

**SUDAN UNIVERSITY OF SCIENCE & TECHNOLOGY
COLLEGE OF GRADUATE STUDIES**

**Phenotypes of ABO and Rhesus and Their Frequencies
in Sudanese Shuluk Ethnic Group**

By

**Abdel Hadi Abdel Gadir Mohammed Salih
B.Sc. Medical Laboratory Technology
(Collage of Technological Sciences)**

**A thesis Submitted in partial fulfillment for the requirements
of the**

Degree of M.Sc. in Haematology

Supervisor

Malik Hassan Ibrahim

**M.Sc. Haematology
Assistant Professor of Haematology
(Haematology Department- SUST)**

August 2005

DEDICATION

To my father's soul

*To all those who enlighten me with
their passions, Supporting and blessings.*

To all my family members.

*To my relatives who are always
keen on supporting me*

To my teachers and colleagues

ACKNOWLEDGMENT

I would like to express my deep thanks and sincere gratitude to all those who helped me in preparing and writing this study.

Ustaz: Malik Hassan Al-fadni, head of Haematology department, Sudan University. He is my supervisor, so thanks are due to him for his great advice and treatments. Also my sincere graduated and my great thanks to Dr. Mohammed Abdella Al-Dabi, head of Haematology department, college of Technology science (C.T.S) and the teaching staff of (C.T.S).

Then thanks extend to Sudan University, in particular to the staff of medical laboratory science and to my friends there.

Alsaha wal-Afia clinic community helped me both mentally and materially, so, I like to thank them in particularly Obada Rhaman the medical technologists- Besides, I owe much to Motok and Deing, Alshuluk tribe members for their efforts to support me a lot.

Last, but by no means least, to all my colleagues and friends who presented their supports, Jamal Jafar and Abd Elrahim Osman.

ABSTRACT

This study aims at determining frequencies of **ABO, Rh** blood groups. A hundred of Healthy Shuluk tribe members chosen (55 Males ,45 females) ,

To represent whole tribe .

Through special questionnaire .Vnous Blood samples taken for laboratory analysis, using Gel diffusion techniques at Sudan University for Science and Technology, The study has been assessed by computer **SPSS** system.

The most common antigen was "c" .

Rh antigen c was 100%, Rh antigen e was 99%, Rh antigen D was 96%, **Rh** antigen **E** was 7%, and **Rh** antigen **C** was 4%. While **ABO** antigens, the most common antigens are as follows:

Blood group **O** was 55%, blood group **A** was 24%, blood group **B** 17% and blood group **AB** 4%.

ملخص الاطروحة

تهدف هذه الدراسة إلي رصد نسب فصيلتي **ABO** و **Rh** ، تناولت الدراسة مائه من الشلك (قبيلة سودانية نيلية) أصحاب ظاهرياً، الذكور منهم 55، والإناث 45، أخذت منهم، عبر استبيان خاص، عينات الدم الوريدي وفحصت معملياً- إعتماذ بمضادات الأمصال الروتينية ولتقنية إنتشار العلام (الجل) Gel Diffusion Technique - في مختبر علم أمراض الدم- جامعة السودان للعلوم والتكنولوجيا، وعولجت حصيلة المعلومات بنظام **SPSS** .

وكان اكثر المستضادات شيوعاً هو المستضد **c** حيث كانت بنسبة 100% ، ثم **e** بنسبة 99% ثم **D** بنسبة 96% ، ثم **E** بنسبة 7% ، ثم **C** بنسبة 4%.

أما انتيجينات **ABO** فقد جاء اكثرها شيوعاً مجموعة **O** بنسبة 55% ثم مجموعة **A** بنسبة 24% ثم مجموعة **B** بنسبة 17% ثم مجموعة **AB** بنسبة 4% .

List of content

Dedication	I
Acknowledgment	II
Abstract in English	III
Abstract in Arabic	IV
List of contents	V
List of tables	VIII
List of figures	IX
Chapter one	
1.1. Introduction & Literature Review:	
1.1.Introduction	1
1.1.1. History of blood groups serology	1
1.1.2. Definition of Blood groups serology	1
1.1.3. Chemistry of the red blood cell antigens	2
1.1.4. The inheritance of blood groups	3
2.1 Literature Review	
1.2.1. History of Landsteiner's Discoveries	5
1.2.2. Inheritance of the ABO blood group	7
1.2.3. The Antigens of the ABO	9
1.2.4. The Antibodies of ABO	11
1.2.5. The Rh blood group system	14
1.2.6. Genetics of Rh	15
1.2.7.1.Nomenclatures of Rh	16
1.2.7.2.Fisher Race Theory of inheritance and terminology	17
1.2.7.3.Wiener Theory inheritance and terminology	17
1.2.7.4.Rosenfield terminology and Genetic model	19
1.2.7.5. Tippett Genetic model	21
1.2.8.Genes in pieces	22
1.2.9. Biochemistry of Rh	22
1.2.10.The Antigens of Rh D ,C ,E ,c and e	23
1.2.11.The Rh D antigen	24
1.2.12.Rh Antibodies	25
1.2.12.1. Naturally occurring antibodies	26
1.2.12.2. Rh antibodies other than anti-D	27
1.2.12.3. Immune antibodies	28
1.2.13. Alleles of D locus	31
1.2.14.The genetics of D	32
1.2.15. The clinical significance of D	32
1.2.16. Subgroups, subdivisions of D (D variants)	33
1.2.17. Disease associated with Rh system	34
1.2.17.1. Rh Hemolytic Disease of Newborn (HDN)	35
1.2.17.2. Rh immune Globulin (Rh19)	36
1.2.17.3.Transfusion reactions due to Rh	37

antibodies	
1.2.17.4. Rh and Auto immune Hemolytic Anemia (AIHA)	37
1.2.17.5. Rh ^{null} syndrome	39
1.2.17.6. Loss of Rh Antigens Associated with some disease states	39
1.2.18. Previous frequency studies of ABO and Rh blood group systems	40
Chapter Two	
3. The Justification and objectives	41
Chapter Three	
4. Material & Methods	43
3.1 Study Design	43
3.2 Study population	43
3.3 Study Area	43
3.4 Master sheet	43
3.5 Sampling technique	43
3.6 Ethics	43
3.7 Apparatus & procedure	44
3.7.1 Equipment	44
3.7.2 Reagents	44
3.7.3 Principle of Rh- typing	45
3.7.4. Principle of gel-diffusion	46
3.7.5 Test ID- Microtyping techniques procedure	46
3.7.6 Interpretation of the Results	47
3.7.7 Remarks	47
3.7.8 Test procedure slide	47
3.7.9 Interpretation	
3.7.10. Quality control.	
Chapter Four	
5. Results	50
Chapter Five	
6. Discussion	63
Chapter Six	
7. Conclusion & Recommendation	65
References	67
Appendix	
Master sheet model	

List of tables

Table (1)	Classification Of The ABO Blood Groups	6
Table (2)	phenotypes and genotypes in the ABO blood group system.....	9
Table (3)	Fisher-Race genes and Antigen.....	17
Table (4)	Wiener's designations for the eight common Rh Gene Complexes.....	13
Table (5)	Numerical and Alphabetical Designations for the Rh (<i>Blood Group System</i>)	20
Table (6)	Tippett's Genetic model Applied to Eight Common Rh gene Complexes.....	21
Table (7)	Frequency of gender	53
Table (8)	Frequency of Rh antigen (DCEce) in Al-shuluk tribe.....	53
Table (9)	The frequency of Rh antigens (D ,C ,c , E,e) with respect to gender	54
Table (10)	Frequency of Rh- phenotype	55
Table (11)	Frequency of ABO among Alshuluk tribe...	56
Table (12)	Relationship between ABO blood group and gender in Al-shuluk group tribe.....	56

List of figures

Fig (1)	Model for the Rh system based on discontinuous gene structure.....	22
	
Fig (2)	Pictures ID – card Diaclon Rh & ID – Diluent 2	49
Fig (3)	Demonstration of the	57
	Gender.....	
Fig (4)	ABO -antigens among the Shuluk	58
	tribe.....	
Fig (5)	Frequency of Rh antigens (DCEce) among Al-	
	shuluk tribe.....	59
Fig	The Rh- antigens(DCEce) with effect of	60
(6)	gender	
Fig (7)	ABO-antigens with effect of	61
	gender.....	
Fig (8)	D-Antigen with effect of	62
	gender.....	