



## RUBELLA SEROPREVALENCE AMONG UNVACCINATED ADOLESCENT GIRLS IN CHENNAI

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### ABSTRACT

Rubella infection occurring during early pregnancy results in Congenital Rubella Syndrome. To estimate the seroprevalence of rubella among adolescent girls attending a tertiary care hospital. 75 adolescent girls in the age group of 10- 19 years who had not received MMR vaccine were included in the study. Serum IgG antibody titre for rubella was estimated by the ELISA method. 78.7% of the adolescent girls were found to be rubella seropositive. The urban adolescent girls had a higher seropositivity of 85.2% as compared to rural adolescent girls (P value= 0.0004). The socioeconomic status was not significantly associated (P>0.5) with rubella seroprevalence. The study indicates that a substantial number of adolescents (21.3%) are seronegative and hence susceptible to rubella infection. Hence, India should focus on the addition of catch up vaccination for Rubella among adolescent girls in the National Immunization Schedule to prevent congenital rubella syndrome.

**KEY WORDS:** Rubella seroprevalence; adolescent girls; Rubella vaccine; National Immunization Schedule.



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Received on : 03-09-2016

Revised and Accepted on : 08-12-2016

DOI: <http://dx.doi.org/10.22376/ijpbs.2017.8.1.p163-166>

## INTRODUCTION

Rubella infection occurs worldwide. Almost 50 to 65% of the infections is asymptomatic. Rubella infection occurring during pregnancy results in abortion, stillbirth and complications in the newborn called Congenital Rubella Syndrome (CRS). The risk of severe fetal anomalies is highest when rubella infection is acquired during the first 16 weeks of pregnancy. Congenital rubella syndrome is characterized by microcephaly, cataract, pigmented retinopathy, microphthalmia, sensorineural deafness, cardiac anomalies predominantly patent ductus arteriosus and pulmonary artery stenosis, intellectual disability, low birth weight, thrombocytopenic purpura, jaundice and hepatosplenomegaly<sup>2</sup>. In 1969, the rubella vaccine was first licensed in the United States and the vaccination program was established with the goal of preventing CRS. The United States documented the elimination of endemic rubella and CRS in 2004 and this was sustained through 2011<sup>3</sup>. However, rubella continues to be endemic in many parts of the world. WHO estimates that worldwide more than 100,000 children are born with CRS each year and most of them are in the developing countries. Sero-surveys conducted in different parts of India have found that 5 to 67% of women are susceptible to Rubella infection<sup>4</sup>. The National Technical Advisory Group on Immunization and the Standing Technical Sub-Committee (STSC) recommended two doses of Measles – Rubella (MR) vaccines in the Universal immunization program (UIP) at 9 months and 16-24 months of age. With the goal of preventing congenital rubella syndrome that results in devastating health burden, Indian Academy of Pediatrics has also recommended 2 doses of MMR for children<sup>5</sup>. The vaccine is being introduced in a phased manner in a few states in the National Immunization Schedule. An important fact that needs mention is that currently the Rubella containing vaccine is not routinely administered to adolescent children as catch up vaccine in the government healthcare policy. This study was conducted to estimate the seroprevalence of rubella among unvaccinated adolescent girls. This provides an estimate of the epidemiologic burden of Rubella in the community. Adolescent girls were selected because they are at a critical stage of child bearing age and their immunity should be a particular area of interest.

## MATERIALS AND METHODS

This cross sectional study was conducted over a 1 year period from July 2013 to August 2014. Seventy five adolescent girls in the age group of 10- 19 years belonging to both urban and rural areas were included in this study. Adolescent girls who had received rubella vaccination and those who were on immunosuppressive therapy or with immunocompromised status were

excluded from the study. Study was conducted after obtaining the Institutional Ethical committee approval. A pre structured questionnaire containing demographic details, anthropometric measurements and examination findings was used. Socio Economic Status was classified based on the modified Kuppuswamy scale. Informed consent was obtained from all the parents and assent was obtained from the participants. Under strict aseptic Precautions, 2 ml of blood was collected and sera separated in sterile plastic containers and stored in the central laboratory at - 20°C. Detection of anti-rubella IgG antibodies was done by using ELSIA method, IgG for rubella persist for life and hence it is used as the serological marker for immunity, Euroimmun Rubella IgG Quant kit which is a quantitative enzyme linked immunosorbent assay for detection of IgG antibodies for Rubella was used in our study, (Medizinische Labordiagnostika AG, EI\_2590G\_A\_UK\_C08.doc, Version: 8/11/2013). A value of  $\leq 11$  IU/ml was taken as the threshold for negative serology and a value  $> 11$  IU/ml as seropositive as per the recommendations of the kit manufacturer. The statistical analysis was performed using IBM SPSS Version-20. Categorical data were presented as actual numbers and percentages. Continuous data were expressed as Mean and SD. For normally distributed data, between group analyses was performed using unpaired t test. Categorical variables were analyzed with "Fisher's exact test". For statistical significance, a two tailed probability value of less than 0.05 was considered.

## RESULTS

In our study a total of 75 adolescent girls aged 10 to 19 years were enrolled. Fifty nine (78.7%) of adolescent girls were seropositive and 16 (21.3%) of adolescent girls were found to be seronegative and hence susceptible for rubella infection. Our study revealed the prevalence of seropositivity to be 54.2%, 37.3% and 8.5% among 10-13 years, 14-16 years and 17-19 years respectively. This association was found to be statistically significant ( $P < 0.0001$ ). In our study, seropositivity was higher in urban as compared to rural population. 85.2 % of urban adolescent girls were seropositive while 61.9% of rural adolescent girls were seropositive ( $P$  value = 0.0004). 2.6 % of adolescent girls belonged to socio-economic status (SES) I, 13% of adolescent girls were in SES II, 52% of adolescent girls were in SES III, 28% of adolescent girls were in socio-economic status IV and 4.4% belonged to SES class V. The socioeconomic status of the family was not significantly associated ( $P > 0.5$ ) with rubella seroprevalence. A past history of exanthematous illness was present in 59 girls (78%) out of 75 girls. Adolescent girls with a history exanthematous illness had a higher level of rubella antibody titre and this was found to be statistically significant. ( $P < 0.0001$ ).

**Table 1**  
**Association between socio-demographic factors and Rubella seroprevalence**

No	Particulars		Seroprevalence		p
			Seropositive	Seronegative	
			Number of children n (%)	Number of children n (%)	
1	Age (years)	10-13 yrs	32(54%)	3(18.8%)	<0.0001
		14-16 yrs	22(37%)	8(50.0%)	
		17-19 yrs	5(8.5%)	5(31.2%)	
2.	Place of living	Urban	46(85%)	8(14.8%)	0.0004
		Rural	13(62%)	8(38.1%)	
3.	H/O Exanthematous Illness	Absent	2(3%)	14(87%)	<0.0001
		Present	57(97%)	2(13%)	
4.	Socio-economic status	I	2(4%)	0	0.5
		II	9(15%)	1(6%)	
		III	29(49%)	10(62%)	
		IV	16(27%)	5(32%)	
		V	3(5%)	0	

## DISCUSSION

The future looks towards eliminating rubella and congenital rubella syndrome due to the devastating complications. In 2012 the Measles Initiative, now known as the Measles & Rubella Initiative launched a new Global Measles and Rubella Strategic Plan for the period 2012-2020. The Plan includes goals to achieve measles and rubella elimination in at least 5 WHO regions by the end of 2020<sup>6</sup>. India has a huge birth cohort of 27 million. CRS is a preventable cause of mental retardation, childhood blindness and deafness, which has life-long special health and social needs. The endemicity of Rubella has been well established in India. But official data regarding the prevalence of acquired and congenital rubella infection is not available as rubella infection is not a notifiable disease. In our study, 78.7% of adolescent girls were seropositive. The overall seronegativity was 21.3% indicating susceptibility to acquire rubella infection. Based on the rubella serosurvey study done in Tamil Nadu it was found the proportion of susceptible women gradually increased from 4% in the 1980s to 15% in 2004<sup>7</sup>. This suggests endemic levels of viral circulation in the community. Another study from Tamil Nadu done in 2004 showed that 13.5% of the adolescent girls were seronegative<sup>8</sup>. As per the WHO guidelines even when the susceptibility levels in women are below 10 per cent,

congenital rubella syndrome can occur. The study done in Chennai in 2014 showed a rubella seroprevalence of 58% among children aged 1 to 14 years<sup>9</sup>. In our study, seropositivity was higher in urban population as compared to rural. 85.2% of urban adolescent girls were seropositive whereas 61.9% of rural adolescent girls were seropositive (P value= 0.0004). This finding is in concurrence with a study from Maharashtra by Hitt et al<sup>10</sup>. In this study, we found no statistical significant association between susceptibility of rubella infection among adolescent girls with relevance to socioeconomic status. This finding is in concurrence with a study done by Tuna Demirdal in Turkey<sup>11</sup>. But a study conducted in New Delhi by Rustgi reported a high seronegativity and hence susceptibility to rubella, especially among adolescents belonging to the high socio-economic group<sup>12</sup>. A past history of exanthematous illness was present in 59 girls (78%). Adolescent girls with a history exanthematous illness had a higher level of rubella antibody titer and this was found to be statistically significant. Studies done in Turkey did not find a similar association<sup>11</sup>. Most of the western world has eliminated congenital rubella syndrome since 2004<sup>13</sup> but India has still a long way to go towards achieving this goal. Since, there is no specific treatment for rubella infection, vaccination is the primary means of preventing CRS<sup>14</sup>. Rubella containing vaccine is being

introduced in a phased manner in our National Immunization Schedule for young children<sup>15</sup>.

## CONCLUSION

This study indicates that a substantial number of adolescent girls will reach childbearing age without immunity against rubella and are thus at an increased risk of acquiring the infection during pregnancy. This in turn

will infect the fetus which may result in congenital rubella syndrome (CRS). Hence, it may be recommended that catch up vaccination for Rubella for the adolescent girls should be included in the National Immunization Schedule to eliminate Congenital Rubella Syndrome in our country.

## CONFLICT OF INTEREST

Conflict of interest declared none.

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