SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF GRADUATE STUDIES

Genotyping of Haemoglobinopathies in Beja Tribes and Other Minor Groups in Port Sudan City

التحليل الجينى لاعتلالات خضاب الدم فى قبائل البجا و المجموعات القبلية الأخرى بمدينة بور تسودان

A Thesis Submitted in the Fulfillment of the Requirements of PhD Degree in Medical Laboratory Science (Hematology)

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(May 2015)

Publications:

1- Gibreel MOA, El Karsani ME, Munsoor MM and Gubartella EA (2014). Screening for Haemoglobinopathy in Beja tribes and other minor groups living in Port Sudan City. Journal of Medical Laboratory and Diagnosis, 5(4). PP. 35-40.

2- Gibreel MOA, Munsoor MM and El Karsani ME (2015). Nutritional anemia among patients referred to Hematology Laboratories in Port Sudan City. Clinical Medicine Journal, 1(2). PP. 38-42.

الآية

قال تعالى:

صدق الله العظيم

(سورة طه الآية 114)

Dedication

To the sole of my father and the sole of Dr. Hassai Awli Ali who have both died before seeing the completion of this work.

To my family.

To my great wife and my lovely daughter.

To my teachers; everyone from whom I have learned or acquired a letter, skill or behavior all during the course of my education life.

To my colleges, friends and students.

And; to you as well.

ACKNOWLEDGEMENTS

This work would not have been completed without the help, support and encouragement of many people and organizations. I would like here to thank a number of people and Institutes, that without the help and support of whom, this work would never been possible. Firstly, thaks are for my main supervisor Dr. Mubarak El Saeed El Karsani and for my Co-supervisors Dr. Munsoor Mohammed Munsoor and Dr. Hanan Babeker El Eahir. They are the supervisors that a student would ever seem to be supervised by. Thanks are for the management of Port Sudan Ahlia College for financial support and encouragement. I am grateful to Dr, Mohamed Ahmed El Feel, Dr. Manal Mustafa and Mr. Yassir Abdin Babeker, from the haematology department at the central laboratory, Om Durman Military Hospital for kindly performing the capillary electrophoresis. Thanks are also for my college, Mr. Bashir Abder Rahman Bashir, who has made his own laboratory available at all times. All thanks are for Professor Mousa Mohammed Mousa and again for Dr. Hanan Babiker Eltahir for technical support. I would also like to thank my students at Port Sudan Ahlia College and all the patients who have participated in this study and their families.

ABSTRACT

Haemoglobinopathies prevalence and distribution among ethnic groups inhabiting the Red Sea state in Sudan was not reported till date. Accordingly, this cross-sectional descriptive study has been conducted to address this problem in that area. The study was conducted in Port Sudan city in the period from 2011 to 2013 to screen for haemoglobinopathy in anemic patients referred to three Hematology laboratories in major hospitals. The study sample included 600 patients, 54% males and 46% females aged between 1 and 98 years old, of whom 209 (34.83%) were selected on hematological basis and subjected to capillary electrophoresis. Five milliliters of blood were drawn from each subject for CBC (Sysmex KX 21N), peripheral blood films, hemoglobin electrophoresis and genotyping. The results showed that haemoglobinopathy was detected in 59 (28.22%) subjects of whom 26 (44.06%) showed electrophoretic patterns of sickle cell anemia and confirmed by DNA analysis to be Benin (BEN) haplotype, 29 (49.15) beta thalassaemia trait (All 100% showed the -88(C→T) beta thalassaemia mutation), 2 (3.38%) hemoglobin D trait, 1 (1.69%) hemoglobin E trait and 1 (1.69%) showed beta thalassaemia major. The study concluded that occurrence of these frequencies in this population indicated that the target group have haemoglobinopathies that is most probably loaded to the area through the migration of many African tribes into the Sudan early during the eighteenth century and recommended that the patients with hemoglobin below lower limits of normal in respect to age and sex, MCV and MCH lower than 78fl and 27pg, respectively, should be screened for haemoglobinopathy, besides the establishment of a center for diagnosis and control of haemoglobinopathy in that area.

الخلاصـــــــة

هذه هي الدراسة الأولى التى تستهدف استقصاء تواتر و انتشار اعتلالات خضاب الدم لدى النسيج السكاني لمدينة بورتسودان بولاية البحر الأحمر بشرق السودان. وهي دراسة وصفيه اجريت فى الفترة من 2011 الى 2013ميلادية و شملت 600 مريض كانو قد ارسلو الى معامل امراض الدم فى ثلاث مستشفيات رئيسيه بالمدينه، هي مستشفى بورتسودان التعليمي و مستشفى هيئة الموانئ البحرية و مستشفى الشرطة، منهم 54% من الذكور و 46% من الاناث تراوحت أعمارهم بين سنة و 98 سنة. تم اختيار 209 (34.83%) من هؤلاء المرضى بناءا على نتائج الاختبارات الأولية لتجرى عليهم اختبارات الرحلان الكهربائي للهيموجلوبين. تم جمع عينات دم وريدي 5 مللترات من كل مريض لاجراء تحليل الدم الطرفي الكامل بواسطة المعداد اللأوتوماتيكى (Sysmex KX 21N)، اختبار الرحلان الكهربائى لخضاب الدم بواسطة الطريقة الشعرية لرحلان الهيموجلوبين (Capillary electrophoresis)، و استخلاص الحمض النووي لدراسة الجينات. أظهرت النتائج المتحصلة من الدراسة أن 59 (28.22%) من هؤلاء المرضى يعانون من اعتلال خضاب الدم منهم 26 (44.06%) أعطوا نتيجة رحلان كهربائى تدل على اصابتهم بالأنيمياء المنجلية (ثبت بالتحليل الجينى أنها من نوع (البنين))، 29 (49.15) أعطوا نتيجة رحلان كهربائي تدل على وجود الثلاثيمياء الحميدة (ثبت عند التحليل الجينى وجود طفرة من نوع (C ⟶ T -88))، 2 (3.38%) يوجد لديهم نوع خضاب الدم D الحميد، 1 (1.69%) يوجد لديهم نوع خضاب الدم E الحميد، و 1 (1.69%) مصاب الثلاثيمياء الرئيسة. خلصت الدراسة الى أن وجود اعتلالات الدم بهذه النسب يشير الى وجود اعتلالات الدم (والتى يمكن أن تكون ناتجة عن التمازج مع القبائل ذات الأصول الأفريقية التى دخلت الى السودان فى بدايات القرن الثامن عشر) في مجتمع الدراسة و توصي الدراسة بضرورة استقصاء وجود اعتلالات الدم فى المرضى الذين تكون لديهم نسبة كل من خضاب الدم، متوسط حجم الخلية و متوسط هيموجلوبين الخلية أقل من الحد الأدنى للقيم المرجعية مع اعتبار عمر المريض و نوعه. توصى الدراسة أيضا بضرورة قيام مركز متخصص لتشخيص و متابعة اعتلالات خضاب الدم في حقل الدراسة.

List of Abbreviations

AP1	Activator protein 1
ARMS	Amplified Refractory Mutation System
ASA	Allele-Specific Amplification
ATP	Adenosine tri phosphate
CE	Capillary Electrophoresis
DGGE	Denaturing Gradient Gel Electrophoresis
DNA	Deoxyribonucleic Acid
ddNTPs	Didioxynucleotide triphosphate
EKLF	Erythroid Krupple-Like Factor
Hb	Hemoglobin
HBB	Hemoglobin Beta
HPFH	Hereditary Persistence of Fetal Hemoglobin
HPLC	High Performance Liquid Chromatography
HS	Hyper Sensitive
IEF	Isoelectric Focusing
LCR	Locus Control Region
MCH	Mean Cell Hemoglobin
MCV	Mean Cell Volume
mRNA	Messenger Ribonucleic Acid
NFE	Nuclear Factor, erythroid
NTP	Neglected Tropical Disease
Nrf	Nuclear factor Related Factor
PCR	Polymerase Chain Reaction
PPi	Pyrophosphate
RFLP	Restriction Fragment Length Polymorphism
RNA	Ribonucleic Acid
SCD	Sickle Cell Disease
SCT	Sickle Cell Trait
SNP	Single Nucleotide polymorphism
SSP	Stage Selector Protein
TAL1	T-cell Acute Lymphocytic Leukaemia Protein 1
UTR	Untranslated Region
WHO	World Health Organization
YY1	‘Ying Yang’ 1

List of Contents

List of contents (*continued*):

List of Tables

List of Figures