

Sero-prevalence of Rubella Virus Antibodies in Pregnant Women in the Vicinity of Lucknow, Uttar Pradesh

Ananya Gupta¹, Parul Jain² and Amita Jain³

Abstract

Background and objectives: The acute infection caused by rubella virus during pregnancy sometimes leads to adverse fetal outcomes including congenital rubella syndrome. Data on prevalence of rubella among pregnant women is inadequate from India. Therefore, the present cross-sectional study was conducted to determine the seroprevalence of rubella among pregnant women in Lucknow region of North India.

Methods: Pregnant women visiting antenatal clinics were examined for the presence of anti-rubella virus IgG antibodies using commercially available ELISA kits.

Results: Of the total 152 pregnant women enrolled in the study, 134 (88.2%) women were positive for anti-rubella virus IgG antibodies. The difference in seropositivity and geometric mean titers of anti-rubella virus IgG antibodies among different age groups of pregnant women was not statistically significant (p-value: 0.35 and 0.83 respectively). No relationship was observed between parity and anti-rubella virus IgG positivity (p-value: 0.23).

Key words: Congenital rubella syndrome, North India, Rubella virus, Pregnant women, Prevalence, Vaccination

1 MBBS student, King George's Medical University, Lucknow, India

2 MD-PhD Scholar, Department of Microbiology, King George's Medical University, Lucknow, India

3 Professor, Department of Microbiology, King George's Medical University, Lucknow, India

Corresponding Author:

Dr. Amita Jain, Professor

Department of Microbiology, King George's Medical University, Lucknow-226003, India,

Tel: 919415023928

✉ amita602002@yahoo.com

Introduction

Rubella virus is a member of family *Togaviridae* that usually causes a mild, self limiting infection in children and adults. The virus is of high public health significance owing to its ability to cause congenital rubella syndrome (CRS), abortion and still births. The clinical spectrum of CRS includes complete or partial blindness, sensorineural hearing defects, mental retardation, psychomotor delay and cardiac defects [1]. Although rubella vaccination has drastically reduced the incidence, approximately 100,000 children are still born with CRS worldwide as per the World Health Organization estimates [2]. Analysis of seroprevalence based statistical model indicates 46,621 births of infants with CRS annually in the South- East Asian Region (SEAR) during 2000-2009 [3]. Regional rubella surveillance data is essential to form a national strategy to curtail the morbidity due to rubella virus infection. Thus the present study was conducted to estimate the percentage of pregnant women in the vicinity of Lucknow, Uttar Pradesh (UP), susceptible to rubella virus infection.

Material and Methods

The present cross-sectional study included healthy pregnant women at any gestational age, attending the Department of Obstetrics and Gynecology, King George Medical University (K.G.M.U.), Lucknow for antenatal checkup from May 2013 to July 2013. The study commenced after receiving approval from the Institutional Ethics Committee. Written informed consent was obtained from patients prior to screening and enrollment. Approximately, 2 ml of blood sample was collected from each case. Serological evaluation for rubella virus was done by ELISA in the virology laboratory, K.G.M.U. using kits available commercially (DSI, S.r.l., Italy). The kit can estimate anti-rubella virus IgG antibodies in serum both qualitatively and quantitatively. Based on the manufacturer's instructions sera samples with a titer < 15 IU/mL were classified as negative for anti-rubella virus IgG; samples with titers of ≥ 20 IU/mL were classified as positive; and samples with a titer of 15 to < 20 IU/mL were classified as equivocal. Statistical analysis was done by GraphPad Prism

version 5. In case of nominal variables, intergroup comparison was done using Chi square test. P value < 0.05 was considered significant.

Results

A total of 152 pregnant females, with a mean age of 26 yrs (range: 20-42 years) were enrolled in the present study, of which 134 (88.2%) and 18 (11.8%) females respectively tested positive and negative for anti-rubella virus IgG antibodies. Accordingly, the sero-prevalence of rubella virus was found to be 88.2% and 11.8% females were susceptible to rubella virus infection. Highest sero-positivity was found in the 20-<25 yrs age-group though the difference between age groups was not statistically significant (p-value: 0.35) (**Table 1**). The geometric mean titers (GMT) of anti-rubella virus IgG antibodies were analyzed; no significant difference was observed between age groups (p-value: 0.83) (**Table 1**). No relationship was observed between parity and anti-rubella virus IgG positivity: 89% (73/82) primi- gravida women were positive as compared to 84.3% (59/70) multi-gravida women (p-value: 0.23).

Discussion

Serological surveys are essential for knowing the epidemiology of infectious diseases, based on which the health policies may be designed. Several such sero-epidemiological surveys from India have shown that 10 to 28 per cent pregnant women have no immunity (by natural infection or immunization) to rubella virus [4-6] infection and thus are at risk of acquiring the infection during pregnancy. Studies from Delhi [7], North India and Puducherry [8], south India have reported rubella IgG seropositivity in approximately 87% of pregnant women. Another study from Delhi reported that the susceptibility of pregnant women to Rubella virus decreased over a period of 15 years, from 51% in 1988 to 13% in 2002 [9]. In 1976, a case control study from Lucknow [10] demonstrated that 12% of

cases (pregnant women with bad obstetric outcome) and 18% of controls (pregnant women with normal obstetric history) were seronegative for rubella. Another study from Lucknow in 1982 [11] estimated that approximately 21% of 300 pregnant women were sero-negative for rubella. Though, over 32 years, the susceptibility of pregnant women to rubella in Lucknow has decreased to 11% in 2014, the values obtained in the present study are disturbing considering the WHO guidelines [12], which suggest that CRS can occur even when susceptibility levels in women are less than 10%. India is one of the 52% developing nations that are yet to incorporate the rubella vaccine in combination with measles and mumps vaccine (MMR vaccine) in the national immunization schedule, though these countries account for two-third of the global birth cohort [13]. In India, currently the MMR vaccine is offered to children aged 16-24 months as a part of the State health policy in Delhi, Goa, Puducherry and Sikkim. UP relies only on private practitioners for rubella vaccination. This may be the reason for the high susceptibility to rubella among female population of UP.

Previous studies have reported that for rubella virus, both the number of seropositives, and the titers of protective antibodies increase with increasing age [14]; more frequent exposure of the older age groups to the virus has been given as a possible explanation. In contrast to the previous findings, the present study demonstrated no change in the immunity to rubella virus with age. The possible decline in the incidence of rubella virus infection in infants owing to MMR vaccination may contribute to similar prevalence and antibody levels across all the age groups, though pregnant women continue to be exposed to rubella in children and adults. An increase in CRS cases may be predicted in such settings from mathematical models [15] because those who would normally be infected as children will remain susceptible until they reach adolescence and adulthood. Estimating the burden of CRS, therefore becomes very important in UP. In the present study, anti-rubella virus IgG positivity was not related to parity of women as has been reported previously [14].

The present study shows that a significant proportion of pregnant females are still susceptible to rubella virus infection in India. Adoption of adequate rubella vaccination policy along with strengthening surveillance for estimation of percent population susceptible to rubella virus infection, remain the cornerstone for the control of CRS in India.

Acknowledgement

The intramural grant number STS- 2013-00062 by Indian Council of Medical Research, New Delhi is acknowledged.

Age group	No of antenatal women enrolled	Anti-Rubella virus IgG positive women (%)	p-value	Geometric Mean Titers of anti-Rubella virus IgG antibodies	p-value
20-<25 yrs	56	54 (96.4)	0.35	575.91	0.83
25-<30 yrs	66	54 (81.8)		464.84	
30-<35 yrs	18	16 (88.9)		564.62	
>35 yrs	12	10 (83.3)		521	
Total	152	134 (88.2)			

Table 1 Relationship between maternal age group and anti-rubella virus IgG antibodies.

References

1. Dewan P, Gupta P (2012) Burden of Congenital Rubella Syndrome (CRS) in India: a systematic review. *Indian Pediatr* 49: 377-399.
2. Vijayalakshmi P, Anuradha R, Prakash K, Narendran K, Ravindran M, et al. (2004) Rubella serosurveys at three Aravind Eye Hospitals in Tamil Nadu, India. *Bull World Health Organ* 82: 259-264.
3. Centers for Disease Control and Prevention (CDC) (2010) Progress toward control of rubella and prevention of congenital rubella syndrome --- worldwide, 2009. *MMWR Morb Mortal Wkly Rep* 59: 1307-1310.
4. Singh MP, Arora S, Das A, Mishra B, Ratho RK (2009) Congenital rubella and cytomegalovirus infections in and around Chandigarh. *Indian J Pathol Microbiol* 52: 46-48.
5. Fomda BA, Thokar MA, Farooq U, Sheikh A (2004) Seroprevalence of rubella in pregnant women in Kashmir. *Indian J Pathol Microbiol* 47: 435-437.
6. Yasodhara P, Ramalakshmi BA, Naidu AN, Raman L (2001) Prevalence of specific IGM due to toxoplasma, rubella, CMV and c.trachomatis infections during pregnancy. *Indian J Med Microbiol* 19: 52-56.
7. Gupta E, Dar L, Broor S (2006) Seroprevalence of rubella in pregnant women in Delhi, India. *Indian J Med Res* 123: 833-835.
8. Raveendran V, Pragash DS, Manju, Shaker IA, Rayapu V (2012). Seroprevalence of rubella in antenatal women in and around Kirumampakkam, Puducherry. *Int J Bioassays* 1: 74-78.
9. Gandhoke I, Aggarwal R, Lal S, Khare S (2005) Seroprevalence and incidence of rubella in and around Delhi (1988-2002). *Indian J Med Microbiol* 23: 164-167.
10. Chaturvedi UC, Tripathi BN, Mathur A, Singh UK, Mehrotra RM (1976) Role of rubella in congenital malformations in India. *J Hyg (Lond)* 76: 33-40.
11. Mathur A, Tripathi R, Chaturvedi UC, Mehra P (1982) Congenital rubella following inapparent rubella infection. *Indian J Med Res* 75: 469-473.
12. (2011) Rubella vaccines: WHO position paper. *Wkly Epidemiol Rec* 86: 301-316.
13. Taneja DK, Sharma P (2012) Targeting rubella for elimination. *Indian J Public Health* 56: 269-272.
14. Adam O, Makkawi T, Kannan A, Osman ME (2013) Seroprevalence of rubella among pregnant women in Khartoum state, Sudan. *East Mediterr Health J* 19: 812-815.
15. (1993) Rubella and pregnancy. ACOG Technical Bulletin Number 171--August 1992. *Int J Gynaecol Obstet* 42: 60-66.