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PREVALANCE OF IRON DEFICIENCY ANEMIA IN SCHOOL GOING CHILDREN IN LAHORE CITY

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ABSTRACT
A cross-sectional study was conducted to investigate the prevalence of iron deficiency anemia in school children aged 6 to 18 years, who live in the Lahore City. The study sample consisted of 144(49.7%) male students, and 146 (50.3 %) female students. Complete blood count (CBC) was performed and blood samples with main corpuscular volume (MCV) value less than 80um (FL) were subjected to serum iron test. The prevalence of iron deficiency was 26.7% (12.7% with anemia, and 14% without anemia). The prevalence of iron deficiency among females was 30.5%, and among males was (21.6%). Iron deficiency was apparent in all studied age groups. The prevalence of 32.4% was observed among the age group 6-8 years, 35.3% among age group 9-11 years, 25.9% among 12-13 years and 12.1% among 14 years old. There was no clear link between family size and iron deficiency. With respect to prevalence of iron deficiency and family income, no significant difference was observed (24.9% low income; 28.1% with medium and 30.2% with high income). To effectively face these deficiencies it is necessary to think about the possibilities and cost effectiveness of fortifying foodstuffs (floor, salt, milk) and it is essential to carry out nutritional education activities to improve children and parents awareness and knowledge regarding iron deficiency anemia and its consequence.

INTRODUCTION
Iron deficiency is considered to be one of most prevalent forms of malnutrition, yet there has been a lack of consensus about the nature and magnitude of the health consequences of iron deficiency in populations. This paper presents new estimates of the public health importance of iron-deficiency anemia (IDA), which were made as part of the Global Burden of Disease (GBD) 2000 project. Iron deficiency is considered to contributed to death and disability as a risk factor for maternal and prenatal mortality, and also through its direct contributions to cognitive impairment, decreased work productivity, and death from severe anemia.

Based on meta-analysis of observational studies, mortality risk estimates for maternal and prenatal mortality are calculated as the decreased risk in mortality for each 1 g/dl increase in mean pregnancy hemoglobin concentration. On average, globally, 50% of the anemia is assumed to be attributable to iron deficiency. Globally, iron deficiency ranks number 9 among 26 risk factors included in the GBD 2000, and accounts for 841,000 deaths and 35,057,000 disability-adjusted life years lost.

Africa and parts of Asia bear 71% of the global mortality burden and 65% of the disability-adjusted life years lost, whereas North America bears 1.4% of the global burden. There is an urgent need to develop effective and sustainable interventions to control iron-deficiency anemia. This will likely not be achieved without substantial involvement of the private sector. Iron deficiency anemia (IDA) has been estimated to be the 14th leading cause of disease burden in the world in 1990: accounting for 1.8% of total DALYs (Murray & Lopez, 1996). Iron deficiency anemia is a condition where blood hemoglobin levels are lower than normal with the dominate cause being iron deficiency (Baker and DeMaeyer, 1979: GBD 1990 IDA Chapter, 1995).

Iron-deficiency anemia is characterized by the sign of pallor (reduced ox hemoglobin in skin or mucous membranes), and the symptoms of fatigue, lightheadedness, and weakness, None of the symptoms (or any of the others below) are sensitive or specific. Pallor of mucous membranes (primarily the conjunctiva) in children is the sign of anemia with best correlation to the actual disease, but in a large study was found to be only 28% sensitive and 87% specific (with high predictive value) in distinguishing children with anemia [hemoglobin (Hb)< 11.0 g/dl] and 49% sensitive and 79% specific in distinguishing severe anemia (Hb<7.0 g/dl). Thus, this sign is reasonably predictive when

present, but not helpful when absent, as only one-third to one-half of children who are anemic (depending on severity) will show pallor. Iron deficiency must be diagnosed by laboratory testing.

OBJECTIVES

The main objective of the study is to analyse the prevalance of iron deficiency anemia in school going children in Lahore city.

MATERIAL AND METHODS

A Hospital Based cross sectional descriptive study done in Lahore City

Tools of study

- Blood Samples For Anemia Tests in Hospital Labouteries
- HB% kit

Samping technique

Stratified sampling.

Sample size

Sample size was 300 cases, collected by 95% confidence interval.

Sampling selection

Inclusion Criteria

- (School going children b/w 4-9 years having Hb below 10gm/dl) were included in study.

Exclusion Criteria

- School children having Hb above 10gm/dl) were not included in study.

Study sample

Three hundred students randomly chosen in order to evaluate the prevalence of iron deficiency in this group. The sample represents school children of all educational levels and age ranged between 4-12 years. This cross sectional study represents the total population through the used parameters of sample selection. The study sample was collected through two stage strafied random sample from Ganga Ram & Services Hospitals.

Blood tests

Complete blood count (CBC) conducted for all participants. Based on main corpuscular volume, all samples with a value less than 80um (FL) were considered to be at risk and were subjected to serum iron test. Blood sample collection and blood tests performed as described later in the procedure section.

Table 01 represents the internationally adopted cutoff values for the used blood tests.

Table 01: Cutoff values for iron deficiency and anemia.

Age	Hemoglobin g/dl	MCV Um (FL)	Serum iron ug/dl
4-12 yrs	11.5-15.5	80-100	
Male	12.5-15.5		
Female	12-16	80-100	50-100

Procedure

Permission from the MS Office obtained to carry out the survey consent for blood Reports Data Collection & parents Data collected through home visits and direct interview with the parents in & Out Side of Hospitals.

Samples collection and handling.

1. Blood samples were obtained following standard methods by well trained nurses to prevent hemolytic and clot formation
2. Blood samples were then transferred under appropriate conditions, avoiding exposure to high or low temperature, to Ganga Ram & Services Hospital laboratory, where blood tests were performed.
3. All samples with MCV less than 80 femtoliter (Siberry and lannone, 2000; Rodger, 1993) were processed for serum Iron evaluation
4. Samples with hemoglobin less than 11.5g/dl, MCV below 80 um (FL), and serum iron less than 50Mg/dl were considered iron deficiency anemia. Samples with MCV below 80um (FL), serum iron below 50mg/dl, and hemoglobin within normal value were considered iron deficiency (Siberry and lannone, 2000; Rodger, 1993).

Data analysis

Data of the questionnaire and blood test were analyzed using SPSS software (Statistical Package for social Sciences). Descriptive studies and Chi-Square used. Calculated weighted mean are used to measure the means as un weighted mean to avoid bias.

RESULTS AND DISCUSSION

Prevalence of iron deficiency and iron deficiency anemia iron deficiency is a global nutritional problem, which mainly affects infants, children and women of childbearing age, using anemia as an indicator of iron deficiency, an estimated 30-60% of women and children in developing countries are iron deficient. Even in developed countries, iron deficiency warrants significant public health concern (Halileh and Gordon, 2006). In developing countries, the main cause of iron deficiency is low iron bioavailability in diet.

In Lahore, studied on iron deficiency anemia are limited and none directed mainly to school students. In addition, most of these studies depended on complete blood count as major diagnostic tool. The present study represents is the first to focus on school aged children at the various educational levels in Lahore City locality using the most commonly adopted diagnostic procedures for the determination of iron deficiency with or without anemia.

Table 2: Prevalence of iron deficiency by demographic patient characteristics.

Demographic Characteristic	N	ID (%)	IDA (%)	ID total (%)	Normal Total (%)
Age Group					
4-12 years	300	23.6	**8.8**	**32.4**	**68.6**
Gender					
Female	146	16	14.5	30.5	69.5
Male	144	13.3	8.3	21.6	78.4
Family Size					
1-3	60	13.4	6.7	20.1	79.9
4-6	170	20.5	12.7	33.2	66.8
7-10	70	12.1	11.2	23.2	76.8
F. Income					
High	60	20.1	10.1	30.2	69.8
Medium	170	14.3	13.8	28.1	71.9
Low	70	17.5	7.4	24.9	75.1

* P, place; F, family

Among the 300 school children between 4 and 12 years, 26.7% were with iron deficiency (12.7% ID, and 14% IDA). Other types of anemia and students with transient infections or chronic inflammatory process excluded as infections known to induce secondary iron deficiency anemia (Yip and Dallman, 1988).

Table 3: Prevalence of iron deficiency according to family awareness regarding diet maintaining iron levels.

Meals	Answer	n	ID (%)	IDA (%)	ID% Total
Breakfast increase ability to concentrate and be alert	Yes		15.7	12	27.7
	No		0	0	0
	Don't know		11.2	11.2	22.4
Tea with meals increase iron absorption	Yes		16.1	15.4	31.5
	No		14.9	8.5	23.4
	Don't know		0	0	0
Tea one hour after meal deceases iron absorption	Yes		12.1	11.9	24
	No		20.1	13.7	33.8
	Don't know		15.2	3	18.2
The Following types of food are rich in iron					
Spinach	Yes		14.7	11.9	26.6
	No		100	0	100
	Don't know		51.3	0	51.3
Carrots/Apples	Yes		12.1	12.1	24.2
	No		17.5	11.1	28.6
	Don't know		20.5	13	33.5
Milk and milk products	Yes		17.1	8.2	25.3
	No		12.2	20.3	32.5
	Don't know		0	16.9	16.9
Foul/hommus			14.7	12.8	27.5
			23.4	0	23.4
			13.2	18	31.2
Liver	Yes		13.8	12	25.8
	No		28.9	4.8	33.7
	Don't know		10.3	13.6	23.9
Eggs	Yes		14.2	11.8	26
	No		18.6	11.9	30.5
	Don't know		10.6	10.4	21
Soft Drinks	Yes		29	0	29
	No		14.4	12.5	26.9
	Don't know		24	6	30
Natural fruit Juice	Yes		14.3	11.4	25.7

	No		25.3	4.2	29.5
	Don't know		18	18	36
Chips	Yes		31	7.8	38.8
	No		14.7	12.3	27
	Don't know		12.6	8.4	21
Fish/Sardines	Yes		16.6	8.1	24.7
	No		9	26.4	35.4
	Don't know		8.4	21.1	29.5
Biscuits	Yes		22.6	3.6	26.2
	No		13.4	12.4	25.8
	Don't know		20.1	11.5	31.6

Our finding with respect to prevalence of iron deficiency anemia are much higher than that reported by Khawar among 24 secondary school children (5% for those aged 14-18 years) in Jhelum district (Khawar, 2003). It is important to note that Khawar study was limited to secondary school children and used CBC as the main diagnostic tool for IDA.

Table 4: The prevalence of iron deficiency related to the practice (health profiles) of the study population.

Practice	Answers	ID (%)	IDA (%)	ID % Total
Make sure that children have breakfast daily	Yes	14.3	12.2	26.5
	No	18.8	7.6	26.4
Children Provided with three regular meal daily	Yes	14.6	12.4	27
	No	10.3	10.2	20.5
Fruit juice provided for children	Yes	13.7	11.1	24.8
	No	16.4	13.9	30.3
Vegetables provided as salads	Yes	15.3	12.8	28.1
	No	9.6	7.1	16.7
Fresh fruits provided for children	Yes	14.6	11.5	26.1
	No	15.3	13.2	28.5
Tea consumption	Much	23.5	16.2	39.7
	Medium	11.7	12.6	24.3
	Little	16.3	9.3	25.6
Availability of animal products (meat, eggs, milk,…etc)too	Much	14	10.7	24.7
	Medium	16.4	11.8	28.2
	Little	11.7	15.1	26.8

Much = more than tow cups daily; Medium= up to tow cups daily;=less than tow cups per week

CONCLUSIONS AND RECOMMENDATIONS

The effects of iron-deficiency anemia will depend on the duration and severity of the situation. If left untreated, iron-deficiency anemia may lead to behavioral or learning problems. These may not be reversible, even with later iron supplementation in severe prolonged cases. However, in most cases, iron-deficiency anemia is preventable by following some basic recommendations.

These include iron supplementation programs that might include fortification of foodstuff; especially designed educational programs through curriculum; other educational programs targeted both children and parents and this might involve various media or channels. Most of these activities can be run by both the Ministry of Education in collaboration with the Ministry of Health or under the supervision of various government and non-government organizations. Such programs should focus on the needs of infants younger than 1 year (breast milk or an infant formula supplemented with iron); the needs of children under 2 years (requirements of cow's milk/day) and older age groups.

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