

# CYTOMEGALOVIRUS INFECTION IN POLYTRANSFUSED INFANTS AND CHILDREN

A THESIS

Submitted for The Partial Fulfilment of  
Master Degree in  
**PEDIATRICS**



BY

*IMAN MOHAMED EL-BAHAY HAMAD*

SUPERVISED BY

Prof. Dr. *AHMED SAMY KHALIFA*

Professor of Pediatrics

Ain shams University

31-65

Prof. Dr. *MEDHAT DARWISH*

Professor of Microbiology and Immunology

Ain Shams University

Dr. *MONA EL-SAMAHY*

Lecturer of Pediatrics

Ain Shams University

*Handwritten signature*

(1989)

*Handwritten signature*

## *ACKNOWLEDGEMENT*

*I would like to express my sincere thanks and gratitude to Professor **AHMED SAMY KHALIFA**, Professor of Pediatrics, Ain Shams University, for his continuous encouragement and his sincere guidance.*

*I feel greatly indebted to Professor **MEDHAT DARWISH**, Professor of Microbiology and Immunology, Ain Shams University, for his kindness and enthusiastic guidance.*

*I would like to express my deepest gratitude to Doctor **MONA OMAR**, Assistant Lecturer of Microbiology and Immunology, Ain Shams University for her generous help in the fulfilment of this thesis.*

*I feel greatly indebted to Doctor **MONA EL SAMAHY**, Lecturer of Pediatrics, Ain Shams University for her moral support and continuous advice.*



## Contents

|                                                                        | Page |
|------------------------------------------------------------------------|------|
| - List of Abbreviations                                                | I    |
| - List of Tables                                                       | II   |
| - List of Figures                                                      | IV   |
| <br>                                                                   |      |
| I Introduction and aim of the work                                     | I    |
| <br>                                                                   |      |
| II Review of Literature                                                |      |
| A- Complications of blood transfusion                                  | 3    |
| B- Herpesviruses group                                                 | 16   |
| C- Cytomegalovirus (CMV)                                               | 18   |
| 1- History                                                             | 18   |
| 2- Characters of the virus                                             | 19   |
| 3- Pathogenesis                                                        | 21   |
| 4- Clinical manifestations                                             | 22   |
| 5- Immunology                                                          | 29   |
| 6- Epidemiology                                                        | 33   |
| * Prevalence                                                           | 33   |
| * Incubation period                                                    | 36   |
| * Transmission                                                         | 37   |
| 7- Diagnosis                                                           | 40   |
| B- Prophylaxis and Treatment                                           | 45   |
| D- Cytomegalovirus infection in<br>polytransfused infants and children | 50   |
| <br>                                                                   |      |
| III Materials and Methods                                              | 56   |

|             |                               |           |
|-------------|-------------------------------|-----------|
| <b>IV</b>   | <b>Results</b>                | <b>64</b> |
| <b>V</b>    | <b>Discussion</b>             | <b>76</b> |
| <b>VI</b>   | <b>Summary and Conclusion</b> | <b>81</b> |
| <b>VII</b>  | <b>References</b>             | <b>84</b> |
| <b>VIII</b> | <b>Arabic Summary</b>         |           |

**List of Abbreviations**

- 1- CF : Complement fixation.
- 2- CMV : Cytomegalovirus.
- 3- DNA : Deoxyribonucleic acid.
- 4- EBV : Epstein- Barr virus.
- 5- ELISA : Enzyme linked immunosorbent assay.
- 6- HLA : Human leukocyte antigen.
- 7- IgG : Immunoglobulin G.
- 8- RIA : Radio-immunoassay.

## List of Tables

## Page

- Table (1) : Major complications of blood transfusion and their causes. 5
- Table (2) : Distribution of polytransfused patients and controls according to age. 57
- Table (3) : Comparison between the Weight/ Age percentile of male patients and controls. 69
- Table (4) : Comparison between the Height/ Age percentile of male patients and controls. 69
- Table (5) : Comparison between the Weight/ Age percentile of female patients and controls. 70
- Table (6) : Comparison between the Height/ Age percentile of female patients and controls. 70
- Table (7) : Incidence of CMV infection in patients with Thalassemia,

|                                                                                                  |     |
|--------------------------------------------------------------------------------------------------|-----|
|                                                                                                  | III |
| Leukemia and Hemophilia in<br>comparison with controls in<br>the different age groups.           | 71  |
| - Table (8) : Incidence of CMV antibody in<br>cord blood samples in<br>comparison with controls. | 75  |



**List of Figures****Page**

- Figure (1): The test plate showing the yellowish green colour formed by enzymatic cleavage. 63
- Figure (2): Height/Age percentile of male patients and controls. 65
- Figure (3): Weight/Age percentile of male patients and controls. 66
- Figure (4): Height/Age percentile of female patients and controls. 67
- Figure (5): Weight/Age percentile of female patients and controls. 68
- Figure (6): Histogram showing the percentage of positivity of CMV infection in patients with Thalassemia at the different age groups in comparison with controls. 72
- Figure (7): Histogram showing the percentage of positivity of CMV infection in patients with Leukemia at the

different age groups in  
comparison with controls. 73

- Figure (8): Histogram showing the percentage  
of positivity of CMV infection in  
patients with Haemophilia at the  
different age groups in comparison  
with controls. 74

- Figure (9): Incidence of CMV infection in cord  
blood samples in comparison with  
controls. 75

***INTRODUCTION***  
***&***  
***AIM OF THE WORK***

### Introduction and aim of the work

Blood and blood component transfusion carries the risk of infection. This infection may be bacterial, viral or by monocellular organisms.

One of the most important viral infections due to blood transfusion or component therapy is CMV, particularly, in the immunocompromised host.

Winston , 1980, put forward the hypothesis that latent CMV may be present in blood donors with previous CMV infection. Once transfused, the latent virus may be activated to produce active infection.

The clinical manifestations of CMV infection varies according to the age of the patient. In the new-born infants CMV causes fever, hepatitis, pneumonia and may cause death (Yeager et al., 1981). Generalised infection with CMV has been described in older children in association with poor general condition due to leukaemia and malignant tumours, CMV has been shown as a possible and important cause in hepatosplenomegaly and cirrhosis of obscure origin.

The aim of this work is to study the prevalence of CMV infection in patients receiving blood and/or blood products transfusion in a trial

to demonstrate the seriousness of this disease in  
Egypt.

# ***REVIEW OF LITERATURE***

### Complications of blood transfusion

In the majority of carefully prepared and properly supervised transfusions, there are no untoward effects. Nevertheless, complications occur in a small percentage (2 to 5%) of transfusions, while these complications are often of only minor severity, they are sometimes serious and occasionally cause death.

The complications of transfusion may be listed as follows:

- 1- Febrile reactions.
- 2- Allergic reactions.
- 3- Circulatory overload.
- 4- Haemolytic reactions.
- 5- Reactions due to infected blood.
- 6- Thrombophlebitis and vasoactive substances.
- 7- Air embolism.
- 8- Pulmonary embolism.
- 9- Fat embolism.
- 10- Transfusion haemosiderosis.
- 11- Complications of massive transfusion.
- 12- Toxic complications of blood transfusion.
- 13- Effect of transfusion on immune function.
- 14- Transmission of diseases.

(Penington et al., 1978)