PREVALENCE AND SIGNIFICANC OF IRON DEFICIENCY ANAEMIA AMONG PEOPLE OF MORNAG DISTRICT OF NEPAL

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Abstarct:

Iron deficiency anaemia is one of the most dangerous and devastating causative form of malnutrition in developing countries, where special care should be taken from the health community to address the problem in South East Asian countries, 1.3-2.2 billion population is affected according to world health organization. Fifty percent of women and children and 60% of gross anemic women of developing nations have been adversely affected till date. The most common cause of iron deficiency anaemia is due to inadequate intake of iron in diet, physiologic demands of pregnancy and rapid growth and loss due to parasitic infections. Other prevalent causes of anaemia include malaria, chronic infections and nutritional deficiencies of vitamin A, folic acid and Vitamin b-12. The study reveals that 25.57 % of patients have been suffering from iron deficient anemia.

Key Words: Iron, Anaemia, Nepal

Introduction:

Iron deficiency anaemia is one of the major concerns in health, mainly focusing the developing countries like Nepal. The World Health Organization identifies iron deficiency anaemia as the most common anaemia[1]. Almost 2 billion people are affected worldwide. In developing countries, this high rate has been related to insufficient iron intake, accompanied by chronic intestinal blood loss due to parasitic and malarial infections[4]. Iron deficiency anemia affects 3% children under 2 years of age, up to 9-11 % adolescents female and less than 1% of adolescent males[3]. Reduction of iron deficiency anaemia is an area, to be taken care of with utmost urgency.

Iron deficiency anaemia leads to lost productivity and premature death in adults [24]. It is also associated with prenatal complications like low birth weight, premature delivery and associated health problems[5], long-term effects including Increased susceptibility to infection and poor growth, risk for developmental and behavioral delays in children including lower mental and motor test scores[24]. Some evidence suggests that severe iron deficiency anaemia may cause behavior and learning problems, persisting throughout childhood [2].

To address the problem, prevalence of iron deficiency anaemia was investigated in Biratnagar, Morang district, Nepal, taking sample data from 262 patients in both out patients and inpatient department. The main objective was to investigate iron deficiency anaemia by age and sex and to establish the statistical correlation between iron, TIBC (Total Iron Binding Capacity), Ferritin and hemoglobin in Iron Deficiency Anaemia.

Materials and Methods:

Measurement of Serum Iron Profile:

Serum Iron Estimation:

Abnormal levels of iron are characteristics of many diseases, including iron deficiency anaemia and haemochromatosis. Up to 70% of iron is found in hemoglobin of RBCs. The other 30% is stored iron in the form of ferritin and hemosiderin. About 10% of the ingested iron is absorbed in the small intestine and transported to the plasma. There the iron is bound to the globulin protein called transferrin and carried to the bone marrow for incorporation into haemoglobin. The serum iron determination is a measurement of the quantity of iron bound to transferrin.

TBC (Total Iron Binding Capacity) and Transferrin:

TBC is a measurement of all proteins available for binding mobile iron. Transferrin represents the largest quantity of iron-binding proteins.Therefore TIBC is an indirect, yet accurate measurement of transferrin. During iron overload, transferring levels stay the same or decreases, whereas the other less common iron-carrying proteins increase in number. In this situation, TIBC is less reflective of true transferring levels. TIBC is increased in 70% of patients with iron deficiency. Transferrin is also negative acute-phase reactant protein.
TIBC

Serum Iron Estimation:

Serum iron is estimated after dissociation of iron transferring bound in acid medium, when ascorbic acid reduces Fe^{3+} into $Fe2^{+}$. The reduced iron then form a coloured complex with 3-(2-pyridyl)-5, 6 difuryl 1, 4 triazine-disulfonate (ferene).The absorbance thus measured at 600 nm (580-620) is directly proportional to the amount in the specimen. Thiourea is added in the reagent to prevent copper interference.

Determination of TIBC:

TIBC is evaluated after saturation of the transferring by an iron solution and adsorption of excess iron on Magnesium Hydroxide Carbonate. After centrifugation, iron is measured in the supernatant colorimetrically with the iron ChromazurolBor iron Ferrozine method.

Estimation of ferritin:

In the Ekonzyme Ferritin assay, two monoclonal antibodies are used in an immunoenzymatic assay system, which incorporates magnetic solod phase separation.Fixed amounts of fluorescein-conjugated antiferritin monoclonal antibody conjugated to alkaline phosphatase are added and incubated at 37 °C. During the incubation, the fluorescein-antiferritin and alkaline phosphatase-antiferritin monoclonal antibodies bind to discreet sites on the ferritin molecule forming a sandwitch. At the end of the incubation period antifluorescein coupled to a magnetic solid phase is added in excess. This rapidly and specifically binds to the ferritin-antibody complexes and is sedimented in a magnetic field. After aspirating the liquid phase and washing the solid phase, a solution of the enzyme-substrate, phenolphthalein monophosphate is added to the tubes and incubated at 37°C. After incubation, the enzyme reaction is stopped by the addition of a stop reagent and the intensity is used for estimation of concentration.

Results:

The study was carried out at the Department of Biochemistry, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal. Samples were collected from patients of at a random basis, based on random sampling techniques, and estimation and calculations were done in the above department. The patients were found to be from Morang District, Nepal and accordingly inferences have been established.

Table-1: Prevalence of Iron Deficiency Anaemia

Total Cases	Iron Deficiency Anaemia	Incidence
262	67	25.57

Table-2: Distribution of Patient according to sex

Gender	Number of Patients	Percentage
Male	124	47.32
Female	138	52.68
Total	262	100

Table-3: Prevalence of Iron Deficiency Anaemia according to sex.

Sex	Number of Patients	Percentage	Sex Ratio (Male:Female)
Male	26	9.92	
Female	41	15.65	
Total	67	25.57	1:1.58

Table-4: Distribution of patients according to age and sex

Age Group (Years)	Number of Patients	Sex		Percentage	
		Male	Female	Male	Female
≤20	17	6	11	8.96	16.42
21-40	25	6	19	8.96	28.36
41-60	17	6	11	8.96	16.42
>60	8	2	6	2.99	8.96

Table-5: Prevalence of Iron Deficiency Anaemia with Iron, TIBC, Ferritin and Haemoglobin according to age and sex

Age Group (Years)	Iron (µg/dL) Mean± Standard Deviation		TIBC(µg/dL) Mean ± Standard Deviation		Ferrritin(µg/dL) Mean ± Standard Deviation		Haemoglobin (mg/dL) Mean ± Standard Deviation	
	Male	Female	Male	Female	Male	Female	Male	Female
≤20	29.25 ± 0.75*	23.50 ± 0.42	523 ±16.30	432 ± 99.42**	13.34 ±0.62	9.24 ±0.44*	9.52 ±0.72	8.42 ±0.24*
21-40	18.34 ±2.42*	22.61 ±0.84	412.56 ± 36.44	496.44 ± 56.82	8.42 ± 0.44*	9.12 ±0.46	9.12 ±1.22	8.54 ±0.42
41-60	23.78 ±1.42	27.12 ±3.42	388.42 ±22.78	514.22 ±46.86	10.12 ±0.64	10.12 ±0.24**	10.24 ±0.46	8.92 ±0.72
>60	28.94 ±2.44	26.42 ±4.26*	364.58 ±48.92	394.46 ±65.23	9.8 ±2.62*	10.10 ±2.62	9.67 ±1.24	9.54 ±0.64**

P<0.01 p>0.05

Discussion:

Iron deficiency anaemia is one of the most dangerous and devastating causative form of malnutrition in developing countries , where special care should be taken from the health community to address the problem in South East Asian countries, !.3-2.2 billion populations is affected according to world health organization.50% of women and children and 60% of gross anemic women of developing nations have been adversely affected till date. The most common cause of iron deficiency anaemia is due to inadequate intake of iron in diet, physiologic demands of pregnancy and rapid growth and loss due to parasitic infections. Other prevalent causes of anaemia include malaria, chronic infections and nutritional deficiencies of vitamin A, folate and Vitamin b-12. The study reveals that 25.57 % of patients have been suffering from iron deficient anaemia.

The study reveals that iron deficiency anaemia is most frequent in the female age group of 21-40, that the rate of incidence is very much associated with pregnancy .Hemoglobin and Total iron has been found to correlate directly with the incidence of Iron deficiency anaemia, although ferritin and total iron binding capacity do not possess direct correlation ship with the incidence. This finding has significant clinical importance, as replenishment of iron only can eradicate the incidence of iron deficient anaemia to a significant

extent. 9.92% of total patients are male with the disease and 15.65% of patients are female with IDA [Iron Deficient Anaemia].The ratio suggest a blunt inference that females are more susceptible to the disease. That the highest percentage of patients with IDA are females within the age group of 21-40,that is the most reproductive age , which most adversely affect the process of pregnancy and associated health issues. This is followed by the age group below 20 and 41-60.The worst affected are the women who need iron supplementation and caring for the decrease of the incidence and complications.

Pregnancy, adolescence, periods of rapid growth and an intermittent history of blood loss of any kind should alert the clinician to possible iron deficiency. Signs related to iron deficiency depend upon the severity and chronicity of the anaemia in addition to the usual sign of anaemia –fatigue, pallor and reduced exercise capacity.

The serum iron level represents the amount of circulating iron bound to transferrin. The TIBC is an indirect measurement of the circulating transferrin. A transferring saturation rate of >50% indicates that a disproportionate amount of the iron bound to transferring is being delivered to nonerythroid tissues.

Free iron is toxic to cells, and because of the toxicity, the body has established an elaborate set of protective mechanism to bind iron in various tissue compartments. Within cell, iron is stored complexed to protein as ferritin or hemosiderin.Under steady state conditions, the serum ferritin level correlates with total body iron stores; thus, the serum ferritin level is the most convenient laboratory test to estimate iron stores. Evaluation of bone marrow iron stores, red cell protoporphyrin level and serum levels of transferring receptor protein are sophisticated markers, but primary evaluation and control are the first basic need to be addressed in developing countries.The analysis and evaluation establishes the fact that the iron levels are below satisfactory levels and proper care should be taken for restoration of human health in the developing countries.

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