

SEROPREVALENCE OF RUBELLA ANTIBODIES IN PREGNANT WOMEN

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Abstract

Introduction: Clinical or subclinical infection of rubella of pregnant mother gives rise to a handicap baby to the society. Some time affected baby born apparently normal, but subsequently expresses disability.

Objective: This study was carried out to see the seroprevalence of rubella antibodies in pregnant women.

Method: Single blood sample was taken from 134 pregnant women, 66 from 1st trimester, 36 from 2nd trimester and 32 from 3rd trimester. Blood samples were collected from different Out Patient Departments (OPD) of Combined Military Hospital (CMH) and Armed Forces Institute of Pathology (AFIP) over a period of six months. All the sera were examined by enzyme-linked immunosorbant assay (ELISA) for rubella specific Immunoglobulin M (IgM) and Immunoglobulin G (IgG).

Result: The over all prevalence of seropositivity for IgG was 84.33% indicating that they were immune for rubella infection and the rest 15.67% were susceptible for rubella infection. The seropositivity for IgM antibody was 0.75%, which was a single case found in 22 year old pregnant women in 3rd trimester and was 2nd gravida. The study demonstrated that 85.71% of the pregnant women between the ages of 15 to 20 years had rubella IgG, peaking at 87.80% in the age group 26-30 years and the seropositivity lower to 66.67% in the age group 31- 35 years.

Analysis of rubella specific IgG antibody among the different socio-economic group population in the present study, showed that seropositivity rate was much higher in lower (91.67%) socio-economic status group, 89.02% in middle status group and the difference was lower in upper (72.50%) socio-economic status group and the difference was statistically significant ($p < 0.05$). Higher (86.84%) incidence of seropositivity for IgG antibody was observed in women presenting with adverse pregnancy out comes than that the normal pregnancy (80.65%) out comes group.

Conclusion: The present study revealed that the

substantial percentage of pregnant women were susceptible for rubella infection. The findings of this study will help to formulate a guideline for taking nation wide vaccination program.

Key words: Rubella antibody, seroprevalence, pregnant women

Introduction

A physically or mentally handicapped child becomes burden for the family as well for the society. Some infections which the mother contacts during pregnancy may cause handicaps like infections caused by Rubella virus, Cytomegalovirus (CMV), Toxoplasma gondii and syphilis¹. These infections are usually subclinical and the affected children may born apparently well, but subsequently develop the evidence of mental retardation and other disabilities².

Mental retardation is observed from 0.2 to 0.5% in the population of USA and 0.3% in UK. It is estimated that 85% of the world's disabled children live in less developed countries³. The incidence of mental retardation (IQ<50) in Pakistan is 4.2%⁴. In Bangladesh, nearly 7% children have developmental disabilities⁵. Rubella virus is most consistent in its harmful effects on foetus. The virus can be transmitted to the foetus through the placenta and is capable of causing serious congenital defects (congenital rubella syndrome- CRS), abortion and still birth⁶. The risk of foetal infection is about 90% during first trimester, when the majority of these infants suffer from congenital defects⁷. Total or partial blindness (78%), sensorineural hearing loss (66%), psychomotor delay (62%), mental retardation (42%) and heart disease (58%) are commonly found in infants with congenital rubella⁸. Deafness is the most common sequelae and was found in two thirds of all children with congenital rubella infection⁹. There is a 2% mortality rate among the congenitally infected infants who were symptomatic at birth¹⁰. Diagnosis of rubella by clinical evidence may not be reliable and does not give a complete picture of the situation because nearly one half of individuals infected with this virus are asymptomatic⁶. Laboratory diagnosis includes isolation of virus and detection of rubella specific antibodies in the serum¹¹.

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In Bangladesh, a study was carried out in Dhaka in 1994-1995 on 120 disabled children. Amongst them 25 (20.83%) were seropositive for rubella specific antibody. It was found that 40% mother of the seropositive children had clinical history suggestive of rubella in the 1st trimester and 12% in the 2nd trimester of the pregnancy¹². Another study in Bangladesh on 50 congenitally handicapped children and their mothers found that prevalence of rubella antibody was 48% in children and 62% in the mothers of those children¹³. The risks of developing congenital defects are inversely related to gestational age. If the maternal infection occurs before 9 weeks of gestation the risk of foetal manifestations is 85%, if infection occurs between 9 to 12 weeks then the risk of foetal manifestations is 52% and foetal manifestations is rare if maternal infection occurs after 16 weeks of gestation¹⁴. These findings indicate that rubella infection in pregnancy is an alarming health hazard.

Prevention of morbidity and mortality from rubella infection depends on prevention of the infection in childbearing women and early recognition of maternal infection¹¹. The present study was carried out on the seroprevalence of rubella in pregnant women to see their immune status and their vulnerability to rubella infection.

Materials and Methods

Study was carried out at the Immunology Department of the Armed Forces Institute of Pathology (AFIP), Dhaka Cantonment covering period from October 2003 to March 2004. A total of 134 pregnant women were included in the prospective study in three groups. Sixty six cases from the first trimester, 36 cases from the second trimester and 32 cases from the third trimester were taken from different family out patient departments of Combined Military Hospital (CMH), Dhaka and out patients from AFIP irrespective of age and parity.

The economic conditions of the study subjects were ascertained by interviewing the pregnant women regarding their monthly income from all possible sources. The study populations were then categorized into different groups¹⁵:

- m **Low-income group** : Having monthly income of less than Taka 3000
- m **Middle income group** : Having monthly income between Taka 3001 and 20,000
- m **Upper income group** : Having monthly income more than Taka 20,000

About 2-3 ml of single blood sample was collected aseptically by venipuncture in a sterile, dry test tube from each pregnant woman. Sera samples were tested for detection of IgM and IgG antibody specific for Rubella virus by enzyme-linked immunosorbant assay (ELISA).

The tests were performed with commercially available kits and manufacturer's instructions were strictly adhered to in the performance and interpretation of the tests.

Results

Out of 134 cases 0.75% and 84.33% were seropositive for rubella specific IgM and IgG antibodies respectively. Relationship between duration of pregnancy and rubella specific IgG and IgM antibodies is shown in table-I. The distribution of age in different trimester is shown in (Table-II).

Table-I: Relationship between duration of pregnancy and Rubella specific IgM and IgG antibodies (n=134)

Gestational age	Seropositive Cases Number (%)	
	IgM	IgG
1st Trimester (n=66)	-	51 (77.27)
2nd Trimester (n=36)	-	33 (91.67)
3rd Trimester (n=32)	1 (3.12)	29 (90.63)

Table-II: Distribution of subjects according to age group and different trimester (n=134)

Age Group	1 st Trimester	2 nd Trimester	3 rd Trimester	Total (%)
15-20	10	07	04	21 (15.67)
21-25	26	13	15	54 (40.30)
26-30	21	10	10	41 (30.60)
31-35	09	06	03	18 (13.43)
Total	66	36	32	134

The mean age was 25.29 years and range was 17 to 35 years. Highest seropositivity of IgG (87%) was found in age group 26-30 year as well as 21-25 years age group (Table-III).

Table -III: Relationship between Rubella specific IgG with maternal age group (n=134)

Age group	Number	IgG Antibody Positive Number (%)
15-20	21	18 (85.71)
21-25	54	47 (87.04)
26-30	41	36 (87.80)
31-35	18	12 (66.67)
Total	134	113(84.33)

Relationships between rubella specific IgM & IgG antibodies with gravidity, socioeconomic condition and with previous obstetric performance are respectively shown in (tables IV, V and VI). High seroprevalence rate of IgG (91.67%) was found in lower socioeconomic group which is statistically significant ($\chi^2 = 6.9, p < 0.05$). Seropositivity for IgM antibody was found only in one case, which belonged to middle socioeconomic group. Out of 134 cases, 34 cases were primigravida. Rest of the 100 cases, 62 cases had normal pregnancy outcome.

In adverse previous pregnancy out come group one seronegative case had 2 abortions and one seropositive case had one stillbirth.

Table-IV: Relationship between Rubella specific IgM & IgG antibodies and gravida (n=134)

Parity	Number	Seropositive Number (%)	
		IgM	IgG
Primi Gravida	34	-	30 (88.24)
2 nd Gravida	56	01 (1.79)	50 (89.29)
3 rd Gravida	33	-	23 (69.70)
4 th Gravida	10	-	09 (90.00)
5 th Gravida	01	-	01 (100.0)
Total	134	01 (0.75)	113 (84.33)

Table-V: Seroprevalence of Rubella specific IgM and IgG in different socioeconomic groups (n=134)

Socioeconomic Group	Number (%)	Seropositive (%)	
		IgM	IgG
Upper	40 (29.85)	-	29 (72.50)
Middle	82 (61.2)	01 (1.22)	73 (89.02)
lower	12 (8.95)	-	11 (91.67)
Total	134 (100)	01 (0.75)	113 (84.33)

Table-VI: Relationship between Rubella specific antibody with previous obstetric performance (n= 100)

Obstetric Performance	Number (%)	IgG Seropositive Number (%)
Normal pregnancy outcome	62 (62)	50 (80.65)
Adverse pregnancy outcome	38 (38)	33 (86.84)
Total	100	83 (83.00)

All other adverse pregnancies, out come were spontaneous abortion in the 1st trimester of gestation.

Discussion

In the present study, sera from 134 pregnant women were taken. Out of them 66 from 1st trimester, 36 from 2nd trimester and 32 from 3rd trimester were examined for rubella specific IgM and IgG antibodies by ELISA. An attempt was made to assess the seroprevalence rate of rubella specific antibodies in pregnant women on the basis of serodiagnosis.

The over all prevalence of seropositivity for IgG was 84.33%, that means, they were immune for rubella infection and the rest 15.67% seronegative cases were susceptible for rubella infection. The prevalence of seropositivity for IgM was found in only one (0.75%) case. In a similar study in Pakistan; the over all seropositivity for rubella specific IgG was observed in 94% cases¹⁶. Another report from India showed the

seroprevalence rate in pregnant women was 67.8%, that is, a large group is susceptible for rubella infection¹⁷. In Malaysia, it was observed that the immunity of rubella in pregnant women was 92.3%¹⁸. In Iran, seropositivity rate among women of childbearing age were 96.2%, 93% and 94.9% in different studies¹⁹. Similar study was carried out in Haiti, and it was observed that the 95.2% cases were seropositive for rubella specific IgG and 4.8% pregnant women were susceptible for rubella²⁰. In Bangladesh, a study was carried out among antenatal population attending a tertiary level hospital in Dhaka City. In that study it was observed that 85.9% were seropositive and 14.1% were seronegative for rubella specific IgG antibody²¹. These results correlate with the present study.

In 1995-96, World Health Organization (WHO) conducted a study to assess the rate of CRS per 1000 live births in developing countries. These ranged from 0.6-2.2 and were similar to those reported from industrialized countries during the pre vaccine era. The same study also assessed seroprevalence among the women of child bearing age of 45 developing countries and 10-25% of the women tested were seronegative²². These findings point out the alarming fact that due to the failure to adopt an immunization policy, the susceptibility and rates of CRS have remained unchanged in developing countries even 30 years after the discovery of the rubella vaccine.

There is considerable variation in the prevalence of rubella antibodies among women of childbearing age. European women have relatively higher prevalence of rubella immunity (93.2%) as compared to women of African (86.7%) and Asian origin (78.4%). In India the reported figures vary from 53% to 94.1%. The reason for this difference in immunity is difficult to explain. However, factors such as net birth rate, population density, opportunities for entry of virus, level of herd immunity at the time of virus introduction and ethnicity of the population may be responsible for this variation¹⁷.

In the present study, the seropositivity for IgM antibody was 0.75%, which was a single case found in 22 years old pregnant women in 3rd trimester and was 2nd gravida. In Pakistan 3% of the study population were found seropositive for rubella specific IgM antibody in a study¹⁶. In India it was seen in one report that the seropositivity of IgM antibody was 6.5%²³. Present study demonstrated that 85.71% of the pregnant women between the ages of 15 to 20 years had rubella IgG, peaking at 87.80% in the age group 26-30 years. The seropositivity decreased to 66.67% in the age group 31-35 years. This result correlates with one study carried out in Bangladesh where 80% of the pregnant women were between ages of 15-20 year's group that had rubella IgG antibody. Seroprevalence increased with age, peaking at

87% in the age group of 26-30 years²¹. In India, one study showed that the seropositivity amongst the age group 16-25 years was 69.2%, 77.2% in 26-35 years and 59.3% in 36-45 years¹⁷. Therefore the age specific seroprevalence of the present study is similar to previous study in Bangladesh and also similar to the neighbouring country.

In the present study, 70.90% of pregnancies occurred in 21-30 year group, indicating a 11.2% risk of rubella infection during their pregnancies. It is similar to the study of Ashrafunnesa et al. Author observed that the 70% of pregnancies occurred at 21-30 year group²¹. Seroprevalence of IgG antibody from 43% amongst primigravida to 59% and 78% in multiparous grand multiparous women respectively were observed²⁴.

Analysis of rubella specific IgG antibody among the different socioeconomic group population in the present study showed that seropositivity rate was much higher in lower (91.67%) socioeconomic status group and lower in upper (72.50%) socioeconomic status group which is statistically significant ($p < 0.05$). Crowded living conditions in lower class population might increase the chance of exposure to rubella infection. In India a study showed the similar type of incidence in the different socioeconomic status group, rubella specific IgG antibody positive in 55.9% in upper group, 67.3% and 71.8% in middle and lower socioeconomic status group respectively¹⁷. In another study in Bangladesh, population from lower socioeconomic class showed higher prevalence of rubella antibody (69.2%) than the observed upper class (55.6%)²⁵.

In the present study, the higher (86.84%) incidence of seropositivity for IgG antibody was observed in women presenting with adverse pregnancy outcomes than that of the normal pregnancy (80.65%) outcomes group, suggested that rubella could be a cause of repeated pregnancy wastage in those women. Similar evidence was seen in Punjab, India that higher (73.2%) incidence was seen in the adverse pregnancy outcomes group than the normal (69.5%) obstetric outcomes group¹⁷.

Conclusion

Rubella in pregnancy especially during the first 12 weeks of pregnancy may lead to congenital malformation in the form of deafness, cataract, congenital heart disease, mental retardation and even foetal death. The outcome of congenital rubella is tragic consequence for both the infant and the parents. Rubella is a preventable viral disease after introducing successful vaccination. In large number of developing countries a proper and adequate vaccination policy was not adopted at national level. This is probably due to non-focusing on rubella-related problems or numerous other health-related issues keeping this important morbidity-related

issue out of sight. Also governments of these countries are not probably motivated to carry the huge economic expenditure required for rubella immunization program. This small preliminary study indicates that like many other countries rubella is an endemic condition in Bangladesh and the requirement of detailed study for identification and its influence on perinatal morbidity and mortality. More detailed epidemiological studies for a basis of national immunization program is also needed.

Providing a recommended vaccination program, early detection of maternal rubella infection, can easily be prevented congenital rubella by screening. Thus we can eradicate rubella like small pox from our global village.

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