

**BORRELIA BURGDORFERI SPECIFIC SERUM  
IgG IN PATIENTS WITH ARTHRITIS**

**THESIS**  
SUBMITTED FOR PARTIAL FULFILMENT OF  
M.S. Degree in  
**CLINICAL AND CHEMICAL PATHOLOGY**

By  
**Amal Farouk Mohamed Barakat**  
M.B.B.Ch.

SUPERVISED BY

**Prof. Dr. Ibrahim Khalil Ali**  
Prof. of Clinical Pathology  
Faculty of Medicine - Ain Shams University

**Prof. Dr. Amira Mohammed Moukhtar**  
Ass. Prof. of Clinical Pathology  
Faculty of Medicine - Ain Shams University

**Dr. Nahed Ahmed Mahmoud Afify**  
Lecturer of Clinical Pathology  
Faculty of Medicine - Ain Shams University

Faculty of Medicine  
Ain Shams University  
1996





بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ

خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ

اقْرَأْ وَرَبُّكَ الْأَكْرَمُ الَّذِي عَلَّمَ بِالْقَلَمِ

عَلَّمَ الْإِنْسَانَ مَا لَمْ يَكُنْ يَعْلَمُ

المتن، ١-٥



## **ACKNOWLEDGMENT**

Words can never express my deepest gratitude and appreciation to ***Prof. Dr. Ibrahim Khalil Ali, Professor of Clinical Pathology, Ain Shams University***, for his great supervision, unforgettable valuable generous advice and faithful guidance.

My particular and deepest thanks to ***Prof. Dr. Amira Mohammed Moukhtar, Assistant Professor of Clinical Pathology, Ain Shams University***, who showed extraordinary care and guidance to me all through this study.

I am grateful to ***Dr. Nahed Ahmed Mahmoud Afify, Lecturer of Clinical Pathology, Ain Shams University*** for her great support, great help and unending guidance in preparing and finishing this work.



## LIST OF TABLES

- Table (1):** Properties of the families of the order Spirochaetales (p. 3)
- Table (2):** Classification of pathogenic spirochaetes (p. 5)
- Table (3):** Phenotypic characteristics of spirochaetes (p. 6)
- Table (4):** Characteristics and distribution of arthropod-borne borreliæ (p. 8)
- Table (5):** Epidemiologic studies of Lyme disease in the United States (p. 28)
- Table (6):** Manifestations of Lyme disease by stage (p. 34)
- Table (7):** Treatment regimens for Lyme disease (p. 49)
- Table (8):** *Borrelia burgdorferi* serum IgG in patients and control groups (p. 64)
- Table (9):** Clinical data of the ELISA IgG positive patients (p. 65)
- Table (10):** Results of clinical and serological diagnosis in patients with arthritis of undetermined aetiology (p. 66)
- Table (11):** Incidence of *B. burgdorferi* IgG antibodies in serum of patients with different types of joints affection (p. 67)
- Table (12):** Incidence of positivity of *B. burgdorferi* IgG antibodies in serum of patients with and without knee arthritis (p. 68)
- Table (13):** Incidence of positivity of *B. burgdorferi* IgG antibodies in serum of patients according to the number of joints affected (p. 68)
- Table (14):** Incidence of *B. burgdorferi* IgG antibodies in serum of patients according to the course of arthritis (p. 69)
- Table (15):** Laboratory data of patients with ELISA positive IgG antibodies to *B. burgdorferi* (p. 70)



## **LIST OF FIGURES**

- Fig. (1):** Electron micrograph of cross section through *Borrelia burgdorferi*, the agent responsible for Lyme disease (p. 11)
- Fig. (2):** Comparison between patients and control groups regarding incidence of *B. burgdorferi* IgG (p. 71)
- Fig. (3):** Comparison between different types of inflamed joints regarding incidence *B. burgdorferi* IgG (p. 72)
- Fig. (4):** Frequency of affected joints in the 12 positive patients for *B. burgdorferi* IgG (p. 73)
- Fig. (5):** Comparison between patients with and without knee arthritis regarding incidence of *B. burgdorferi* IgG (p. 74)
- Fig. (6):** Comparison between mono and polyarthritis regarding incidence of *B. burgdorferi* IgG (p. 75)
- Fig. (7):** Comparison between different courses of arthritis regarding incidence of *B. burgdorferi* IgG (p. 76)



## CONTENTS

<b>INTRODUCTION AND AIM OF THE WORK</b>	1
<b>REVIEW OF LITERATURE</b>	
<b>Spirochaetes</b>	
- Classification of spirochaetes	2
- Taxonomy of <i>Borrelia</i>	4
<b><i>Borrelia burgdorferi</i></b>	
- Historical aspects	9
- Taxonomy	9
- Morphology and ultrastructure	10
- Staining properties	12
- Cultural properties	13
- Antigenic structure	17
- Immune response	20
<b>Lyme disease</b>	
- Historical aspects	25
- Epidemiology	26
- Pathogenesis	30
- Clinical manifestations	32
- Lyme disease during pregnancy	38
- Laboratory diagnosis	38
- Treatment	47
- Prevention and control	48
<b>SUBJECTS AND METHODS</b>	51
<b>RESULTS</b>	61
<b>DISCUSSION</b>	77
<b>CONCLUSION AND RECOMMENDATIONS</b>	81
<b>SUMMARY</b>	82
<b>REFERENCES</b>	84
<b>ARABIC SUMMARY</b>	



# **INTRODUCTION AND AIM OF THE WORK**

