Results chapter on cmv infection research

Results

This study has been conducted on 366 patients with suspected CMV infection attending pediatric department at Zagazig University Hospital.

Table (1): Age distribution of the studied patients (except for neonates with congenital anomalies) (N= 344)

Studied patients (N= 344)	
No.	%
Age (years)	
Mean ± SD	9. 9 ± 3. 4
Median (Range)	10. 0 (3. 5 – 18. 0)

The mean age and standard deviation (SD) of ages of the studied patients (except for neonates with congenital anomalies) in years as shown intable (1)was 9. 9 ± 3. 4.

Table (2): Age distribution of neonates with congenital anomalies (N= 22)

Studied patients (N= 22)	
No.	%
Age of neonateswith congenital anomalies group	

(days)	
Mean ± SD	4. 1 ± 1. 6
Median (Range)	4. 0 (2. 0 – 7. 0)

Table (2)shows that The mean age and standard deviation (SD) of ages ofneonates with congenital anomalieswere4. 1 ± 1. 6 days

Table (3): Sex distribution of the studied patients (N= 366)

Studied patients (N= 366)		
No.	%	
Sex		
Male	202	55. 2%
Female	164	44. 8%

Table(3) shows that 55. 2% (202 out of 366) of the studied patients were males, while 44. 8% were females.

Figure (1): Pie diagram showing sex distribution of the studied patients (N= 366)

Table (4): Distribution of the risk factors among the studied patients (N= 366)

Risk factors	Studied patients (N= 366)	
	No.	%
• Malignant hematological disease with chemotherapy	43	11. 7 %
• Receiving repeated blood transfusion	164	44. 8 %
• Fever of unknown origin	16	4. 4 %
• Critically ill patients lying in the ICUs with prolonged hospitalization	28	7. 7 %
• Receiving corticosteroids or other immunosuppressives for long period	22	6 %
• Chronic renal failure with haemodialysis	64	17. 5 %

• Fever with pancytopenia	7	1. 9 %
• Neonates with congenital anomalies	22	6 %

As shown intable (4)andfigure (2), 44. 8% of the studied patients were receiving repeated blood transfusion, 17. 5% were suffering from chronic renal failure and receiving haemodialysis, 11. 7% were suffering from Malignant hematological disease and receiving chemotherapy, 7. 7% were critically ill patients lying in the ICUs with prolonged hospitalization, 6% were receiving immunosuppressive agents for long period, 6% were neonates with congenital anomalies, 4. 4% had fever of unknown origin, and 1. 9% suffered from fever with pancytopenia.

Figure (2): Pie diagram showing Distribution of the risk factors in the studied patients (N= 366).

Table (5): Results of ELISA IgM and IgG for CMV in the enrolled patients (N= 366)

ELISA results	Studied patients (N= 366)	
IgM		
• Positive	60	16. 4 %

- Negative 306 83. 6 %

IgG

- Positive 93 25. 4 %
- Negative 273 74. 6 %

Over all seropositivity

- Positive both IgM and IgG 109 29. 8 %

As shown intable (5), out of the 366 studied patients, 60 (16. 4%) and 93 (25. 4%) were positive for CMV IgM and IgG in an ELISA test respectively.

Table (6): Agreement between ELISA IgM and IgG in the studied patients (N= 366)

ELISA IgM		ELISA IgG				
		Negative	Positive	Total	#Test	P-value
Negative	No.	257	49	306	0. 469	0. 000* (HS)
	%	94. 1 %	52. 7 %	83. 6 %		

	No.	16	44	60
Positive	%	5. 9 %	47. 3 %	16. 4 %
Total	No.	273	93	366
	%	100. 0 %	100. 0 %	100. 0 %

Kappa measure of agreement

P < 0. 05 is significant.

Statistical Significance

Standards for strength of agreement for the kappa coefficient:

≤0= poor,

. 01-. 20= slight,

. 21-. 40= fair,

. 41-. 60= moderate,

. 61-. 80= substantial, and

. 81-1= almost perfect.

Table 6shows that there is a moderate agreement between ELISA IgM and IgG in the detection of CMV in children with high statistical significance.

Table (7): Prevalence of CMV IgM seropositivity among different risk groups

Risk Factors	Studied patients (N= 366) No.	Positive IgM No.	%
• Malignant hematological disease with chemotherapy	(43)	8	18.6 %
• Receiving repeated blood transfusion	(164)	36	21.9 %
• Fever of unknown origin	(16)	8	50 %
• Critically ill patients lying in the ICUs with prolonged hospitalization	(28)	0	0 %
• Receiving corticosteroids or other immunosuppressives for long period	(22)	0	0 %
• Chronic renal failure with	(64)	8	12.

haemodialysis			5 %
• Fever with pancytopenia	(7)	0	0 %
• Neonates with congenital anomalies	(22)	0	0 %

Table (7)andfigure (3)show that the highest prevalence (50%) of CMV IgM seropositivity was reported from patients suffering from fever of unknown origin.

Figure (3): Bar chart showing prevalence of CMV IgM seropositivity among different risk groups

Table (8): Association between CMV IgM seropositivity and different risk factors

Risk factors	No. Studied patients (N= 366)		Test	p-value
	ELISA IgM			
	Positive (N= 60)	Negative (N= 306)		
	No. %	No. %		

• Malignant hematological disease with chemotherapy	(43)	8	18. 6 %	35	81. 4%	
• Receiving repeated blood transfusion	(164)	36	21. 9 %	128	78 %	#1 1. 17 0. 010 (S)
• Fever of unknown origin	(16)	8	50 %	8	50 %	
• Chronic renal failure with haemodialysis	(64)	8	12. 5 %	56	87. 5%	

chi square test

P < 0. 05 is significant.

*statistical Significance

Table (9): Prevalence of CMV IgG seropositivity among different risk groups

Risk factors	Studied patients (N= 366) No.	Positive IgG No.	%
• Malignant hematological disease with chemotherapy	(43)	0	0 %
• Receiving repeated blood transfusion	(164)	63	38. 4 %
• Fever of unknown origin	(16)	0	0 %
• Critically ill patients lying in the ICUs with prolonged hospitalization	(28)	0	0 %
• Receiving corticosteroids or other immunosuppressives for long period	(22)	0	0 %
• Chronic renal failure with	(64)	8	12. 5 %

haemodialysis

- Fever with pancytopenia (7) 0 0 %
- Neonates with congenital anomalies (22) 22 100 %

Table (9)andfigure (4)show that the highest prevalence (100%) of CMV IgG seropositivity was reported from neonates with congenital anomalies.

Figure (4): Bar chart showing prevalence of CMV IgG seropositivity among different risk groups.

Table (10): Association between CMV IgG seropositivity and different risk factors

Risk factors	No.	Studied patients (N= 366)	ELISA IgG		Test	p-value
			Positive (N= 93)	Negative (N= 273)		
			No. %	No. %		

• Receiving repeated blood transfusion	(164)	63	38.4%	101	61.6%	
• Chronic renal failure with haemodialysis	(64)	8	12.5%	56	87.5%	53.96 0.000* (HS)
• Neonates with congenital anomalies	(22)	2	10 0%	20	0%	

chi square test

P < 0. 05 is significant.

*highly statistical Significance

Table (11): Results of real time PCR for CMV in the enrolled patients (N= 366)

Real time PCR	Studied patients (N= 366)
• Positive	36 9. 8%

- Negative 330 90. 2%

Table (11)shows that 9. 8% (36 out of 366) of the studied patients were positive for CMV in real time PCR test.

Table (12): Results of nested PCR for CMV in the enrolled patients (N= 366)

Nested PCR	Studied patients (N= 366)	
• Positive	29	7. 9%
• Negative	337	92. 1%

Table (12)shows that 7. 9% (29 out of 366) of the studied patients were positive for CMV in nested PCR test.

Figure (4): Results of real time PCR and nested PCR for CMV in the enrolled patients.

Figure (5): 1 st run nested PCR showing band at 435 bp.

Figure (6): 2 nd run nested PCR showing band at 159 bp.

Table (13): Prevalence of CMV infection in the studied patients (using real time PCR as a gold standard test)

Risk factors	No. Studied patients (N= 366)	Positive	
		No.	%
• Malignant hematological disease with chemotherapy	(43)	36	83.7%
• Receiving repeated blood transfusion	(164)	0	0%
• Fever of unknown origin	(16)	0	0%
• Critically ill patients lying in the ICUs with prolonged hospitalization	(28)	0	0%
• Receiving corticosteroids or other immunosuppressives for long period	(22)	0	0%
• Chronic renal failure with haemodialysis	(64)	0	0%
• Fever with pancytopenia	(7)	0	0%

- Neonates with congenital anomalies (22) 0 0%

As shown intable (13), CMV infection (using real time PCR as a gold standard test) was only reported from patients suffering from malignant hematological disease and receiving chemotherapy, where 83. 7% of these patients were positive for CMV.

Figure (7):

Figure (8):

Table (14): Titer of CMV viremia in patients with malignant hematological disease receiving chemotherapy

Quantitative PCR	Studied patients (N= 366)
Mean ± SD	6907. 30 ± 15846. 04
Median (Range)	623. 50 (3. 70 – 57500)

The mean titer and SD of titers of CMV viremia in patients with malignant hematological disease receiving chemotherapy as shown intable (14)was 6907. 30 ± 15846. 04.

Table (15): Results of Nested PCR for CMV among different risk groups

Risk factors	Studied patients (N= 366) No.	Positive No.	%
• Malignant hematological disease with chemotherapy	(43)	29	67.4%
• Receiving repeated blood transfusion	(164)	0	0%
• Fever of unknown origin	(16)	0	0%
• Critically ill patients lying in the ICUs with prolonged hospitalization	(28)	0	0%
• Receiving corticosteroids or other immunosuppressives for long period	(22)	0	0%
• Chronic renal failure with haemodialysis	(64)	0	0%
• Fever with pancytopenia	(7)	0	0%

- Neonates with congenital anomalies (22) 0 0%

Twenty nine out of 43 patients suffering from malignant hematological disease with chemotherapy with a percentage of 67. 4 were positive for CMV in a nested PCR test as shown intable (15).

Table (16): Relation between ELISA IgM and real time PCR and nested PCR in the studied patients (N= 366)

Agreement between ELISA IgM and real time PCR and nested PCR in the studied patients (N= 366)

Laboratory findings	ELISA Positive IgM (N= 60) No.	%	ELISA Negative IgM (N= 306) No.	%	Test	P-value
Real time PCR						
• Positive (n= 36)	8	22. 2 %	28	77. 8 %	# 0. 05	0. 320 (NS)
• Negative (n= 330)	52	15. 8 %	278	84. 2 %		
Nested PCR						

• Positive	8	27. 6 %	21	72. 4 %	#0. 082 0. 090 (NS)
• Negative	52	15. 4 %	285	84. 6 %	

Kappa measure of agreement

P < 0. 05 is significant.

Statistical Significance

Standards for strength of agreement for the kappa coefficient:

≤0= poor,

. 01-. 20= slight,

. 21-. 40= fair,

. 41-. 60= moderate,

. 61-. 80= substantial, and

. 81-1= almost perfect.

As shown intable 16, there is poor statistical agreement between ELISA IgM and PCR reactions in the detection of CMV in children with no significance.

Table (17): Relation between ELISA IgG and real time PCR and nested PCR in the studied patients (N= 366)

Agreement between ELISA IgG and real time PCR and nested PCR in the studied patients (N= 366)

Laboratory findings	ELISA				Test	P-value
	Positive IgG (N= 93)		Negative IgG (N= 273)			
	No.	%	No.	%		
Real time PCR						
• Positive (n= 36)	0	0 %	36	100 %	# -0.137	0.001* (HS)
• Negative (n= 330)	93	28.2 %	237	71. 8 %		
Nested PCR						
• Positive	0	0 %	29	100 %	#-0.165	0.000* (HS)
• Negative	93	27.6 %	244	72. 4 %		

Kappa measure of agreement

P < 0. 05 is significant.

*highly statistical Significance

Standards for strength of agreement for the kappa coefficient:

≤0= poor,

. 01-. 20= slight,

. 21-. 40= fair,

. 41-. 60= moderate,

. 61-. 80= substantial, and . 81-1= almost perfect.

A high statistically significant non-agreement is present between ELISA IgG and PCR reactions in the detection of CMV in childrenas shown intable 17.

Table (18): Relation between real time PCR and nested PCR in the studied patients (N= 366)

Agreement between real time PCR and nested PCR in the studied patients (N= 366)

Laboratory findings	Nested PCR		Test	P-value
	Positive (N= 29)	Negative (N= 337)		

	No.	%	No.	%		
Real time PCR						
• Positive (n= 36)	29	100 %	7	2. 1 %	# 0. 882	0. 000* (HS)
• Negative (n= 330)	0	0 %	330	97. 9 %		

Kappa measure of agreement

P < 0. 05 is significant.

*highly statistical Significance

Standards for strength of agreement for the kappa coefficient:

≤0= poor,

. 01-. 20= slight,

. 21-. 40= fair,

. 41-. 60= moderate,

. 61-. 80= substantial, and . 81-1= almost perfect.

Table 18shows that there is an almost perfect statistical agreement between real time PCR and nested PCR in the detection of CMV in children with high significance.

Table (19): Relation between real time PCR and nested