

## **Dedication**

This study is dedicated  
to.....  
my parents, teachers,  
wife, son,  
colleagues and students.

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## **Abstract**

A hospital-based analytical descriptive case control study was conducted in Khartoum state hospitals from November 2007 to October 2010 to determine the frequency of iron deficiency anemia and thalassemia among anemic Sudanese women of reproductive age.

The study revealed that means of hemoglobin, hematocrit and RBC count were statistically significant lower than means of control group (P value <0.05).. The findings confirmed that all enrolled women were anemic.

The study shows that the frequency of the iron deficiency anemia was (24.8%), thalassemia was (2.5 %), normocytic and normochromic type of anemia was (46.2%), other types of hypochromic anemias was (17.5%). On the other hand, normocytic normochromic anemia with feature of Hb AS was found to be (2.5%), sickle cell anemia was (0.5%), microcytic hypochromic anemia with Hb AS was (0.5%). Anemia associated with chronic disease was (5.5%).

Iron profile in women of iron deficiency anemia group the means of serum iron, serum ferritin and transferrin saturation were significantly lower, with statistically significant higher total iron binding capacity in comparison with means obtained in control group (P.Value <0.05).

However, in women with anemia of chronic disease iron profile revealed significant lower means of serum iron and transferrin saturation, and non significant differences in means of total iron binding capacity and serum ferritin in comparison to control group (P.Value > 0.05), that well defined anemia of chronic disease.

The study explained higher frequency of iron deficiency anemia in women at premarital age with heavy menstruation (13%), than of normal menstruation (9.5%). IDA is the most common occurring among rapid multipara pregnant women (18%), than in normal child spacing pregnant women (9%).

Hemoglobin electrophoresis related to types of anemia showed that among iron deficiency anemia group the frequency of normal Hb A pattern was (23.8%) and

Hb AS pattern was (1%) , in group of anemia of chronic disease only normal pattern of Hb A was found (5.5%). In thalassemic carrier group significant higher mean levels of Hb A<sub>2</sub>, and Hb F were counted, and lower level of Hb A in comparison with control group (P Value <0.05). In homozygous sicklers non significant differences of Hb A<sub>2</sub> in comparison with control group (P. value > 0.05), while Hb F and Hb S show significant elevation respectively in comparison with control group (P Value <0.05).

## مستخلص الدراسة

اجريت هذه الدراسة التحليلية الوصفية بمستشفيات ولاية الخرطوم في الفترة ما بين نوفمبر 2007م حتى اكتوبر 2010م. وقد هدفت الدراسة الى تحديد تكرار الاصابة بفقر الدم الناتج عن نقص الحديد و الثلاسيميا عند السودانيات البالغات في فترة سن الانجاب والمصابات بفقر الدم.

كشفت الدراسة ان متوسطات خضاب الدم ، ونسبة الخلايا المكدسة من الدم الكلي ، وعدد كريات الدم الحمراء منخفضة بالمقارنة مع متوسطات المجموعة الضابطة والفرق ذو دلالة احصائية . وهذا يؤكد ان كل السيدات تحت الدراسة مصابات بفقر الدم.

كذلك اوضحت الدراسة ان تكرار فقر الدم الناتج عن نقص الحديد (24.8%)، وفقر الدم نوع الثلاسيميا (2.5%) ، وفقر الدم المصحوب بخلايا الدم الحمراء طبيعية الحجم ولون الخضاب (46.2%)، وفقر الدم المصحوب بخلايا الدم قليلة الخضاب (17.5%). وفقر الدم المصحوب بخلايا الدم طبيعية الحجم ولون الخضاب ذو الرحيل الكهربائي (2.5% AS) وفقر الدم المصحوب بخلايا الدم قليلة خضاب الدم ذو الرحيل الكهربائي (0.5% AS) وفقر الدم المنجلي المتجانس (0.5%) ، وفقر الدم المرتبط بالامراض المزمن (15.5%).

في مجموعة النساء المصابات بفقر الدم الناتج عن نقص الحديد وجد ان متوسط تركيز الحديد في مصل الدم، ومتوسط تركيز فرتين مصل الدم ، و متوسط تشيع الترانسفيرين بالمقارنة مع متوسطات المجموعة الضابطة كانت قليلة بفرق احصائي معنوي، وكانت قيمة متوسط سعة ارتباط الحديد الكلي اعلى من متوسط المجموعة الضابطة والفرق ذو قيمة احصائية معنوية.

في النساء المصابات بفقر الدم المرتبط بالامراض المزمنة وجد ان متوسط الحديد في مصل الدم ومتوسط تشيع الترانسفيرين بالمقارنة بالمتوسطات المتحصله من المجموعات الضابطة وجد انها اقل بفرق احصائي ذو دلالة. كما لا توجد اختلافات احصائية في متوسط سعة ارتباط الحديد الكلي و متوسط فرتين مصل الدم بالمقارنة بالمتوسطات المتحصله عند المجموعات الضابطة .

اظهرت نتائج الدراسة ان فقر الدم الناتج عن نقص الحديد في السيدات غير المتزوجات ذوات الطمث الكثيف (13%) اعلى ترددا من ذوات الطمث العادي (9.5%) . كما اوضحت نتائج الدراسة ايضا ان فقر الدم الناتج عن نقص الحديد اكثر شيوعا بين السيدات ذوات الحمل السريع المتعدد (18%) مقارنة بذوات الحمل طبيعي الفترات (9%). الرحلان الكهربائي لخضاب الدم عند مرضى فقر الدم الناتج عن نقص الحديد وجد ان خضاب الدم الطبيعي (23.8% Hb A) و (1%) تحتوي على خضاب الدم المعتل نوع Hb AS. وفي المجموعة المصابة بفقر الدم المرتبط بالامراض المزمنة كان الرحلان الكهربائي كله من نوع خضاب الدم الطبيعي Hb A. وفي المجموعة المصابة بفقر الدم الثلاسيميا وجد ان الرحلان الكهربائي لخضاب الدم كالاتي: ارتفاع خضاب الدم من النوع Hb A2 و النوع Hb F ، وانخفاض خضاب الدم الطبيعي Hb A بالمقارنة بقيم الرحلان الكهربائي عند المجموعة الضابطة والفرق ذو دلالة احصائية. في مرضى فقر الدم المنجلي المتجانس وجد انه لا اختلاف بين متوسط الرحلان الكهربائي لخضاب الدم النوع Hb A2 ومتوسطه في المجموعة الضابطة، بينما يوجد فرق احصائي بين متوسط الرحلان الكهربائي

لخضاب الدم نوع Hb F والنوع Hb S حيث كانا مرتفعان في مرضى فقر الدم المنجلي.

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## List of abbreviations

<b>ACD</b>	Anaemia of Chronic Disease
<b>ARC</b>	Absolute reticulocyte count
<b>AUB</b>	Abnormal Uterine Bleeding
<b>CBC</b>	Complete blood count
<b>GI</b>	Gastrointestinal
<b>CRC</b>	Corrected reticulocyte count
<b>ELSA</b>	Enzyme linked immunosorbent assay
<b>fl</b>	Fimtoliter
<b>G 6- PD</b>	Glucose 6- phosphate dehydrogenase
<b>gm</b>	Gram
<b>Hb</b>	Hemoglobin
<b>Hb.F</b>	Fetal hemoglobin
<b>Hct</b>	Hematocrit
<b>HPFH</b>	hereditary persistence of fetal hemoglobin
<b>IDA</b>	Iron deficiency anemia
<b>K<sup>2</sup>EDTA</b>	Potassium Ethylene Diamine Tetra Acetic acid
<b>L/L</b>	Liter per Liter
<b>LCD</b>	Liquid Crystal Displayer
<b>MCH</b>	Mean cell hemoglobin
<b>MCHC</b>	Mean cell hemoglobin concentration
<b>MCV</b>	Mean cell volume
<b>mg</b>	Milligram
<b>MPV</b>	Mean platelet volume
<b>nRBCs</b>	Nudeated red blood cells
<b>PBP</b>	Peripheral blood picture
<b>PCV</b>	Packed cell volume
<b>Pg</b>	Picogram
<b>RBCs</b>	Red blood corpuscles
<b>RC</b>	Reticulocyte count
<b>RDW</b>	Red cell distribution width
<b>RE</b>	Reticuloendothelia
<b>RPI</b>	Reticulocyte production index
<b>SCD</b>	Sickle cell disease
<b>SD</b>	Standard deviation
<b>SI</b>	Serum iron
<b>SPSS</b>	Statistical Package of Social Science
<b>sTFR</b>	Serum transferrin receptor
<b>TEB</b>	Tris /EDTA/Borate
<b>TIBC</b>	Total iron binding capacity
<b>TWBCs</b>	Total white blood cells

<b>WHO</b>	World Health Organization
<b>WRA</b>	Women of reproductive age
<b>ZPP/H</b>	Zinc protoporphyrin/ Heme
<b>%</b>	Percentage
<b>µg</b>	Microgram
<b>µm</b>	Micrometer