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Evaluation of Nutritional Status in Students of Primary Schools in Kosti City Using Blood Parameters and Iron Profile

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ABSTRACT: This descriptive and cross-sectional study had been done over four months to evaluate the nutritional status in primary schools students in Kosti City , through detection of hemoglobin (Hb) level, red blood cell (RBCs) count, packed cell volume (PCV) , iron profile , and type of daily diet. Three hundred students of primary schools were included. Two hundred and four were males, and remaining were females with varying age between 6 to 14 years. Each student, who accepted to participate in the study, received three sheets. The first sheet, a consent was a declaration form for each participant that he/she understood the study well, the second, a blood collection form, included information about the procedure of study tests. Student was physically and mentally well, the third sheet was a questionnaire from that included demographic data of the participants. A blood aliquot (2-5 ml) was collected from each student into ethylene diamine tetra acetic acid (EDTA) container to estimate Hb, RBCs count, PCV, using Sysmex (automated blood analyzer). Another 2.5 ml of blood was collected from the same student into plain container; the serum was separated by centrifugation, and analyzed for serum iron and serum firritin using Biosystem A 25. The results were analyzed using Statistical Package of Social Science (SPSS) software program. The results showed that the means of Hb, RBCs count, and PCV were 12.2 g/dl (±2 SD), 4.7 million c/cumm, 37.2%, respectively**,** and the means of serum iron, and serum ferrtin were 44.6µ g/l, 50.5µ g/l, respectively. Study also proved that about 85% of students used faba beans as main dish in their food**.**

KEYWORDS*: Nuutritional anemia, blood parameters, students diet*

INTRODUCTION

Nutritional anemia is a widespread public health problem associated with an increased risk of morbidity and mortality, especially in pregnant women and young children. Among the numerous factors, both nutritional factors, (vitamin an mineral deficiencies) and non-nutritional (infection and hemoglobinopathies), that contribute to the onset of anemia, iron deficiency and malaria play an important role in this problem. Given the role of iron in oxygen transport and the low levels of available iron in the diets of a large proportion of the global population, it is assumed that iron deficiency is one of the biggest contributing factors to anemia [(1)].

Nutritional anemia refers to types of anemia that can be directly attributed to nutritional disorders. Examples included iron deficiency anemia, anemia and megaloblstic anemia. Red blood cells are made in the bone marrow and circulate in the blood. They only have a life expectancy of about four months. The body needs iron, vitamin B12 and folic acid (one of the B group of vitamins) to produce more red blood cells. If there is a lack of one or more of these nutrients, anemia will develop. One needs iron for many important processes inside the body,

especially for making the oxygen-carrying pigment called hemoglobin [1].

Iron is absorbed from the food and drink by small intestine. The iron is carried in the blood to the bone marrow - where blood cells are produced - where it's combined with proteins to make haemoglobin. Spare iron can be stored in the liver. Iron is lost from body in urine, faeces, and dead skin cells and when blood is lost from the body [1].

On average, men need 8.7 mg of iron a day and women need 14.8 mg a day. One can usually get all the iron he needs from his diet. Certain groups of people are more likely to have iron-deficiency anaemia. These include babies, teenagers and women who have heavy periods [2] .

Folate deficiency may lead to glossitis, diarrhea, depression, confusion, anemia, and fetal neural tube defects and brain defects (during pregnancy). Folate deficiency is diagnosed by analyzing CBC and plasma vitamin B12 and folate levels. CBC may indicate megaloblastic anemia but this could also be a sign of vitamin B12 deficiency [3]. A serum folate of 3 μg/L or lower indicates deficiency. Serum folate level reflects folate status but erythrocyte folate level better reflects tissue stores after intake. An erythrocyte folate level of 140 μg/L or lower indicates inadequate folate status.

Increased homocysteine level suggests tissue folate deficiency but homocysteine is also affected by vitamin B12 and vitamin B6, renal function, and genetics [4]. One way to differentiate between folate deficiency from vitamin B12 deficiency is by testing for methylmalonic acid levels.Normal MMA levels indicate folate deficiency and elevated MMA levels indicate vitamin B12 deficiency[5,6].

MATERIALS and METHODS

This study has been done in the period between July to November 2009. Three hundred students were selected for this study. The students aged between 6 -14 years. Twelve primary schools were selected according to geographical and socio-economic distributions. Seven schools for males and five for females. 25 to 30 blood samples were collected from each school. Study was conducted after permission from authorities of the schools and the families of students. All participants were informed about the objectives of the study and its health emphasis in the future.

Laboratory methods

Two and a half ml of venous blood was collected into EDTA container and mixed gently, then labeled with student number. The blood samples were analyzed within four hours for CBC, using Sysmex automated blood analyzer. For serum iron, and serum ferritin , 2.5 ml of blood was collected and delivered into a plain container, let to clot and the serum was separated using bench centrifuge machine at 2500 rpm for 10 min. Serum iron and serum ferritin caused agglutination of latex particles is proportional to the ferritin and iron concentration and can be measured by turbidometry. Transferritin bound ferric ions in the sample were released by guanidinum and reduced to ferrous, by means of hydroxylamine. Ferrous ions react with ferrozine forming a colored complex that can be measured by a spectrophotometer.

RESULTS

Initially, 300 students between 6 and 16 years old were included in the study 68% (204 cases) were male and 32% (96 cases) were female. Sex and age distributions are given in tables 1 and 2. According to this study the mean of Hb in male and female students were within the normal range (Table 3). Also the means of PCV, MCV MCH, MCHC, and RBCs count were 37.3%, 79.1fl, 26pg, 32.8 g/dl, 6.4 million/cumm, respectively (Table 4). The means of serum iron, serum ferritin were within the normal ranges (Table 6). The study proved that most of students took faba bean as main dish in their food. See (Figure. 1)

Table 1 : Distribution of gender in the study group

Gender	Frequency	Percentage distribution (%)
Male	204	68
Female	96	32

Table 2 : The frequency of age

Age (years)	Frequency	Percentage (%)
6	23	7.7
7	24	8.0
8	21	7.0
9	30	10.0
10	25	8.3
11	42	14.0
12	50	16.7
13	48	16.0
14	37	12.3
Total	300	100.0

Table 3: The mean Hb conc. according to gender

Gender	Mean Hb concentration (± 2 SD)
Male	12.3 g/dl
Female	12 g/dl

Table 4. Means of PCV, MCV, MCH, MCHC, and RBCs according to the gender

Gender	Mean PCV (%)	Mean MCVfl (± 3SD)	Mean MCH pg	Mean MCHC (g/dl)	Mean RBCs count c/cumm
Male	37.3	79.1	26	32.8	5 million
Female	37.2	79.7	25.9	32.2	6.4 million

Table 5. Mean of serum iron, and serum ferritin in study population

Gender	Mean serum iron	Mean serum ferritin
Male	44 μ g/l	50 μ g/l
Female	44.6 μ g/l	50.5 μ g/l

Table 6: Number of students with serum iron and serum ferritin less than normal

Gender	Students with Serum iron , and serum ferritin less than normal	Percentage (%)
Male	10	3.3
Female	5	1.7

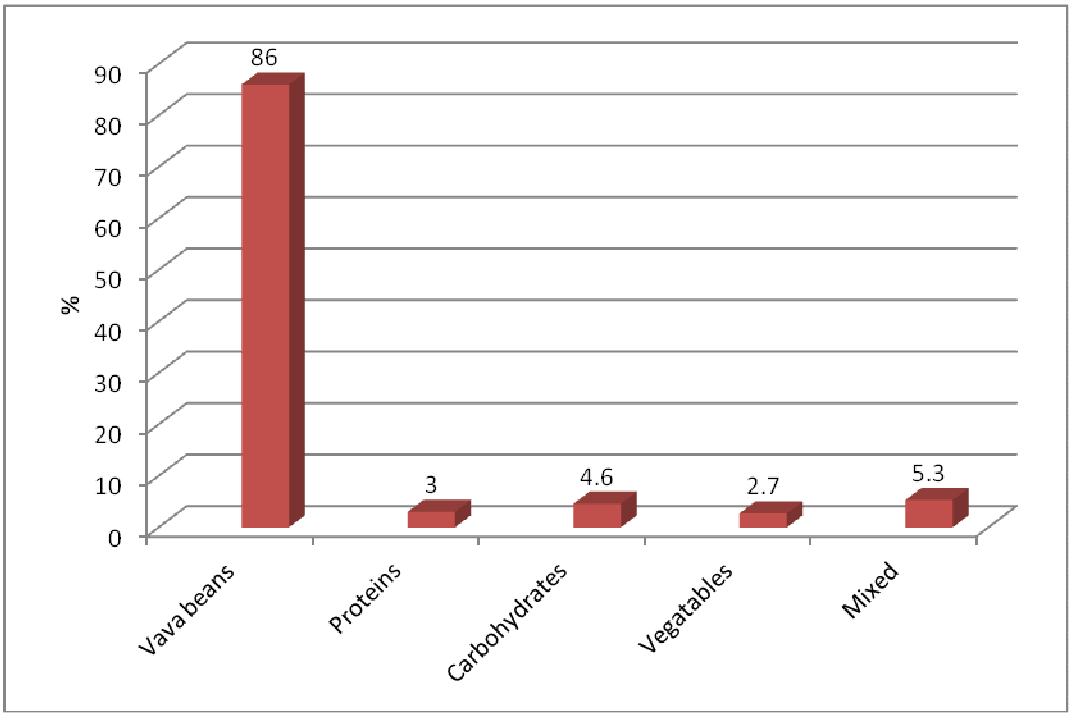

Figure: 1 types of diet among study groups

DISCUSSION:

Anemia is a common health problem throughout the world, and usually it affects the work capability and mental capacity of the human. The most common anemia is nutritional type due to iron and folic acid deficiency in infancy, childhood, and pregnancy. Among the total 300 tested samples, 15 were characterized by low Hb concentration, PCV, MCV, RBCs, serum iron and serum ferritin. Also this study does not agree with the study done in Istanbul by Emel Gur,*et al* [7], reported that over all frequency of IDA was 27.6%. In addition to that this the present study does not agree with the study published in the Indian Journal of Medical Research, among urban slums, and the results showed that the frequency of anemia was 41.8 %. Most of students included in this study were dependent on faba bean in their food; this may due to some nutrition -al habits, and also may due to economical situations of students families. Verma, *et al.*[8] assessed the prevalence of anemia (Hb512g/dl) among 2000 urban school children aged 5–15 years from Punjab. They found that the prevalence of anemia was 51.5 %, and it was significantly higher in girls. In the present study, there was no significent difference between girls and boys in the rate of anemia.

In this study the means of Hb concentration, PCV, MCV, RBCs, serum iron, serum ferritin, were recorded to be within the normal range. Lwambo, et al[9], from Tanzania, found higher anemia rates in school children. Mild anemia prevalence was the highest in our study. A study performed in peri-urban Bangladesh schoolgirls showed a similar anemia [9] the effects of parents' educational and working status and

family income , previously reported as independent predictors of anemia prevalence were not found to be risk factors in our study as indicated by the logistic regression test [8,10]. The number of family members was identified as a risk factor for anemia. The high prevalence of anemia in crowded families can be related to the low income and care per child, and the high risk of contamination with infections.

CONCLUSIONS

In conclusions this study showed that nutritional status of students in primary schools in Kosti city is good and that blood, serum iron and serum ferritin were good indicators for diagnosis of nutritional anemia.

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