INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

ESTIMATION OF SOME METALS AND HEMATOLOGICAL PARAMETERS IN ANEMIC PATIENTS IN COMPARING TO HEALTHY SUBJECTS: A COMPARATIVE STUDY

Suha T. Abd, Wasan L. Abdulla, Khalid H. Gathwan, Shatha K. Jwad & Mohammed S. Kadim
Department of Basic Science, College of Dentistry, University of Baghdad, Iraq.

ABSTRACT
Anemia is global health problems and common medical conditions seen in everyday clinical practice, mainly affecting poor people in developing countries. For the determination of these parameters intravenous blood samples from anemic patients and normal subjects were collected and immediately centrifuged to obtain the supernatant liquid, serum of both the groups for analysis. The mean serum levels of Nickel, magnesium, copper in anemic patients were 0.0112 ± 0.0015 µmol/ L, 17.55 ±1.99 µmol/ L, 0.0453 ±0.0654 µmol/ L respectively and there is decrease in concentration of Nickel and increase of magnesium and copper in anemic patient. Also the concentration of hemoglobin, white blood cell count and hematocrit was lower in patients group than the control group.

KEYWORD: Anemia, Nickel, magnesium, Cobalt, Hemoglobin, WBC count.

INTRODUCTION

Definition of anemia is reduction of the amount of hemoglobin in the blood below the normal values in regarding to the sex and age of the subjects[1]. In spite of its definition physic pathologically as reduce of the total mass of erythrocyte in circulation of the blood, it can be defined functionally as the reduction of the blood capacity to carry oxygen and therefore the tissue hypoxic[2]. The definition of anemia in World Health Organization as the point at which the hemoglobin amount in the circulation drops under cutoffs of World Health Organization for specific sex and age groups. Anemia is a problem of worldwide of complex causes and is related with many factors[3]. In spite of that anemia influence all groups of population in all world countries, but there is certain groups are more susceptible than others. The highest prevalence occurs in children of preschool-age (those aged 6–59 months), female of reproductive age (those aged 15–49 years) and pregnant women[4]. Anemia is an indicator of both poor health and poor nutrition and therefore cause increased risks of child and maternal mortality. Hemoglobin is transfer in the circulation within RBCs or the erythrocytes, where its main function is to bring oxygen to body tissues. The demands for oxygen are affected by environmental factors like smoking and altitude and physiological factors like gestation, and the body can alter blood volumes and/or concentrations of Hb to conciliate the necessity for oxygen [5].So the aim of this study was to estimate some metals and hematological parameters in anemic patients in comparing to healthy subjects as a comparative study.

MATERIALS & METHOD

Twenty five patient with anemia (15 male and 10 female) enrolled in this study with age range from (32- 55) years. Data were collected from patients including name, age, gender, whether smoker or alcoholic or not, family history and other systemic diseases. The control group consist of 25 participants (15 male and 10 female) and they were in healthy condition (not suffer from any systemic diseases) with age range from (30- 50) years. Samples of venous blood were collected from the patients and healthy control into EDTA anticoagulated containers for analysis of hematological parameters. The results were analyzed using t-test and level of significance set at $P<0.05$. A cyanomethemoglobin method was used to estimate the hemoglobin contents of the blood. The method was based on Drabkin's cyanide- ferriccyanide solution. Twenty micro liter (µL) of blood was added for 5 ml of Drabkin's solution mixing, and incubated for at least 5 minutes at 37°C and then the results were estimated by using Hb meter at 540 nanometer (nm) wave length[6]. Microhematocrit method was used to determine PCV. Heparinized capillary tubes used, and blood was filled to approximately three quarters of their lengths then the unmarked end is closed with modeling clay and put in the microhematocrit centrifuge. AfterCentrifugation for 15 minutes, the red blood cells were separated from plasma and remain a band of buffy coat at the interface between them consisting of leukocytes and blood platelets[7]. The content of trace elements cobalt, and nickel in blood serum was determined by atomic absorption spectrophotometry (AAS) on a spectrophotometer C-115 M1 (JSC "Selmi," Ukraine) [8].

RESULTS & DISSCUSION

The obtained demographic analysis of present study show that the number of anemic patient was 25 (15 male and 10 female) with age mean (55- 32), in regard to control group; their number was 25 (15 male and 10 female) with

age mean (46.3) as show in table 1. Table 2 and figure 1 revealed that there was highly significant decrease in concentration of Nickel among anemic patients group as compared to its concentration in plasma of control. This result coincide with result obtain by Angelova *et al*. (2014) since they found that serum concentration of Nickel in children with anemia was lower than healthy control and they attributed the cause to that the nickel play important roles in the processes of erythropoiesis. It has been shown that both metals stimulate erythropoietin production by activation of the transcription factor hypoxia-inducible factor 1 (HIF-1)[9].

TABLE 1: Demographic analysis in Anemia group and controls group

Subjects	No. of male	Age mean year	Female	Age mean year	Total
Control	**15**	**55 -32**	**10**	**39 -33**	**25**
Anemic patient	**15**	49.7	**10**	46.3	**25**

TABLE 2: Mean & SD of Ni, Co & Mg and comparison between two groups (anemia and control)

The Metals measured in blood	Anemia group (mean ± SD) µmol/ L	Controls group (mean ± SD) µmol/L	p-value
Ni	0.0112 ± 0.0015	0.0234 ± 0.0046	P < 0.01
Co	0.0453 ± 0.0654	0.0221 ± 0.006	P < 0.05
Mg	17.55 ± 1.99	12.24 ± 1.862	P < 0.05

TABLE 3: Mean & SD Hb, Hematocrit, Total WBC and comparison between two groups (anemia and control)

The hematological parameters measured in blood	Anemia group (mean ± SD) µmol/ L	Controls group (mean ± SD) µmol/L	p-value
Hb (g/100 ml)	10.83± 1.85	12.12± 1.72	P < 0.05
Hematocrit %	33.61± 3.5%	38.65 ± 3.7%	P < 0.05
Total WBC (cell/µl)	4.98 ± 2.6	8.23± 3.1	P < 0.01

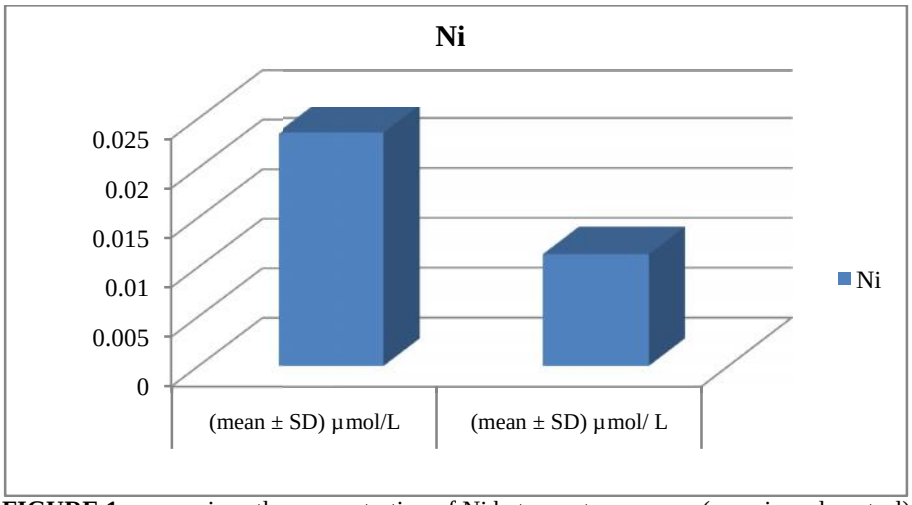

FIGURE 1: comparison the concentration of Ni between two groups (anemia and control)

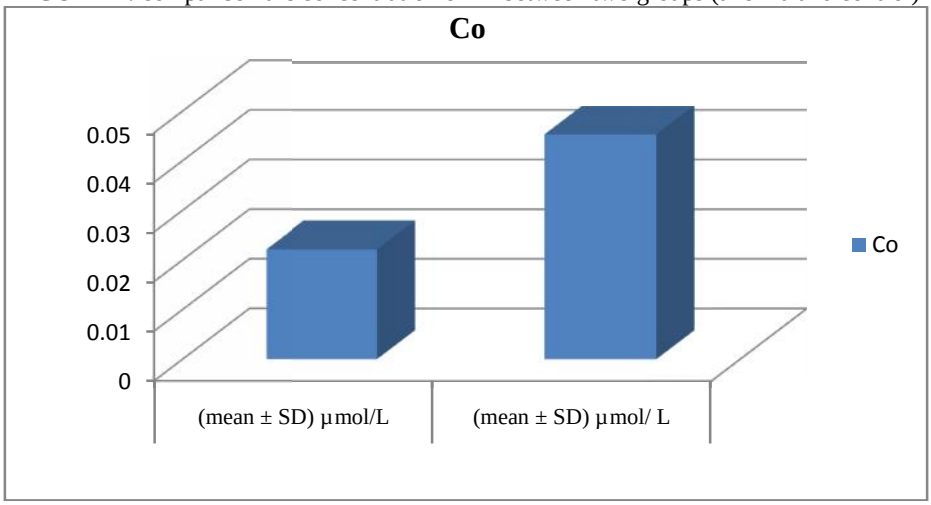

FIGURE 2: comparison the concentration of Co between two groups (anemia and control)

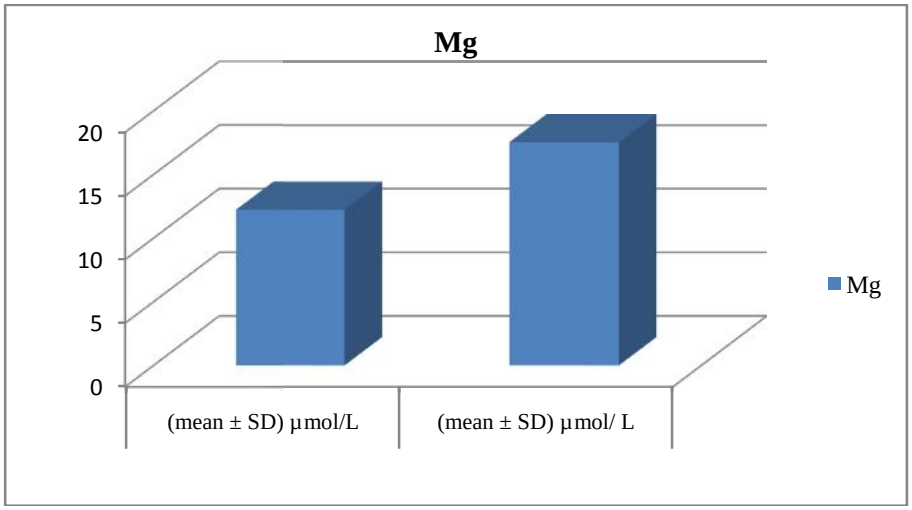

FIGURE 3: comparison the concentration of Mg between two groups (anemia and control)

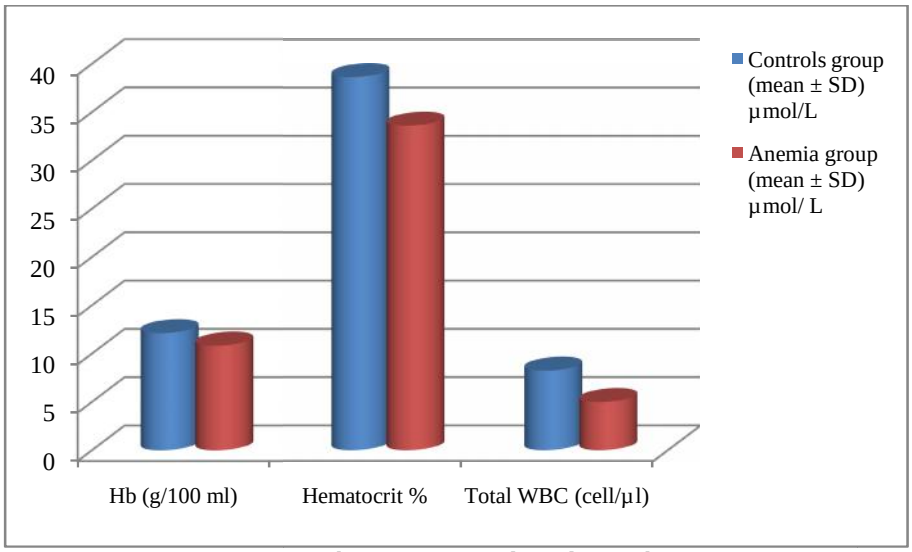

FIGURE 4: comparison Hb, Hematocrit and Total WBC between two groups

Nickel is considered synergistic to iron by promoting its intestinal absorption and nickel deficiency can lead to anemia[10]. Therefore, deficiencies of this trace element might be a contributing factor for development of iron deficiency anemia in their study. Meanwhile table 2, figure 2 and 3 show that there was highly significant elevation ($P<0.05$) in concentration of Cobalt and Magnesium among anemic patients group as compared to that in control healthy group, this result contrast with result of study conducted by Ghathwan *et al*. (2016) since they found that the salivary concentration of magnesium in anemic patient lower that in control. Meanwhile increase of cobalt in this study coincides with result of study accomplished by Baloch *et al*. (2013) [11]. In addition to that the current study show that was highly significant decrease in concentration of hemoglobin in blood of anemic patients group (10.83 ±1.85) when compared it to control group (12.12 ±1.72) as revealed in table 3 and this study agree with result of study conducted by Kurzawa *et al*. (2016)[12] since found that they can diagnose the anemia by decrease of hemoglobin concentration. As well as there was highly significant reduction in PCV or hematocrit in blood of anemic patients group as compared to control, also there was highly significant decrease in number of white blood cell in blood of anemic patients group when compared to its number in blood of healthy person as revealed in figure 4 .and this result disagree with result obtained by Akinbami *et al*. (2012) [13] since they found that the count of white blood cell increase in Sickle cell anemic patients. They attribute the cause to that the leucocytosis in sickle cell disease patients may due to auto splenectomy resulting from recurrent splenic vessels occlusion, which make patients more vulnerable to overwhelming infections particularly, encapsulated organisms like *Streptococcus pneumonia* and *Haemo philus influenza* [14].

CONCLUSION

In conclusion to this study the hematological parameters as well as the metal elements effected in blood with anemic patients, these changes can be depended on in diagnosis of anemia.

REFERENCES

[1]. Akman, N. (2001) A general approach to anemia in adults, Symposium of anemia, Istanbul, 9-16.

[2]. Baslar, Z. (2001) Distinguishing Diagnosis Guide In Anemia Patient, Symposium of anemia, Istanbul, 107-116.

[3]. Christine, A. Northrop-Clewes and David I Thurnham (2013) Biomarkers for the differentiation of anemia and their clinical usefulness. J Blood Medicine, **4: 11–22.**

[4]. De Benoist, B., McLean, E., Egli, I., Cogswell, M.E., World Health Organization (WHO) editors. Worldwide Prevalence of Anaemia 1993–2005 WHO Global Database on Anaemia. Geneva, Switzerland: WHO; 2008.

[5]. United Nations Children's Fund, United Nations University, World Health Organization (WHO) Iron Deficiency Anaemia: Assessment, Prevention and Control; A Guide for Programme Managers. Geneva, Switzerland: WHO; 2001. WHO/NHD/01.3.

[6]. Markarem, A. (1974) Clinical Chemistry: Principles and techniques, 2nd. Edition, Herny, D.C. Cannon. J.W. and Winkelmen Editor, Hargeston, p 1128-1135.

[7]. Lewis, S., Bain, B. and Bates, I. (2006) Dacie and Lewis Prctical haematology, 10th Edition. Churchill Livingstone Elsevier .Germany.

[8]. Sunderman Jr., F.W., Marzouk, A., Crisostomo, M.C. and Weatherby, D.R. (1985) "Electrothermal atomic absorption spectrophotometry of nickel in tissue homogenates," Annals of Clinical and Laboratory Science, vol. 15, no. 4, pp. 299–307, view at Google Scholar · View at Scopus.

[9]. Maria Georgieva Angelova, Tsvetelina Valentinova Petkova-Marinova,Maksym Vladimirovich Pogorielov, Andrii Nikolaevich Loboda, Vania Nedkova Nedkova-Kolarova, and Atanaska Naumova Bozhinova. Trace Element Status (Iron, Zinc, Copper, Chromium, Cobalt, and Nickel) in Iron-Deficiency Anaemia of Children under 3 Years Volume 2014 (2014), Article ID 718089, 8 pages.

[10]. Shah, F., Kazi, T.G., Afridi, H.I. (2011)"Evaluation of status of trace and toxic metals in biological samples (scalp hair, blood, and urine) of normal and anemic children of two age groups," Biological Trace Element Research, vol. 141, no. 1–3, pp. 131–149, 2011.

[11]. Khalid Hamdan Ghathwan, Suha Talal Abd, Shatha Kasem Jwad, Ali H.AL Saadi (2016) Some salivary constituents changes in anemic patients .International journal of advance research in biological sciences: 3(3)14-16.

[12]. Teresa Kurzawa, Aleksander Owczarek, Joanna K. Strzelczyk, Karolina Gołąbek, Andrzej Wiczkowski (2016) The Content of Reticulocyte Hemoglobin and Serum Concentration of the Soluble Transferrin Receptor for Diagnostics of Anemia in Chronically Hemodialyzed Patient. Adv Clin Exp Med 2016, 25, 3, 425–431.

[13]. Akinsegun Akinbami, Adedoyin Dosunmu, Adewumi Adediran, Olajumoke Oshinaike, Phillip Adebola, and Olanrewaju Arogundade. Haematological values in homozygous sickle cell disease in steady state and haemoglobin phenotypes AA controls in Lagos, Nigeria. BMC Res Notes. 2012; 5: 396.

[14]. Oloopoenia, L., Fredrick, W., Greaves, W., Adams, R. (1990) Pneumococcal sepsis and meningitis in adults with sickle cell disease. South Med J.,83:1002–1004.