

Dedication

To my beloved family who give me warmth and love.

To the soul of my mother, the means of true love.

Acknowledgment

Nothing can be said before thanks god for good health, forgiveness and believe in god.

Special thanks to Dr Malik Hassan Alfadni who guided me in this research.

You are always beside me (Uz Mostafa Mohamed) thanks for your kind help.

Lovely thanks to my friends who accompanied me in the nice journey to Algadaref state.

I want to convey thanks to the staff members of The National Health Laboratory who helped me in achieving a part of practical of this research.

I am so grateful to thanks the lab authorities (Hashim Abo sarea) and his staff in the medical lab in Algadaref state for their kind helps to run my experiments.

مستخلص البحث

هذه دراسة وصفية مقطعية تحليلية هدفت لتحديد نسبة إنتشار فقر الدم المنجلي في القبائل المختلفة بالمنطقة الشماليه بولاية القضارف . أجريت هذه الدراسة في الفترة من شهر سبتمبر 2008 إلي شهر مارس 2009 . أخذت الموافقة من المرضى بعد أحاطتهم بأهداف الدراسة حيث تم سحب 2 مليلتر من الوريد في وعاء يحتوي علي مادة مانعة للتجلط من مائة شخص. جميع العينات أخضعت لاختبار تعداد الدم الكامل ، فحص التمنجل ، والرحلان الكهربائي للخصاب . وقد تم استخدام برنامج الإحصاء التحليلي الاجتماعي لتحليل البيانات ، أظهرت النتائج أن عدد (20) مريضاً كانوا مصابين بفقر الدم المنجلي ، وأن متوسط خضاب الدم لدي الذكور 6 جم / ديسلترولدي الاناث 7 جم / ديسلتر ، وأن كريات الدم البيضاء أظهرت ارتفاعاً في العدد بمتوسط $10^9 \times 13$ خلية / لتر ، وكذلك أيضاً عدد الصفيحات الدميه بمتوسط $10^9 \times 432$ خلية / لتر . كما أوضحت النتائج أن عدد (55) مريضاً كانوا من حاملي فقر الدم المنجلي حيث كان متوسط خضاب الدم لدي الذكور 10 جم /ديسلتر وعند الاناث 11 جم/ديسلتر ، ومتوسط عدد كريات الدم البيضاء كان في المعدل الطبيعي $10^9 \times 7$ خلية / لتر، وكذلك عدد الصفيحات الدميه بمتوسط $10^9 \times 307$ خلية / لتر . عدد (25) عينة كانت خاليه من فقر الدم المنجلي وفي المعدل الطبيعي من حيث خضاب الدم وكريات الدم البيضاء والصفيحات الدميه . أعلي نسبة إصابة بفقر الدم المنجلي سجلت لدى قبائل المساليت والمسالمة، أما أقل نسبة فقد سجلت لدي قبيلة الفولاني .

Abstract

This was descriptive, cross sectional and analytical study that aim to determine the incidence of sickle cell anemia in different tribes of Northern area of Alcadaref state .This study was conducted during the period of September 2008—March 2009.

After taking the informed consent from the participant in the research and following the explanation of the targets of the research 2 ml of blood were taken in EDTA container from 100 patients .All samples were tested for complete blood count , sickling test and hemoglobin electrophoresis. The results were analyzed using SPSS program and it showed that, twenty samples were sickle cell disease (Hb SS) the mean of the hemoglobin concentration in the male was 6 g/dl while in the female was 7 g/dl, the mean of the white blood cells was found above the normal range 13×10^9 c/l, also the mean of the platelets was increased above normal range 432×10^9 c/l.

Fifty five of samples were sickle cell trait (Hb AS),the mean of the hemoglobin concentration in the male was 10g/dl while in female was 11g/dl ,the mean of white blood cells was about 7×10^9 c/l and the mean of the platelets was in normal range 307×10^9 c/l .

Twenty five samples were normal (Hb AA) with normal hemoglobin, white blood cells and platelets count.

The results showed that the greatest percentage of sickle cell anemia was found in Masaleta and Masalem tribes and the lowest percentage was found in Folani.

List of Contents

Subject	Page
Dedication	I
Acknowledgement	II
مستخلص البحث	III
Abstract	IIIV
List of Contents	V
List of Tables	X
List of Figures	XI
List of Abbreviations	XII
1-Chapter One: Introduction and Literature Review	
1.1 General Introduction to Anemia.....	1
1.2 Physiological Compensation for Decreased Hb, TRBCs.....	1
1.3 Prevalence of Anemia	1
1.4 Classification of Anemia	1
1.4.1.1 Morphological Classification	2
1.4.1.2 Etiological Classification	2
1.5 General Introduction to Sickle Cell Anemia	3
1.5.2 History of Sickle Cell Anemia.....	3
Subject	Page
1.5.3 Prevalence of Sickle Cell Anemia	3
1.5.4 Survival of Ppatients with Sickle Cell Anemia	5
1.5.5 Genetic of Sickle Cell Anemia	5
1.5.6 Inheritance of Sickle Cell Anemia	5
1.5.7 Classification of Sickle Cell Anemia	6

1.5.8 Pathphysiology of Sickle Cell Anemia	7
1.5.9 Signs and Symptoms of Sickle Cell Anemia	8
1.5.9.1 Vaso occlusive Crisis.....	8
1.5.9.2 Other Sickle Crisis	8
1.5.1.0 Complication of Sickle Cell Anemia.....	8
1.5.11 Diagnosis of Sickle Cell Anemia.....	9
2- Chapter Two Rational and Objectives	
2.1Rational	10
2.2 Objectives	11
2.2.1General Objective	11
2.2.2Specific Objectives	11

Subject	Page
3 - Chapter Three: Materials and Methods.....	
3.1 Study Design.....	12
3.2 Study Population	12
3.3 Samples Collection.....	12
3.4 Tests that Used for Diagnosis of Sickle Cell Anemia	12
3.4.1 Complete Blood Count.....	12
3.4.1.2 Principle of WBCs, RBCs, PLTs Count	13
3.4.1.3 Hemoglobin Measurement	13
3.4.1.4 Leukocyte Analysis.....	13
3.4.1.5 Erythrocyte Analysis	14
3.4.1.6 Platelets Analysis	15

3.4.1.7 Reagents of Mythic	15
3.4.1.8 Method of Mythic	15
3.4.2 Sickling Test	15
3.4.2.1 Principle of Sickling Test	15
3.4.2.2 Reagents of Sickling Test	15
3.4.2.3 Method of Sickling Test	15
3.4.3 Hemoglobin Electrophoresis.....	16
Subject	Page
3.4.3.1 Preparation of Red Cell Lysate	16
3.4.3.2 Principle of Electrophoresis	16
3.4.3.3 Equipments of Electrophoresis	16
3.4.3.4 Reagents of Electrophoresis	17
3.4.3.5 Method of Electrophoresis	17
4- Chapter Four: The Results	
4.1Table of Gender Distribution.....	19
4.2 Table of Distribution of Samples in Northern Area.....	19
4.3 Table of Tribes Distribution	19
4.1 Figure of Hb Electrophoresis Results.....	20
4.2 Figure of Hb Electrophoresis Results in Rural, Urban areas..	21
4.3 Figure of Hb Electrophoresis Results among Tribes	22
4.4 Figure of Sickling Test Results.....	23
4.5 Figure of Mean of Hb Concentration in Hb AA, AS, SS.....	24
4.4 Table of Severity of Anemia and Hb Concentration	25
4.5 Table of Hb in Grouped Data.....	25
4.6Table Hb in Grouped Data Electrophoresis Cross Tabulation	26

4.6 Figure of Hb in Grouped Data and Hb AA,AS,SS	27
Subject	Page
4.7 Figure of TWBCs counts and Hb Electrophoresis.....	28
4.8 Figure of Platelets Counts and Hb Electrophoresis	29
5-Chapter Five:Discussion,Conclusion , Recommendations	
5.1 Discussion	30
5.2 Conclusion	32
5.3 Recommendations	33
6-Chapter Six References	
References.....	34
Appendices	

List of Tables

NO	Name of the table	Page
1.1	Compound Heterozygous.....	7
3.1	White Blood Cell Parameters.....	13
3.2	Erythrocyte Parameters	14
4.1	Gender Distribution	19
4.2	Distribution of Sample in Northern area of Alcadarefe.....	19
4.3	Tribes Distribution	19
4.4	Severity of Anemia and Hemoglobin Concentration	25
4.5	Hemoglobin in Grouped Data	25
4.6	Hemoglobin in Grouped Data and Hb Electrophoresis	26

List of Figures

NO	Name of figure	Page
1.1	Spread of Sickle Cell Gene	4
1.2	Percentage of Sickle Cell Allele	4
1.3	Inheritance of Sickle Cell Gene.....	6
4.1	Hemoglobin Electrophoresis Results	20
4.2	Hb electrophoresis in Rural and Urban Areas	21
4.3	Hb Electrophoresis Results among Tribes	22
4.4	Sickling Test Results	23
4.5	Hemoglobin Concentration in Hb AA.SS, AS.....	24
4.6	Hemoglobin in Grouped and Hb Electrophoresis.....	27
4.7	TWBCs count and Hemoglobin Electrophoresis.....	28
4.8	Platelets count and Hemoglobin Electrophoresis	29

List of Abbreviations

Hb	Hemoglobin
RBCs	Red blood cells
MCV	Mean corpuscular volume
MCH	Mean corpuscular hemoglobin
MCHC	Mean corpuscular hemoglobin concentration
DNA	Deoxy ribonucleic acid
Hb S	Sickle hemoglobin
HbA	Adult hemoglobin
HbF	Fetal hemoglobin
HcT	Hematocrit
WBCs	White blood cells
PLTs	Platelets
n.m	nano meter
G6PD	Glucose 6 phosphate dehydrogenase
KCN	Potassium cyanide
TEB	Tris EDTA borate
EDTA	Ethylene diamine tetra acetate
Na ₂ HPO ₄	Di sodium hydrogen phosphate
HPLC	High performance liquid chromatography