

الآية

قال تعالى :

بسم الله الرحمن الرحيم

﴿ اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴿١﴾ خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ ﴿٢﴾
اقْرَأْ وَرَبُّكَ الْأَكْرَمُ ﴿٣﴾ الَّذِي عَلَّمَ بِالْقَلَمِ ﴿٤﴾ عَلَّمَ الْإِنْسَانَ مَا لَمْ
يَعْلَمْ ﴿٥﴾ ﴾

صدق الله العظيم

سورة العلق (1-5)

Dedication

To my honorable parents

To my beloved brothers

Moataz and Mohamed

To my dear teachers

To my best friends

To every person hopes to see me successful

ACKNOWLEDGEMENTS

First of all, my thanks to **ALMIGHTY ALLAH** for giving me help and power to do this study.

I would like to express my sincere thanks and gratitude to my supervisor **Prof. Yousif Fadlalla Hamed Elnil** whose stimulating suggestion, help, knowledge, experience and encouragement that helped me all times of study.

Special thanks to working staff of **Zinam Specialist Hospital** for their cooperation and kindness.

I would like to thanks **Us. Suhair Ramadan** in research laboratory for technical assistance.

Thanks extend to **Us. Wafa Mohamed** and **Us. Mohamed Karrar** for their help.

I would like to acknowledge and extend my heartfull gratitude to my best friends **Hajer Ali Omer** and **Namarig Alfatih Ali** for their support and help.

Finally, my appreciation to all staff members of Microbiology Department in Sudan University of Science and Technology for their help, cooperation and encouragement.

ABSTRACT

This is a descriptive, cross-sectional study, conducted among subjects with type 2 diabetes mellitus attending Zinam Specialist Hospital in Khartoum State, during the period from February to April 2015. This study aimed to detect the prevalence of cytomegalovirus (CMV) among type 2 diabetic patients.

A total of 87 subjects were included in this study (n=87). All of them with type 2 diabetes mellitus. Fifty two (n=52) of them were males, and thirty five (n=35) were females. Their age ranged from 45-83 years (mean=59.18 years).

The enzyme-linked immunosorbent assay (ELISA) technique was used, and the results showed 84/87 (96.6%) of the total population under the study were positive for CMV IgG.

Age groups 58-70 years and 71-83 years showed the higher percentage of CMV prevalence (100%).

The results revealed higher percentage of prevalence of CMV in males 51/52 (98.1%).

Only 6 subjects with family history of diabetes mellitus and 6 subjects had history of blood transfusion, only 5/6 (83.3%) of each group were positive for CMV IgG.

Subjects with low level of education showed the higher percentage of prevalence of CMV 50/50 (100%).

The study showed no association between age, gender, family history of diabetes, history of blood transfusion or level of education and CMV IgG antibodies ($P > 0.05$). More research work is required to validate these results.

ملخص الأطروحة

أجريت هذه الدراسة الوصفية، المستعرضة، على أشخاص مصابين بداء السكري النوع الثاني في مستشفى زينام التخصصي في ولاية الخرطوم، خلال الفترة من فبراير إلى أبريل 2015. الهدف من هذه الدراسة هو اكتشاف انتشار فيروس مضخم الخلايا بين مرضى السكري النوع الثاني.

شملت هذه الدراسة سبع وثمانون شخص (87). كلهم يعانون من داء السكري النوع الثاني. اثنان وخمسون (52) منهم من الذكور، وخمس وثلاثون (35) منهم من الإناث. تراوحت أعمارهم بين 45-83 سنة (متوسط الأعمار 59.18 سنة).

تم استخدام اختبار الروز المناعي الإنزيمي، وأظهرت النتائج أن أربع وثمانون/سبع وثمانون (96.6%) من المجموع الكلي للأشخاص تحت الدراسة أعطوا نتيجة إيجابية للقلوبيولين المناعي G لفيروس مضخم الخلايا.

المجموعة العمرية 58-70 سنة و 71-83 سنة أظهرت أعلى نسبة مئوية لانتشار فيروس مضخم الخلايا (100%).

النتائج أظهرت أن أعلى نسبة مئوية لانتشار فيروس مضخم الخلايا كانت في الرجال وهي واحد وخمسون/اثنان وخمسون (98.1%).

فقط ست أشخاص لديهم تاريخ مرض السكري الوراثي وست أشخاص كان لديهم تاريخ نقل الدم، فقط خمس/ست (83.3%) من كل مجموعة أعطوا نتيجة إيجابية للقلوبيولين المناعي G لفيروس مضخم الخلايا.

الأشخاص الذين لديهم أقل مستوى تعليمي أظهروا أعلى نسبة مئوية لانتشار فيروس مضخم الخلايا وهي خمسون/خمسون (100%).

هذه الدراسة أظهرت انه لا توجد علاقة بين العمر، النوع، تاريخ مرض السكري الوراثي، تاريخ نقل الدم أو المستوى التعليمي بالقلوبيولين المناعي G لفيروس مضخم الخلايا (القيمة الاحتمالية أكبر من 0.05). أكثر من عمل بحثي مطلوب ليصدق هذه النتائج.

TABLE OF CONTENTS

No.	Subjects	Page No.
	الآية	I
	Dedication	II
	Acknowledgement	III
	Abstract, English	IV
	Abstract, Arabic	VI
	Tables of contents	VIII
	List of tables	XIII
	List of figures	XIV
	Abbreviations	XV
CHAPTRE ONE: INTRODUCTION		
1	Introduction	1
1.1	Background	1
1.2	Rationale	3
1.3	Objectives	4
1.3.1	General objective	4
1.3.2	Specific objectives	4
CHAPTER TWO: LITERATURE REVIEW		
2	Literature review	5
2.1	Cytomegalovirus	5

2.1.1	History	5
2.1.2	Classification	6
2.1.3	Structure of the virus	6
2.1.4	Properties of the virus	9
2.1.5	Replication of the virus	10
2.1.6	Transmission	10
2.1.7	Epidemiology	11
2.1.8	Pathogenesis	11
2.1.8.1	Infection in immunocompetent hosts	12
2.1.8.2	Infection in immunocompromised patient	12
2.1.9	Laboratory diagnosis	13
2.1.9.1	Collection and transportation of samples	13
2.1.9.2	Direct detection	13
2.1.9.2.1	Microscopy	13
2.1.9.2.2	Cell culture technique	14
2.1.9.2.3	Histopathology technique	14
2.1.9.3	Antigen detection	15
2.1.9.4	Serological tests	15
2.1.9.5	Polymerase chain reaction (PCR)	15
2.1.9.6	Shell vial assay	15
2.1.10	Treatment	16

2.1.11	Prevention	17
2.2	Diabetes mellitus	17
2.2.1	Type 2 diabetes mellitus in Sudan	19
2.2.2	Role of CMV in type 2 diabetes mellitus	20
2.2.3	Diagnostic criteria for type 2 diabetes mellitus	22
CHAPTER THREE: MATERIALS AND METHODS		
3	Materials and Methods	23
3.1	Ethical consideration	23
3.2	Study design	23
3.3	Study population	23
3.4	Study area	23
3.5	Study duration	23
3.6	Sample size	24
3.7	Sample technique	24
3.8	Data collection	24
3.9	Sample collection	24
3.10	Sample processing	24
3.11	Laboratory diagnosis of CMV	24
3.11.1	Detection of anti-CMV IgG antibodies using ELISA	24
3.11.1.1	Principle	25

3.11.1.2	Procedure	25
3.11.1.3	Measurement	26
3.11.1.4	Calculation of control values and cut-off	27
3.11.1.5	Interpretation of the result	28
3.12	Statistical analysis	28
CHAPTER FOUR:RESULTS		
4	Results	29
4.2	The relation of seropositivity of CMV IgG with age among subjects with type 2 diabetes mellitus	31
4.3	The relation of seropositivity of CMV IgG with gender among subjects with type 2 diabetes mellitus	33
4.4	The role of family history of diabetes mellitus and history of blood transfusion on CMV IgG seropositivity among subjects with type 2 diabetes mellitus	35
4.5	The relation of seropositivity of CMV IgG with level of education among subjects with type 2 diabetes mellitus	37
CHAPTER FIVE: DISCUSSION		
5	Discussion	39
5.1	Discussion	39
5.2	Conclusion	40

5.3	Recommendations	40
	References	42
	Appendixes	51

LISTS OF TABLES

Table No.	Legend	Page No.
4.1	Frequency of Cytomegalovirus IgG among subjects with type 2 diabetes mellitus	29
4.2	The relation of seropositivity of CMV IgG with age among subjects with type 2 diabetes mellitus	31
4.3	The relation of seropositivity of CMV IgG with gender among subjects with type 2 diabetes mellitus	33
4.4	The role of family history of diabetes mellitus and history of blood transfusion on CMV IgG seropositivity among subjects with type 2 diabetes mellitus	35
4.5	The relation of seropositivity of CMV IgG with level of education among subjects with type 2 diabetes mellitus	37

LISTS OF FIGURES

Figure No.	Legend	Page No.
A	Virtual three-dimensional model of HCMV showing various components of the virus	8
B	CPE of the virus (Owl's eye)	8
C	Frequency of Cytomegalovirus IgG among subjects with type 2 diabetes mellitus	30
D	The relation of seropositivity of CMV IgG with age among subjects with type 2 diabetes mellitus	32
E	The relation of seropositivity of CMV IgG with gender among subjects with type 2 diabetes mellitus	34
F	The role of family history of diabetes mellitus and history of blood transfusion on CMV IgG seropositivity among subjects with type 2 diabetes mellitus	36
G	The relation of seropositivity of CMV IgG with level of education among subjects with type 2 diabetes mellitus	38

ABBREVIATIONS

Ab	Antibody
AIDS	Acquired immunodeficiency syndrome
CID	Cytomegalovirus inclusion disease
CMV	Cytomegalovirus
COC	Cut off calibrator
COV	Cut off value
CPE	Cytopathic effect
DM	Diabetes mellitus
DNA	Deoxyribonucleic acid
ELISA	Enzyme-linked immunosorbent assay
HCMV	Human cytomegalovirus
HCMV-5	Human cytomegalovirus-5
HCMV-6	Human cytomegalovirus-6
HCMV-7	Human cytomegalovirus-7
HSV	Herpes simplex virus
IgG	Immunoglobuline class G
IgM	Immunoglobuline class M
IL-1 β	Interlukin-one beta
MNC	Mean absorbance of negative control

MPC	Mean absorbance of positive control
NC	Negative control
OD	Optical density
PC	Positive control
PCR	Polymerase chain reaction
PP65	Phosphoprotein 65
RNA	Ribonucleic acid
SPSS	Statistical package service solution
TMB	Tetramethylbenzidine
TNF- α	Tumor necrosis factor-alpha