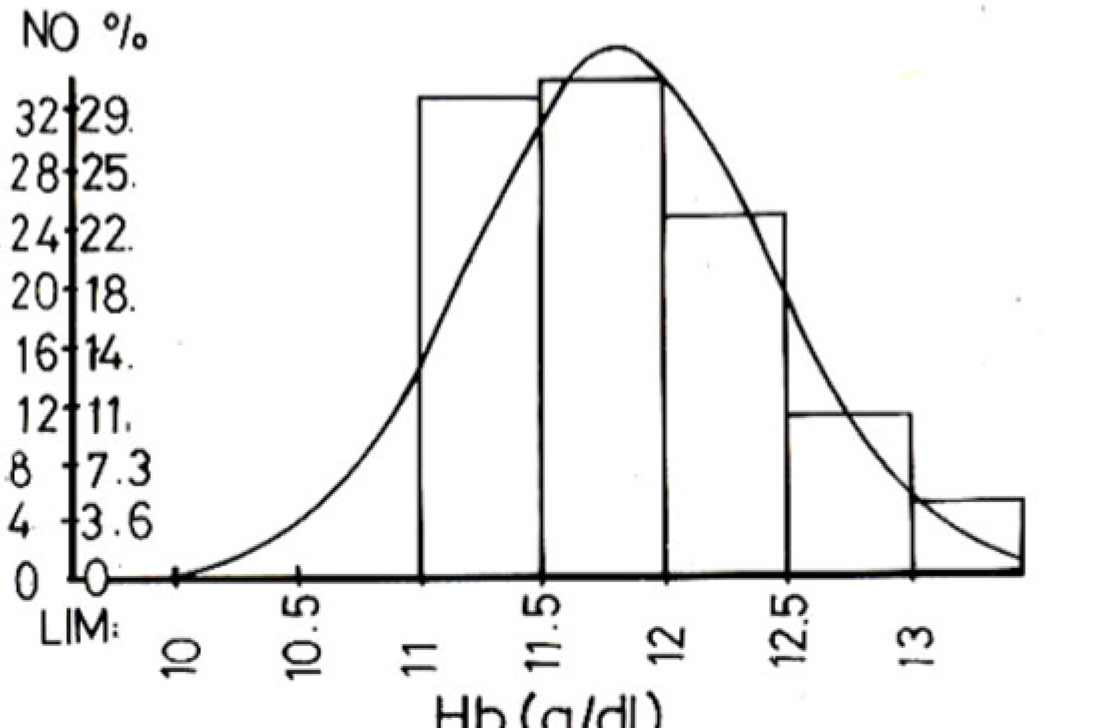
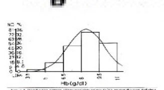



**Figure 2. Distribution pattern of haemoglobin values (g/dl) among the normal children.**



The values from normal children are typically distributed in a gaussian pattern (Figure 2) whereas the distribution curve for the MIH group (Figure 3) has shifted towards the left suggesting a majority of children had lower than 9.5 gm/dl of haemoglobin values. Significant positive correlations (P <0.001) were obtained between haemoglobin and age, weight, wt/age and height for age respectively. This suggests that a close association exists between haemoglobin status and the health indicators used here (Table IV).

**TABLE IV. Correlation between haemoglobin and other variables.**

| Correlation between Hb and the variables | Correlation co-efficient |
|---|---|
| Age (months) | 0.124* |
| Weight (Kg) | 0.195* |
| Wt/age | 0.162* |
| Height/age | 0.108* |
| Wt/height | 0.051 |

*P <0.0001

**DISCUSSION**

The results presented here clearly show that overall a very high percentage (70%) of children had anaemia and that a large number (227/391) of which had microcytic hypochromic (MIH) type of anaemia (Table I). The next larger group had normocytic normochromic (NN) type of anaemia. None of the children had macrocytic anaemia suggesting that deficiency of folic acid and vitamin B12 is not common in these communities. The results of ferritin values further clarifies the anaemia status of the children (Table II). Furthermore, the results showed that a group (32/99) of normal (WHO classification) children with adequate haemoglobin level had low ferritin values (cli ng/ml) suggesting presence of latent iron deficiency. Also a significant number of children of the MIH group and NN group had low ferritin values. About 18% of children (39/2 14) of the MIH group had normal ferritin values suggesting presence of thalassemia minor trait or other causes. These patients were not investigated further. Children in the age groups of 13-24 and 25-36 months were mostly affected by anaemia (Figure I). However even the youngest group (6-12 months) had a significant number of children with anaemia. The important reasons most probably could be the inadequate dietary intake of iron rich food by these children. Analysis of mean and median values for haemoglobin according to nutritional status demonstrated that even the children with normal nutritional status (_ 90% wt/age) had low mean and median values of haemoglobin suggesting that iron deficiency is widely prevalent in these communities. However a significant positive correlation exists between haemoglobin levels . and age, weight, weight/age and height/age criteria respectively (Table IV). The distribution pattern of haemoglobin levels (Figures 2 and 3) among the normal and anaemic children showed two different pattern of curves, respectively a normal gaussian type and a curve with aleft shift. This again suggested that most of the children with anaemia (Figure 3) had lower than 9.5 gm/dl of haemoglobin levels. The study children belonged to poor socioeconomic status, monthly family income varied from a mean Rs, 147-1800 with a household size of 6.4-6.7 members per family. The mean weaning age of the children varied from 6.2-7.4 months. The qualitative dietary history revealed that children of these communities consume very little quantity of dietary iron, averaged between 1.5-1.8 mg/day whereas the RDA values for this age group is 10-15 mg iron/day[12]. However, the intake data recorded by us had many limitations. Nevertheless, from the information obtained on the consumption of different types of food by these children it is not difficult to correlate the high prevalence of anaemia and poor iron intake. Poor consumption of animal food and presence of high quantity of phytate (chapati) limited the quantity of absorbable iron from the childrens' diet[13]. Iron content of lentil may be relatively high but also suffer from poor absorbability and also consumed in very small quantity[14]. Since the study presented here was not originally designed to find out the aetiology of anaemia in children, it was difficult to identify the cause of high prevalence of anaemia present in these communities. However, to control anaemia suggestion can be made for iron supplementation in these children as a short term measure. Fortification of staple food with iron may be used as a more permanent approach to control anaemia. But as a long term measure, national programmes must be adopted through health education to focus on the aspects of improved child feeding practices, where children may consume adequate iron rich food right from the beginning of weaning.

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