Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/apme

Original Article

The study of congenital cytomegalovirus, Rubella and Herpes Simplex Virus-2 infections in infants

Bhagat Shweta [a,*], *Gupta Nupur* [a], *Arvindan Archana* [b], *Gandhok Inderjeet* [c], *Gupta Suman* [d], *Baweja Manisha* [e], *Dutt Thakur* [f], *Reza Shakir* [g], *Khare Shashi* [h]

[a] *Specialist Grade II (Microbiology), NCDC, India*
[b] *Specialist Grade II (Public Health), NCDC, India*
[c] *Junior Microbiologist, GDDIC, India*
[d] *Research Assistant (Microbiology), NCDC, India*
[e] *Laboratory Assistant (Microbiology), NCDC, India*
[f] *Laboratory Technician (Microbiology), NCDC, India*
[g] *Technical Assistant, GDDIC, India*
[h] *Addl. Director & HOD (Microbiology), NCDC, India*

ARTICLE INFO

Article history:
Received 12 January 2015
Accepted 3 February 2015
Available online 4 March 2015

Keywords:
Rubella
Cytomegaloovirus (CMV)
Herpes simplex virus (HSV)

ABSTRACT

Aims: The study was conducted to analyze the role of Cytomegalovirus (CMV), Rubella and Herpes Simplex Virus (HSV-2) as an etiological agent in congenital infections in infants.
Material and methods: The study was carried out at National Reference Centre i.e. NCDC, Delhi where samples are referred from various government hospitals of Delhi from the period of January 2013–December 2013. The samples were tested for CMV, Rubella and HSV specific IgM antibodies by μ capture ELISA (Enzyme linked Immunoassay).
Results: In children the overall positivity of CMV, Rubella and HSV-specific IgM antibodies was 20.7%, 5.4%, and 2.3% respectively.
Conclusion: The study indicated that maternal infection with CMV, Rubella and HSV-2 is a major contributory factor for congenital infections in neonates and infants and therefore screening for these viruses in early pregnancy should be made mandatory.

1. Introduction

The maternal infections are transmissible in utero at several stages of the pregnancy. These infections are caused by many organisms of which the members of the TORCH complex, namely *Toxoplasma gondii*, Rubella virus, Cytomegalovirus (CMV), the Herpes Simplex Virus (HSV) occupy prominent positions.[1] These infections are associated with inadvertent outcomes like multiple abortions, intrauterine fetal deaths,

* *Corresponding author*. Department of Microbiology, National Centre for Disease Control (NCDC), 22 Shamnath Marg, Civil Lines, Delhi 54, India.
E-mail address: dr.shwetabhagat@yahoo.co.in (B. Shweta).
http://dx.doi.org/10.1016/j.apme.2015.02.001

still births, congenital malformations and other reproductive failures, especially when they are acquired during the first trimester of the pregnancy. These maternal infections during the early gestation can result in fetal loss or malformations because of the ability of the fetus to resist infectious organisms is limited and the fetal immune system is unable to prevent the dissemination of infectious organisms to various tissues.[2]

Human cytomegalovirus (CMV), Rubella Virus and Herpes Virus are increasingly being recognized as important causes of congenital infection. Cytomegalovirus is a leading cause of congenital infections and long-term neurodevelopmental disabilities among children. Intrauterine transmission of CMV to the baby can occur irrespective of prior maternal exposure; whereas rubella if contracted during the first trimester of pregnancy infects the fetus, leading to congenital rubella syndrome (CRS). The previous exposure to rubella actually prevents the virus from crossing the placenta by generating protective antibodies.[3] On the other hand neonatal HSV disease is most commonly acquired intrapartum or post natally and can result from primary or recurrent infection.[4]

The incidence of congenital CMV ranges from 0.5 to 3.0% in all live births.[5] CMV is also linked to late abortions and still births. The endemicity of the rubella virus has also been established in India.[6] However following the rubella vaccination, the incidence of Rubella has reduced drastically in developed countries but in developing countries congenital Rubella Syndrome (CRS) is still an important cause of congenital infection in babies. The incidence of neonatal HSV infection ranges from 1 in 2500 to 1 in 20,000 live births and two-thirds of cases are caused by HVS-2.[7]

The present study was carried out to find the incidence of CMV, Rubella and HSV infection in suspected cases of congenital infections by detection of virus specific IgM antibodies by enzyme immunoassay (EIA).

2. Material and methods

Samples of babies exhibiting clinical symptoms suggestive of congenital infection are referred regularly to NCDC (National Centre For Disease Control), New Delhi, from various government hospitals of Delhi for the diagnosis of RCH (Rubella, Cytomegalovirus, Herpes Simplex-2) infections.

In this study serum samples of 130 such children up to the age of 1 year with symptoms suggestive of congenital infections were selected. These samples were received for routine diagnosis of viral etiology of congenital infections, from the period January 2013 to December 2013. These children presented with one or more of the following clinical manifestations – fever, pneumonia, jaundice, hepatosplenomegaly, facial palsy, encephalitis, microcephaly, cardiac anomalies, hearing defects, congenital cataract, fever with rash syndrome, growth retardation, or ascites. The serum samples were screened for CMV, Rubella and HSV-2 IgM antibodies by commercially available IgM μ capture ELISA kits (Enzy-well DIESSIE Diagnostica Senese SpA).

Interpretation of the results was based on controls provided with the kit. A test sample was said to be positive for IgM antibodies when its absorbance value was higher than the absorbance value of the cut-off control.

Positivity of IgM antibodies against CMV or Rubella or HSV-2 in a sample indicates active infection of this group of viruses.

The samples belonged to a mixed population of urban and rural areas.

3. Results

Of the children suspected with congenital infections, CMV, Rubella, HSV-2 specific IgM antibodies were positive in 27 (20.7%), 7 (5.4%) and 3 (2.3%) cases respectively. The babies were divided into 3 age groups: 0–29 days, 1 month-6 months and >6 months to 1 year. Amongst them, the 54 babies belonged to the age group of new born to one month, 46 were in the age group of one month to 6 months and 30 were from >6 months to one year (Table 1 and Fig. 1). Various clinical features in these positive cases have been compiled in Table 2, Fig. 2. Among clinical manifestations reported in babies, hepatosplenomegaly was the most common feature in CMV positive cases; microcephaly and congenital cataract were most common symptoms in Rubella positive cases whereas meningoencephalitis was the most common presenting feature in HSV-2 cases.

None of the cases was positive for mixed infection.

4. Discussion

This study was conducted to find out the incidence of CMV, Rubella and HSV-2 in children with suspected intrauterine infections. The evidence of congenital CMV was seen in 20.7% of children with suspected congenital infections, which is in accordance with the earlier studies.[8,9]

In this study laboratory evidence of Rubella infection in the form of IgM antibodies was found in 5.4% children of suspected congenital infections. The earlier studies have shown the declining trend in the incidence of congenital rubella syndrome from 34.5% in 1988 to 0% in 2002[10] and is much less than the earlier reports of 10–20%.[11,12] The reason for this declining trend shown by the most of the recent studies is

Table 1 – Age specific prevalence of Rubella, CMV and HSV-2 specific IgM antibodies in children.

Age group	Serology performed	No. tested	IgM positive	Percent positivity
0–29 days	CMV	54	15	27.7
	Rubella	54	2	3.7
	HSV-2	54	2	3.7
1 month–6 months	CMV	46	7	15.2
	Rubella	46	5	10.9
	HSV-2	46	1	2.2
>6 months–1 year	CMV	30	5	16.7
	Rubella	30	0	0
	HSV-2	30	0	0
Total	CMV	130	27	20.7
	Rubella	130	7	5.4
	HSV-2	130	3	2.3