

# الآية

قال تعالى: {رَبَّنَا آمَنَّا بِمَا أَنزَلْتَ وَاتَّبَعْنَا  
الرَّسُولَ فَاكْتُبْنَا مَعَ الشَّاهِدِينَ}

صدق الله العظيم

سورة آل عمران الآية {53}

## DEDICATION

:This work is dedicated to

**Dina Nasereldin Ali**

## ACKNOWLEDGEMENTS

First of all, thanks to ALMIGHTY ALLAH for giving me patience and support to complete this work.

I would like to express my gratitude to my supervisor **Prof. Humodi Ahmed Saeed** for his guidance through all the study.

My thanks are extended to Mrs. Thouiba Alhaj, Mrs. Khansaa Ghasim, Mrs. Hiba Abdallmalik, Mrs. Sara Ahmed and Mrs. Tasneem Abdualrahman for their collaboration.

I would like to declare my deep thanks to Mr. Mohamed Ahmed Suliman, Mrs. Walla Ahmed, Mrs. Reem Mohamed Osman, Mr. Hassan Ahmed Hussein, Mrs. Mariam Hatim, my colleagues in Sudan University of Science and Technology, especially Mr. Mohamed Salah, Mrs. Samer Abdalgani, Mrs. Safa Mohamed Ali and Mrs. Yosra Abdallahman for their support.

## **ABSTRACT**

Parvovirus B19 has a marked tropism for erythroid progenitor cells. This may lead to chronic anemia in predisposed individuals. This case control study designed to investigate the frequency of parvovirus in children suffering from Acute Lymphocytic leukemia (ALL) and in healthy one (controls) in Sudan.

Ninety (n= 90) Sudanese children (less than 15 years), 40 diagnosed with acute lymphocytic leukemia as study group (cases) and 50 normal children serve as control matched by age and sex were enrolled in this study. Five milliliters of blood were collected on EDTA container, complete blood count was done.

The plasma was separated from the cells by centrifugation at 3000 rpm for 5 minutes and tested for B19 IgG through the use of ELISA technique. The results showed that parvovirus B19 was 40% among cases compared to 26% in control group.

No significant association between B19 with ALL, sex and HB level were found in this study.

The study concluded that the seroprevalence of B19 infection is high in Sudan with more prevalence among leukemic children.

# المستخلص

يملك فيروس الحطيطة فعالية عالية في إصابة خلايا الدم الحمراء غير الناضجة مما يؤدي إلى فقر الدم المزمن عند الأشخاص خصوصا الذين يعانون من أمراض مزمنة أو مشاكل في المناعة.

أجريت هذه الدراسة لفحص نسبة وجود الفيروس بين الأطفال المصابين بسرطان الدم الليمفاوي الحاد ومقرنتهم بأطفال أصحاء في السودان.

تضمنت هذه الدراسة 90 من الأطفال السودانيين, 40 منهم يعانون من سرطان الدم الليمفاوي الحاد و 50 طفل أصحاء. تم جمع 5 مليمترات من الدم وإجراء تحليل كامل لمكونات الدم ومن ثم فصل البلازما بواسطة جهاز الطرد المركزي عند 3000 دورة لمدة خمسة دقائق ومن ثم فحصها عن مدى إنتشار الأجسام المضادة بواسطة مقايسة الإمتصاص المناعي المرتبط بالإنزيم

كشفت الدراسة عن وجود فيروس الحطيطة بين الأطفال الذين يعانون من سرطان الدم الليمفاوي الحاد بنسبة 40% بينما عند الأطفال الأصحاء بنسبة 26.

لم توجد علاقة إحصائية بين الإصابة بفيروس الحطيطة وسرطان الدم الليمفاوي الحاد, العمر ولا نقص معدل هيموغلبين الدم.

خلصت الدراسة إلى إنتشار فيروس الحطيطة بصورة كبيرة بين الأطفال السودانيين بالأخص المصابين بسرطان الدم الليمفاوي الحاد.

## **Table of Contents**

الآية.....	i
Dedication.....	ii
Acknowledgements.....	iii
Abstract (in English).....	iv
Abstract (in Arabic).....	v
Table of contents.....	vi
List of tables.....	xi
List of abbreviations.....	xii

## **CHAPTER ONE:**

### **INTRODUCTION AND OBJECTIVES**

1.1 Introduction.....	1
1.2 Rationale.....	4
1.3 Objectives.....	5
1.3.1 General objective.....	5
1.3.2 Specific objectives.....	5

## CHAPTER TWO:

### LITERATURE REVIEW

2.1 Parvovirus.....	6
2.1.1 Discovery and brief history.....	6
2.1.2. Structure and classification.....	8
2.1.3. Transmission.....	9
2.1.4. Replication.....	9
2.1.4.1 Attachment .....	10
2.1.4.2 Single- stranded DNA to double stranded DNA.....	10
2.1.4.3 Transcription and translation.....	11
2.1.4.4. DNA replication.....	11
2.1.5. Pathogenesis.....	12
Clinical features.....	14
2.1.6	2.1.6
2.1.6.1. Infections in immunocompetent.....	14
2.1.6.1.1. Erythema infectiosum.....	14
2.1.6.1.2. Joint disease.....	15

Parvovirus in pregnancy.....	15 .2.1.6.1.3
2.1.6.1.4. Other infections.....	17
2.1.6.2 Infection in the Immunodeficient hosts.....	17
2.1.6.2.1 Chronic pure red cells aplasia.....	17
2.1.7. Epidemiology.....	18
2.1.8. Laboratory diagnosis.....	19
2.2. Childhood leukemia.....	21
2.2.1. Classification of leukemia.....	21
2.2.1.1. Acute leukemia.....	21
2.2.1.1.1. Acute lymphoblastic leukemia.....	22
2.2.1.1.2. Differentiation of ALL from AML.....	22
2.2.1.1.3. Incidence and pathogenesis of ALL.....	22
2.2.1.1.4. Clinical features of ALL.....	23
2.2.1.1.4.1 Bone marrow failure.....	23
2.2.1.1.4.2 Organ infiltration.....	23
2.2.1.1.5. Classification of ALL.....	23
2.2.1.1.5.1. L1 type.....	24

2.2.1.1.5.2. L2 type.....	24
2.2.1.1.5.3. L3 type.....	24
2.2.1.1.6. Investigations.....	24
2.3. B19 infections and acute lymphatic leukemia.....	25

**CHAPTER THREE:**

**MATERIALS AND METHODS**

3.1. Study Design.....	26
3.2. Study Area.....	26
3.3. Study Population.....	26
3.4. Sample Size and Type.....	26
3.5. Data collection techniques and tools.....	27
3.6. Data processing.....	27
3.7. Study Duration.....	27
3.8. Ethical considerations.....	27
3.9. Methods.....	27
3.9.1. Complete blood count (CBC).....	27
3.9.2 Enzyme linked immunosorbent assay (ELISA).....	28



3.9.2.1 Principle.....	28
3.9.2.2. Storage and precautions of ELISA kits.....	28
3.9.2.3. Procedure.....	29
3.9.2.3.1 Sample preparation and dilution.....	29
3.9.2.3.2 Sample incubation.....	29
3.9.2.3.3. Washing.....	29
3.9.2.3.4. Conjugate incubation.....	30
3.9.2.3.5. Washing.....	30
3.9.2.3.6 Substrate incubation.....	30
3.9.2.3.7 Stopping of the reaction.....	30
3.9.2.3.8 Measurement.....	31
3.9.2.3.9 Calculation of the results.....	31
3.9.2.3.10 Interpretation of the results.....	31
3.10 Data analysis.....	32

**CHAPTER FOUR:**

**RESULTS**

4.1 Study population.....	33
---------------------------	----

4.2 Seroprevalence of B19 virus among cases and control.....	34
4.3 B19 virus and gender .....	35
4.4 B19 IgG and Acute lymphocytic leukemia.....	36
4.5 B19 virus and HB level.....	37

**CHAPTER FIVE:**

**DISCUSSION**

5.1 Discussion.....	40
5.2 Conclusion.....	42
5.3 Recommendations.....	42
References.....	44
Appendix 1.....	48
Appendix 2.....	49
Appendix 3.....	50

## LIST OF TABLES

<b>Table 1:</b> Distribution of specimens.....	33
<b>Table 2.</b> Prevalence of B19 IgG antibodies among cases and control group.....	34
<b>Table 3.</b> Sample distribution according to gender.....	35
<b>Table 4.</b> HB levels (gm/dl) among case and control group.....	38
<b>Table 5.</b> Effect of B19 virus on HB level.....	39

## **LIST OF ABBREVIATIONS**

ALL: Acute lymphocytic leukemia

AML: Acute myloied leukemia

BM: Bone marrow

CIE: counter immunoelectrophoresis

CMV: Cytomegalovirus

DNA: Deoxyribonucleic acid

Ds: Double stranded

EBV: Epstein barr virus

EDTA: Ethylediaminetetracetic acid

EM: Electron microscope

FAB: French-American-British

H<sub>2</sub>O<sub>2</sub>: Hydrogen peroxide

HIV: Human Immunodeficiency virus

ICTV: International Committee on Taxonomy of Viruses

IgG: Immunoglobulin G

kD: Kilodalton

mRNA: Messenger ribonucleic acid

VP: Viral protein

PCR: Polymerase chain reaction

SCID: Severe combined Immunodeficiency

SPSS: Statistical package for social sciences

TCR: T cell receptor

TMB: Tetramethylebenzedine