

Seroprevalence of rubella antibodies in pregnant women attending tertiary care hospital in Rajasthan

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Abstract

Rubella is the leading vaccine-preventable cause of birth defects. Approximately 6-11% women of reproductive age group are susceptible for rubella infection. Risk of birth defects depends on the gestational age at which woman acquire infection. The prevalence of rubella immunity varies in different geographical area of the world depending on the immunization policy. In India, a woman's serologic status is rarely known before pregnancy and there are very few studies which were conducted to identify the serological status of rubella IgM and IgG antibodies in pregnant women. This study was, therefore, planned to detect presence of both antirubella IgM and IgG antibodies in pregnant women attending

antenatal clinic in the Department of Ob- Gy, S.M.S. Medical College, Jaipur, Rajasthan.

Material and method: 200 women who were willing to participate in the study were included in the study after obtaining informed written consent at their first ANC visit and a detail history regarding age, gravidity, parity, number of abortion was taken. Blood samples were analyzed for anti-rubella IgM and IgG antibodies.

Results: Rubella IgG seropositivity was found in 91.5% and IgM seropositivity was found only in 6.0%. 3.0% were negative for both Ig G and IgM antibodies. . 66% women gave history of receiving rubella vaccination. The highest IgG seropositivity was observed in women in the age group 26 to 30 years (95.1%), residing in urban area (92.1%), belonging to lower socio-economic status

(94.8%) and primipara (94.8%). 94.1% women with abnormal previous pregnancy outcome had Ig G seropositivity as compared to 71.6% women with normal previous pregnancy outcome.

Conclusion: Rubella is a preventable viral disease. There is a need to screen and immunize all adolescent girls and/or women of child-bearing age before conception to reduce incidence of congenital rubella syndrome and bad obstetric outcome.

Introduction

Viral infections in pregnancy are major causes of maternal and foetal morbidity and mortality. Rubella is the leading vaccine-preventable cause of birth defects. Rubella virus is a togavirus transmitted by airborne droplet or direct contact. Approximately 6-11% women of reproductive age group are susceptible for rubella infection. Rubella infection during pregnancy can result in miscarriage, fetal death, stillbirth, or infants with congenital malformations, known as congenital rubella syndrome (CRS). The clinical spectrum of CRS includes complete or partial blindness, sensorineural hearing defects, mental retardation, psychomotor delay and cardiac defects¹. However foetal damage depends on the gestational age at which woman acquires infection². If maternal infection occurs before 9 weeks of pregnancy, the risk of fetal manifestation is 85%, but it is only 52% if infection occurs between 9-12 weeks and damage is rare if it occurs after 16 weeks of gestation³.

The prevalence of rubella immunity varies in different geographical area of the world however the differences are attributed to the immunization policy on rubella in the different countries with high immune responses.⁴ In developed countries of Northern Europe and USA the prevalence of rubella immunity has been reported to be as high as 95%⁴ while in India sero-prevalence of rubella infection in pregnant women varies from 6.5% in

asymptomatic to 26.8% in pregnant females with bad obstetric history.⁵

The presence of rubella-specific IgG antibodies in an unvaccinated population is a long-term marker of previous rubella infection and immunity status, and the antibodies persist life long, protecting the individual from further infections.^{6,7} A study conducted in Tamil Nadu (South India) among unvaccinated girls aged 10–16 shows the presence of protective antibodies in 86.5%.⁶ A similar study in North India (mean age of 10.7 years) reported that 90% have protective antibodies.⁸ It was estimated that in India, about 50% of children acquire rubella antibodies by the age of 5 years and 80–90% become immune by 15 years by naturally acquired rubella.^{6,8} All these studies were conducted before the widespread use of rubella vaccine in private sectors of India. Nowadays rubella vaccine is included in National childhood vaccination program to ensure high immunity and coverage.

In Saudi Arabia antenatal rubella IgG antibody screening is routinely performed during the first antenatal visit, enabling the identification of susceptible women, who can subsequently receive postpartum vaccination.⁹ However, because of the expense of screening, it is not recommended in all countries.¹⁰ In India, a woman's serologic status is rarely known before pregnancy and there are very few studies which were conducted to identify the serological status of rubella IgM and IgG antibodies in pregnant women. This study was, therefore, planned to detect presence of both antirubella IgM and IgG antibodies in pregnant women attending antenatal clinic in the Department of Ob- Gy, S.M.S. Medical College, Jaipur, Rajasthan.

Material and method

This is a hospital based, prospective, cross-sectional, study conducted in the Department of Obstetrics and Gynaecology, S.M.S. Medical College, Jaipur, Rajasthan.

Women who were willing to participate in the study were included in the study after obtaining informed written consent at their first ANC visit and a detail history regarding age, gravidity, parity, number of abortion was taken. Blood samples were taken and sera were analyzed for anti-rubella IgM and IgG antibodies using enzyme-linked immunosorbent assay. The tests were performed according to manufactures instructions. Samples were interpreted as positive if their rubella IgM or IgG index was equal to or higher than the defined rubella IgM or IgG index, which was 1. All samples with an index of 0.90 or less were interpreted as negative, and those with an index of 0.91–0.99 were equivocal. Data were entered in MS excel sheet and statistically analyzed. A p value <0.05 was considered as significant.

Results

In present study 200 women of child bearing age (16 - 40 years) were included. Mean age and gravidity of the women were 25 ± 3.8 years and 1.8 ± 0.9 respectively. Majority of the women (55.0%) were in their second trimester followed by 30.5% in third trimester and 14.0% in first trimester.

Rubella immune status of pregnant women is shown in figure 1. Overall rubella IgG seropositivity was found in 183 (91.5%) and IgM seropositivity was found only in 12 case (6.0%). Out of 17 women who were IgG seronegative, 6 were negative for both Ig G and IgM antibodies and they were advised to receive rubella vaccine after delivery.

Fig 2: shows status of previous rubella vaccination. In our study out of 200 pregnant women screened, 91.5% were Ig G seropositive. 66% women (132/200) gave history of receiving rubella vaccination, 13 % do not know about the vaccination status. Our study, similar to other studies, have shown that high proportion of our women has rubella

immunity suggesting exposure to previous rubella attacks either through vaccination or natural exposure.

Table 1 shows seroprevalence of rubella Ig G and Ig M antibodies among pregnant women according to their socio-demographic profile. Women above 31 years of age had the lowest observed IgG seropositivity while women in age group 26 to 30 years had the highest (95.1%) IgG seropositivity, no statistically significant difference among age groups was seen (p value 0.5). The prevalence of rubella seropositive women was more in those residing in urban areas (92.2%) as compared to those of rural areas (91.1%). Statistically the difference was not significant (p 0.77). A decline in the immune status with rising socioeconomic status was also observed and the difference in seropositivity between upper and lower class was found to be not statistically significant (p 0.2). Second gravida women had the highest IgG seropositivity (93.1%) followed by primigravida (91.1%). No statistically significant difference was seen (p value 0.5) in women according to gravidity. Primipara women had the highest observed IgG seropositivity (94.8%) while women who had a parity of 3 or more had the lowest observed IgG seropositivity (25%). There was no significant difference on the basis of parity (p value 0.5).

Majority of the women in our study were in their second trimester (55.5%) and third trimester (30.5%) and only 13% were in their first pregnancy. However, the proportion of Ig G seropositivity was higher in women in their first trimester (92.9%) followed by women in second trimester (90.9%), it was statistically not significant (p value 0.9). (Table 2)

Seroprevalence of rubella IgM and IgG antibodies among pregnant women according to their previous pregnancy outcome is shown in Table 3. Out of 100 women who were second gravida or more, 81 had normal pregnancy outcome and 19 women had abnormal previous pregnancy

outcome in the form of abortion, preterm delivery or stillbirths. Out of 81 women with normal previous pregnancy outcome IgG seropositivity was seen in 71.6% while 94.1% women with abnormal previous pregnancy outcome had Ig G seropositivity. There was statistically significant difference among women according to their previous pregnancy outcome (p value 0.03). Ig M seropositivity was seen in 10.5% women with abnormal previous pregnancy outcome as compared to 1.2% women with normal previous pregnancy outcome. There was statistically significant difference in women with abnormal previous pregnancy outcome and normal pregnancy outcome (p value 0.03).

Discussion

In our study 200 pregnant women were tested for rubella IgG and IgM antibodies, out of them, 183 (91.5%) were positive for rubella IgG antibodies, 12 (6.0%) for positive for rubella IgM antibodies and 6 (3.0%) were negative for both IgG and IgM antibodies.. There is considerable variation in the prevalence of rubella antibodies among women of childbearing age in different parts of the world. 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%¹¹. 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 variation¹² Our findings of 91.5% seropositivity is comparable with the 90.05%, 91.6%, 93.1% and 94.3% observed by Raza S et al¹³, SharifaA.Alsibiani⁹, Olajide et al¹⁴ and Thayyil Jayakrishnan et al¹⁵ respectively and is much higher than those observed by Shilpi Gupta et al¹⁶, Singla et al. ¹², Yadav et al. ¹⁷, conducted in various part of India and

Nessa A et al. ¹⁸, Ouhaiya et al. ¹⁹, Hasan ARSH et al. ²⁰ from outside India.

In our study rubella IgM antibodies seropositivity is found in 12 case (6.0%). Seropositivity for rubella Ig M in our study was comparable to 5.0% observed by Taku NA et al²¹ in their study and was higher than that observed in the studies of Shilpi Gupta et al¹⁵, Jubaida N et al.¹¹, and lower than that observed in the studies of Yasodhara P et al.²², Chopra S et al.²³ and Naveen Thapliyal et al ²⁴.

A lack of immunity against rubella was seen only in a small number of pregnant women in our study. The proportion of these susceptible women was only 3.0% pregnant women, these were at risk of rubella infection during pregnancy and may give birth to infants with CRS. These women were counseled and advised rubella vaccination after delivery. The proportion of susceptible women in our study was comparable with that observed by Taku NA et al in their study.²¹

In this study according to age, 16-25 year age group prevalence of rubella IgG antibodies was found to be 89.5% which gradually increased in the age group of 26-30year (95.1%) and is decreased in women above 31 years (86.7%). Similar increasing trend in seropositivity as age increases is found in the study conducted by other authors^{25,26}. However study conducted by Vijayalaxmi P et al.²⁷ and Gupta E et al.²⁸ had reported decreasing seroprevalence of rubella IgG antibodies as age increases. There was no significant difference between age groups thus establishing the facts that rubella affects all age groups

Similar to previous hospital based studies, our study also reported that the rubella immunity have no relation with parity¹⁵. In our study primigravida had slightly lower rate of immunity compared to multigravida (91% and 92%) which was consistent with the observation made by Kolawole OM et al²⁹ and in contrast to that observed in a

study from UP reported that primi have higher rate of immunity compared to multigravida (89% and 84.3%) which was also non significant³⁰.

Women who were in first trimester had the highest IgG seropositivity (92.9%) followed by women in second trimester (90.9%). There was statistically no significant difference seen in women according to their trimester of pregnancy (p value 0.9). Our results were consistent with the results observed by Bamgboye A E et al⁴ and Kolawole OM et²⁹ in their study. This shows that majority of the women are immunized, therefore the risk of congenital rubella syndrome is very low.

In our study the seropositivity of rubella IgG and IgM antibodies was higher (94.7% and 10.5%) in women with history of previous adverse pregnancy outcome as compared to women with normal obstetric performance (71.6% and 1.2%), the difference between these two groups is statistically significant (p value 0.03). Observations made in our study were consistent with the observations made by various studies done in India^{12,16} and Bangladesh¹¹. In the study conducted by Gandhoke et al.³¹ in Delhi over 15 years, 5022 samples from pregnant women were evaluated; the seroprevalence of rubella infection was higher in women with bad obstetric history (87%) compared to those with normal pregnancy outcome (83%). Higher incidence of seropositivity observed in women presenting with adverse pregnancy outcomes may suggest that rubella could be a cause of repeated pregnancy wastage in these women¹².

Conclusion

Rubella is a preventable viral disease. Rubella vaccination and early detection of maternal rubella infection by screening can prevent birth of babies with congenital rubella syndrome.

The current study advocates a continuation of the vaccination program among infants, antenatal screening and postnatal vaccination for nonimmunized women. There is a need to screen and immunize all adolescent girls and/or women of child-bearing age before conception to reduce incidence of congenital rubella syndrome and bad obstetric outcome.

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Legends Figure and Table

Figure 1: Rubella immune status of pregnant women

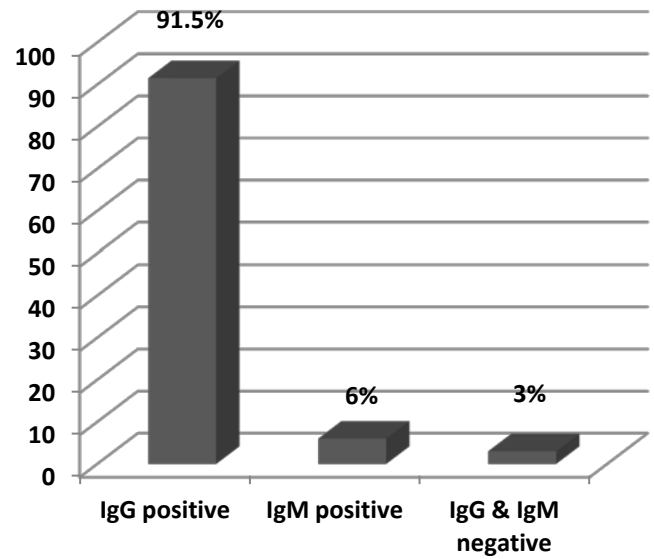


Fig 2: History of previous rubella vaccination

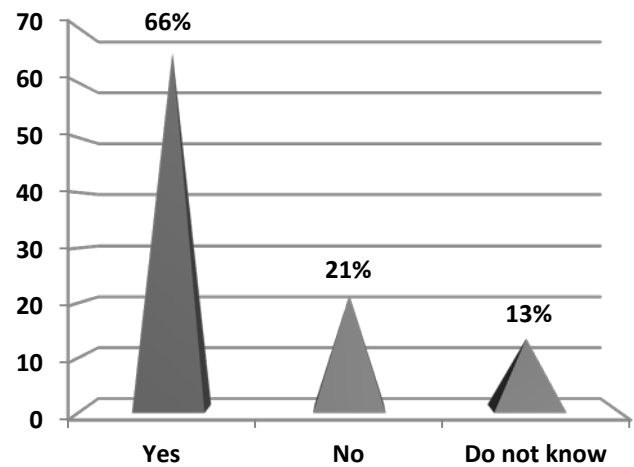


Table 1: Seroprevalence of rubella antibodies according to Socio-demographic profile of the women

Variables	Number analyzed (n=200)	Ig G positive			Ig M positive		
		Number Positive (n=183)	%	P value	Number positive (n=12)	%	P value
Age (years)							
16-20	19	18	94.7	0.5	1	5.3	0.2
21-25	105	93	89.5	Not significant	8	7.6	Not significant
26-30	61	58	95.1		1	1.6	
>31	15	13	86.7		2	13.3	
Residence							
Rural	123	112	91.1	0.77	8	6.5	0.7
Urban	77	71	92.2	Not significant	4	5.2	Not significant
Socio-economic status							
Upper	65	57	87.7	0.2	1	1.5	0.4
Middle	38	34	89.4	Not significant	2	5.3	Not significant
Lower	97	92	94.8		5	5.2	
Gravidity							
Primigravida	100	91	91.0	0.8	8	8.0	0.4
Second gravida	59	55	93.2	Not significant	2	3.4	Not significant
Third gravida	33	30	90.9		1	3.0	
Fourth gravida	8	7	87.5		1	12.5	
Parity							
Nullipara	109	99	90.8	0.5	9	8.3	0.1
Para 1	58	55	94.8	Not significant	1	1.7	Not significant
Para 2	29	26	89.7		1	3.4	
Para ≥3	4	3	25.0		1	25.0	

Table 2: Seroprevalence of rubella Ig G and Ig M antibodies among pregnant women according to their trimester of pregnancy

Trimester of pregnancy	Number analyzed	Ig G positive			Ig M positive		
		Number positive	Percentage	P value	Number positive	Percentage	P value
1 st Trimester	28	26	92.9	0.9	3	10.7	0.4
2 nd Trimester	111	101	90.9	Not sig	5	4.5	Not sig
3 rd Trimester	61	56	89.3		4	6.6	
Total	200	183	91.5		12	6.0	

Table 3: Seroprevalence of rubella IgM and IgG antibodies among pregnant women according to their previous pregnancy outcome

Previous Pregnancy outcome	Number analyzed	Ig G positive			IgM positive		
		Number positive	Percentage	P value	Number positive	Percentage	P value
Normal pregnancy outcome	81	58	71.6	0.03 Sig	1	1.2	0.03 Sig
Abnormal previous pregnancy outcome	19	18	94.7		2	10.5	
Total	100	76	76.0		3	3.0	

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