Maternofoetal transfer of Cytomegalovirus IgG antibodies in Maiduguri, North Eastern Nigeria

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Citation

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Abstract

A serological study to determine the transfer of Cytomegalovirus (CMV) IgG antibody between 94 mothers and their newborns attending the State Specialist Hospital, Maiduguri was carried out using Enzyme Linked Immunosorbent Assay (ELISA) technique. The ELISA technique used was a commercial kit BIOTEC which detects IgG specific to CMV.Of the 94 mothers tested, 93 (98.9%) have CMV IgG antibody while their corresponding newborns had 86.2% (81 out of 93) seroprevalence rate. The percentage prevalence according to sex of the newborns was 86.3% (44 out of 93) and 69.8% (37 out of 93) males and females respectively. About 87.1% of the newborns were immune to CMV infection compared with 12.9% susceptible.There was a positive correlation between maternal CMV IgG antibody with maternal age (r = 0.57), gestational age (r = 0.03) and the number of pregnancies (r = 0.03).Most (87.1%) mothers in the study are immune to CMV infection and were able to pass adequate protection (CMV IgG) to their newborns leaving a small (12.9%) proportion of susceptible newborns to CMV.

INTRODUCTION

Cytomegalovirus (CMV) is found throughout all geographic locations and socioeconomic groups and infects between 50% - 80% of adults in the United States as indicated by the presence of antibodies in much of the general populations[1]. About 2% of pregnant women have either a primary or a restricted CMV infection during pregnancy and it is estimated that 10-20% of congenitally infected newborns will show the evidence of the disease[2] .CMV infections are widespread and approximately half of the adult have antibodies to CMV[3] .The majority of CMV infections is asymptomatic but can cause serious diseases to newborn infants and immunocompromised individuals[4] .Existing evidence suggests that the concentrations of IgG immunoglobulin in maternal and cord sera are essentially the same[5] . In Brazil, 94.7% prevalence rate was reported among female blood donors.

In Gambia, 25 (14%) of 178 Gambian babies were congenitally infected despite the fact that 87% of their mothers were antibody positive to CMV[6]. At the time of delivery of 143 (96%) of the 150 Egyptian mothers and their newborn infants were CMV-IgG seropositive[7]. In Nigeria, 30 (91%) of the 33 mothers were seropositive for CMV, compared to 33% of the infants[8] and a seroprevalence of 84.2% among pregnant women[9].

MATERIALS AND METHODS

The study was carried out among pregnant mothers and their newborns attending the State Specialist Hospital, Maiduguri, Borno State. The study population was part of a larger study on arthropod and rodent-borne viral infections among the populace in Borno State. Ethical clearance to conduct this study was duly obtained from the Borno State Ministry of Health, Maiduguri. Only those pregnant mothers who expressed oral or written consent were recruited for the study. ELISA kit (lgG for cytomegalovirus) manufactured by BIOTEC laboratories Ltd, 32 Anson Road, UK. Lot No. 102B, cod:7/150 was used to screen for CMV specific-IgG antibody according to manufacturers' instructions. Only mothers who gave either written or oral consent were recruited in the study. About 5ml blood samples were collected from mothers at delivery by venepuncture and from the cords of their newborns into sterile plain bottles. The samples were centrifuged at 1500g for 20 minutes and the sera aspirated into sterile labeled plain microvials and kept frozen at minus 20^{o}C until tested.

RESULTS

Table 1 Shows the Characteristics of the mothers and their newborns. 93(98.9%) of the mothers tested were positive to CMV infection and 81 (86.2%) of the newborns were positive. The percentages of the sex of the newborns positive

were 86.3% (44) and 69.8% (37) male and female respectively. The ages of the tested mothers range between 13 to 42 years and the duration of pregnancies range between 37 and 42 weeks.

Figure 1

Table 1. Characteristics of Mothers and their Newborns

Characteristics	Mean ± SD	Range	Frequency	%
Maternal				
Age (Years)	25.8 ± 6.9	13 – 42	-	-
No. of pregnancies (Parity)	4.2 ± 3.0	1 – 13	-	-
No. of Children	3.8 ± 2.7	1 – 11	-	-
Duration of pregnancies (Weeks)	40.3 ± 1.6	37 – 42	-	-
CMV IgG Antibody titre (A.I.)	13.6 ± 3.5	0.48 – 21.7	93	98.9
Newborns				
Sex				
Male	-	-	51	54.3
Female	-	-	53	56.4
CMV IgG titre (A.I.) by Sex				
Male	8.8 ± 5.1	0.4 – 18.2	44	86.3
Female	9.9 ± 4.5	0.4 – 17.9	37	69.8
Total CMV IgG Antibody titre (A.I.)	9.3 ± 4.8	0.4 – 18.2	81	86.2

Figure 2

Table 2. Seroprevalence of CMV IgG Antibody according to age of mothers

Age Group (Years)	No. tested	No. Positive	% Positive
13 – 17	7	7	100
18 – 22	31	31	100
23 – 27	17	17	100
28 – 32	22	21	95.5
33 – 37	12	12	100
38 – 42	5	5	100
Total	94	93	98.9

No. = Number; % = Percentage

$X^2 = 0.02$, df = 5, p = 0.999

Table 2 Shows that 93 (98.9%) out of 94 mothers tested were positive to CMV IgG antibody. The highest number of mothers tested fell into the age group of 18-22 and had 100% positivity while the least number tested were in age group of 38-45 with 100% positivity rate.

Figure 3

Table 3. Seroprevalence of CMV IgG Antibody according to occupational group of Mothers

Occupation	No. tested	No. Positive	% Positive
Business	9	9	100
Civil servant	5	5	100
Farming	1	1	100
Fulltime house wives	36	36	100
Hairdressing	3	3	100
Paramilitary	1	1	100
Seamstress	19	19	100
Schooling	16	16	100
Teaching	4	3	75
Total	94	93	98.9

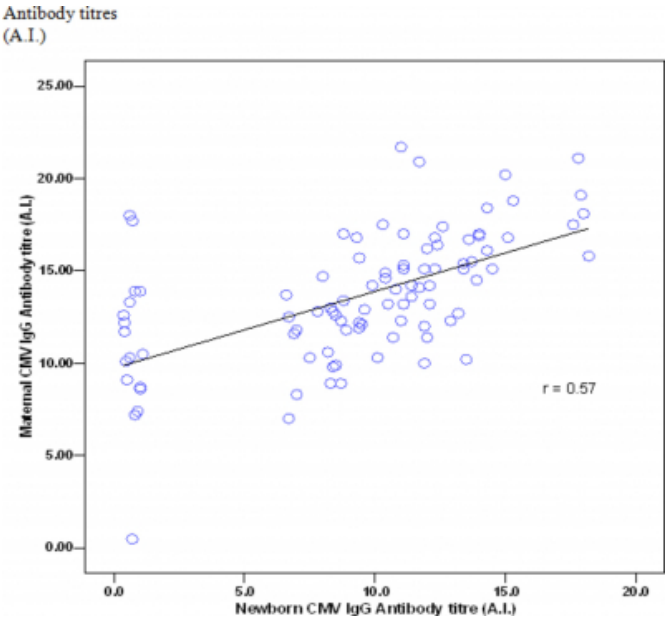
$X^2 = 0.14$ df = 8, p = 0.999

Table 3 shows the seroprevalence of CMV IgG antibody according to the occupational groups of the mothers. The highest numbers tested were full time house wives (36) and all were positive while the least tested were farmers and paramilitary (1).

The correlation between the maternal and newborns CMV IgG antibody titre is as shown in Fig.1; which shows a positive correlation coefficient (r = 0.57). This indicates that as the maternal CMV IgG antibody titre is increasing the newborns CMV IgG antibody tire increases too.

Figure 4

Fig. 1. Correlation between Maternal and Newborn CMV IgG



The correlation between maternal CMV IgG antibodies to

their gestational age is shown in Fig. 2. The figure also indicates a positive correlation (r = 0.03), that as the maternal CMV antibody titre is increasing, the duration of gestation also increases.

Figure 5

Fig.2. Correlation between Maternal CMV IgG Antibody titre to Gestation Period (Weeks)

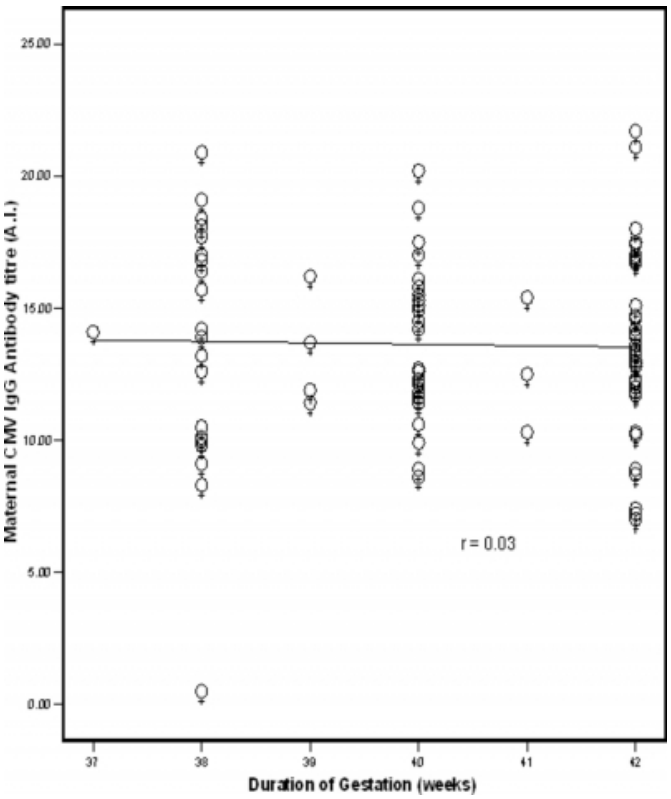


Figure 6

Fig. 3. Correlation between Maternal CMV IgG Antibody titre to Parity

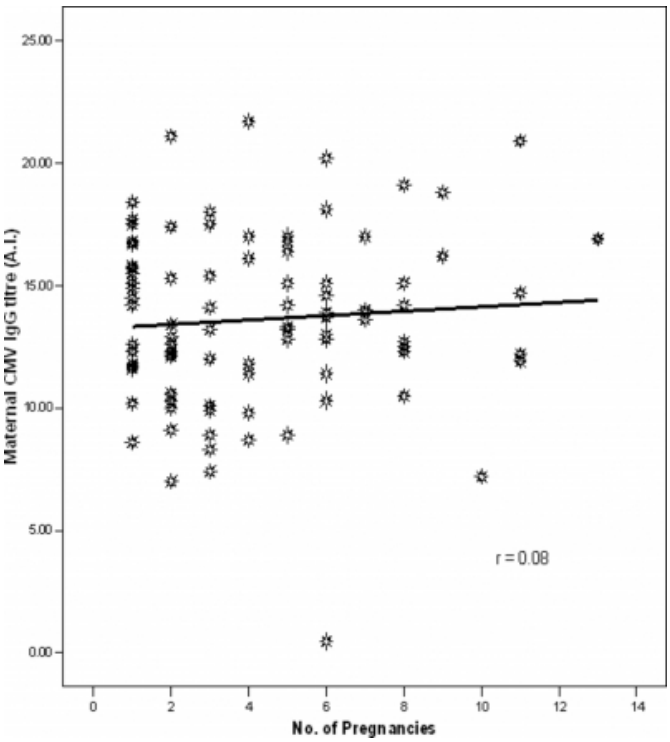


Fig. 3 shows the correlation between maternal antibody to CMV and the number of their pregnancies (Parity). It also shows a positive correlation (r = 0.03) that is, as maternal CMV IgG antibody titre increases with the increase in the number of pregnancies.

DISCUSSION

The high seroprevalence of 98.9% of mothers to CMV IgG antibody compared with 86.2% of their newborns substantiates the previous serological evidence of 96% among Egyptian mothers and their newborn infants who were CMV IgG seropositive[7]. This agrees with Peter et al (1966) that the concentration of IgG immunoglobulin in maternal and cord sera is essentially the same. Other studies have indicated disparity in the seroprevalence of CMV IgG antibody between mother-child pairs such as in Gambia, 14% of 178 babies were congenitally infected despite the fact that 87% of their mothers were antibody positive to CMV[6] and in Nigeria[8] 33% of infants were seropositive for CMV compared to 91% of their mothers. This study has shown that those mothers with CMV IgG antibodies efficiently transferred the antibodies to their developing foetus. This may be due to the fact that IgG antibody is unique among the major immunoglobulin classes for its active transfer across maternal placenta[10]

There is therefore need to routinely screen pregnant women for evidence of CMV infection during their ante natal visits.

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