World Journal of Pharmaceutical Sciences
ISSN (Print): 2321-3310; ISSN (Online): 2321-3086
Published by Atom and Cell Publishers
Available online at: http://www.wjpsonline.org/
Original Article

Evaluation of blood calcium and electrolytes in anemic women of Karachi

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Received: 04-01-2017 / Revised: 11-04-2017 / Accepted: 21-04-2017 / Published: 26-04-2017

ABSTRACT

The present study includes 36 anemic and 30 control subjects. The level of serum iron, hemoglobin, RBC count, and sodium are lower in anemic patients as compared to control subjects, whereas serum calcium and glucose-6 phosphate dehydrogenase (6-PDH) had shown no significant difference between the anemic and control non anemic groups. A positive correlation of serum iron with serum potassium level was found in the anemic group.

Key words: Anemia, Calcium, Sodium, Potassium.

INTRODUCTION

Anemia is characterized by low level of hemoglobin in the blood (1). Anemia is responsible for about 800,000 deaths per year worldwide. The annual incidence rate of iron deficiency anemia is 7.2-13.96 per 1,000 people per year. The estimates are higher in Spain and Germany. Females are at greater risk of iron deficiency anemia (2). In Pakistan the incidence of nutritional anemia associated with GIT disease, in woman of reproductive age is about 5% and in postmenopausal woman is 6.8% (3,4). The iron deficiency is not only by dietary deficiency of iron, but also by poor absorption of available dietary iron (5).

Calcium contributes to the development of bone, muscle contraction, and transmission of nerve impulses & clotting of blood (6). Eryptosis is stimulated by calcium. Eruption is triggered in several clinical conditions such as iron deficiency, diabetes, phosphate depletion, glucose -6-phosphate dehydrogenase deficiency, sickle cell anemia etc. (7). The ca^{++} sensitive k^{+} channels regulate the process of erythrocyte apoptosis (8). Calcium stimulates the protease, resulting in degradation of cytoskeleton. During iron deficiency anemia there was considerable increased absorption of calcium but the calcium balance remained unchanged due to an increased calcium excretion (9). In Thailand about 4% school children suffer from G-6-PDH deficiency (10) which leads to anemia. The aim of study is to explore the relationship of serum calcium, sodium & potassium with serum iron in anemic patients.

MATERIAL & METHOD

The pre diagnosed female anemic patient's were selected from the outpatient departments of Holy family Hospital Karachi. The patients had no other disease except low hemoglobin content in the blood (Hb< 11gm/ dl). The control subjects were selected having no disease and are non-anemic (Hb > 11g/dl). The analysis of blood samples were performed at Hematology Research unit Department of Biochemistry, university of Karachi. The past and present history of anemic women and control was taken by filling Performa. The Study was approved by ethical committee of Department of Biochemistry, University of Karachi, Pakistan.

About 10ml blood was taken from both control and anemic patients. The blood was analyzed for serum iron and serum total iron binding capacity by kit method (supplied by clonital company), calcium was estimated by O- cresolphthalein direct method (*kit Qca 995936). Serum Sodium and potassium were determined by flame Photometry, glucose 6-phosphate dehydrogenase was estimated by kit method (supplied by sigma diagnostic 345-uv). Total RBC count and hemoglobin by automatic hemoglobin analyzer. Statistical analyses were performed by (SPSS Version 20.). The data of

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anemic & control were analyzed by student t "test" P<0.05 is taken as significant.

RESULT

In the present study 30 controls and 36 anemic women were included. The mean age of control subjects was 29.6 ± 1.05 year and anemic subjects was 39.1 ± 1.5 year. Table – 1 shows the variation of hemoglobin, RBC's count, serum iron, Iron binding capacity, serum sodium, Potassium, calcium and G-6 Phosphate dehydrogenase in control and anemic patients. The level of hemoglobin, RBC'S count, Serum iron, and sodium is lower in anemic patient as compared to control, whereas calcium and G-6 PDH has shown no significant difference in anemic patients as compared to control subjects. Table – 2 shows a positive correlation of serum iron with serum potassium level is anemic group.

DISCUSSION

Anemia is a health problem in which blood hemoglobin concentration is decreased. The synthesis of red blood cells requires an adequate supply of variety of nutrients including iron, folate, vitamin B12 & ascorbic acid etc. The iron has the ability to increase erythropoietin production (11) 80% iron is used for this purpose. Poor socioeconomic status and lack of dietary iron, contribute to develop anemia. In the present study, the hemoglobin & serum iron level of anemic subject's were significantly low as compared to control subjects (table-1). Anemia in female may be due to menstrual loss of iron (12).

During iron deficiency anemia the activity of membrane bound ATPase is altered and due to this altered ATPase activity, levels of Na^+ and K^+ are also affected. Na^+ and K^+ ions are restricted to their compartment but can penetrate the cellular membrane via Na^+ K^+ ATPase pumps (13). There was no significant difference in levels of calcium in anemic subjects as compared to control subjects (table –1) as was found earlier (14). Potassium showed a positive correlation with serum iron in anemic subjects in the present study. The serum sodium level of anemic subjects was decreased as compared to normal control subject as was found by Agoreyo and Nwanzen (15). Calcium levels in blood are regulated in order to maintain normal muscle function and bone serves as a store house for calcium. The combined calcium and iron supplementation is equally as effective as single iron supplementation in reducing the prevalence of iron deficiency anemia in Bolivian school children (16).

Conclusion:

The hemoglobin, serum iron and sodium is lower in anemic patients as compared to control subjects. The serum potassium level has shown no significant change in anemic patients as compared to control subjects but had shown a positive correlation with serum iron levels in anemic subjects. It is concluded that further studies are required with large number of patients.

TABLE. 1

VARIATION OF HEMOGLOBIN RBCs COUNT, IRON, TIBC, SODIUM, POTASSIUM, CALCIUM AND GLUCOUSE-6-PHOSPHATE DEHYDROGENASE IN CONTROL AND ANEMIC PATIENTS

PARAMETERS	Hemoglobin gm / dl	RBCS Count X 10^{12}/L	Iron µg/dl	TIBC µg/dl	Sodium mmol/l	Potassium mmol/l	Calcium mmol/l	Glucose-6-phosphate dehydrogenase activity U/g Hb
CONTROL SUBJECT	12.11 ±0.12 (30)	4.03 ±0.06 (30)	75.60 ± 1.23 (30)	272.60 ±2.36 (30)	140.40 ±0.81 (30)	3.91 ±0.03 (30)	2.63 ±0.04 (30)	5.56 ±0.22 (9)
ANEMIC PATIENTS	9.30* ±0.19 (36)	3.24* ±0.05 (36)	52.30* ±1.24 (36)	292.80* ±2.76 (36)	130.43* ±0.54 (36)	3.19 ±0.05 (36)	2.60 ±0.04 (36)	5.41 ±0.21 (9)

***P-value significant at < 0.05**

TABLE- 2: Correlation of serum iron with serum Calcium, Sodium and Potassium in anemic and control groups.

Anemic Group	**r**	**P-value**
Serum iron µg/dl vs Calcium (mmol/L)	0.128	0.457
Serum iron µg/dl vs Sudium (mmol/L)	0.148	0.39
Serum iron µg/dl vs Potassium (mmol/L)	0.432	0.008*
Control Group		
Serum iron µg/dl vs Calcium (mmol/L)	-0.244	0.194
Serum iron µg/dl vs Sudium (mmol/L)	-0.052	0.786
Serum iron µg/dl vs Potassium (mmol/L)	0.15	0.43

***P-value significant at < 0.05; r=correlation**

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