



Susceptibility to Rubella among College Students

Vikas Yadav¹, Sunil Kumar², Renu Yadav³

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Author's Affiliation:

¹Station Health Officer, Dept of Community Medicine, SHO Babina, Jhansi;

²Lecturer, Dept of Microbiology, Command Hospital Kolkatta;

³Resident, Apana clinic, Vasco Goa;

Correspondence

Dr. Vikas Yadav
vksydv84@gmail.com

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ABSTRACT

Introduction: Despite a safe and effective vaccine being available for more than two decades, in India, so far there has been no clear-cut policy regarding rubella immunization of children either at 15 months or young girls at child bearing age. Studies from India and abroad have found that 10-20% women in childbearing age are susceptible to rubella. Between 6-12% of babies born with congenital malformations or infections have serological evidence of rubella.

Methodology: Study was conducted in degree colleges (a health science college/medical college and a general stream). WHO rubella questionnaire was suitably modified. The questionnaire was then validated with pilot study in a group of subjects. A venous blood sample was drawn from each study subject and sent on the same day for ELISA for qualitative determination of IgG- class antibodies against rubella.

Result: Presence of over 16% susceptible college students to rubella suggests the possibility of transmission among non-immune individuals. Seropositivity to rubella antibodies was found to be higher amounts males, participants from urban area and participants belonging to high socio-economic status as compared to their counterparts.

Conclusion: There is a need for reviewing the necessity of rubella vaccination in National Immunisation Schedule.

Key words: Rubella, Susceptibility, Vaccination.

INTRODUCTION

Rubella, also called German measles, is a viral infection of children and adults, and most often occurs in late winter and early spring. Before rubella vaccine was used, children 5 to 9 years old accounted for most of the cases. The disease was initially thought to be generally mild, to occur mostly in childhood and have few complications. In 1941, however, an Australian ophthalmologist, Norman McAllister Gregg, recognized a group of infants born with congenital cataract.¹ Most of the mothers had a history of rubella in early pregnancy. This was the first indication that rubella needed to be considered as a disease with possible sinister complications.² Infection with rubella virus can be disastrous in early gestation. The virus may affect all organs and cause a variety of congenital defects.

Infection may lead to fetal death, spontaneous abortion, or premature delivery. The severity of the effects of rubella virus on the fetus depends largely on the time of gestation at which infection occurs. Up to 85% of infants infected in the first trimester of pregnancy were found to be affected, if followed up after birth.² While fetal infection may occur throughout pregnancy, defects are rare when infection occurs after the 20th week of gestation. The overall risk of defects during the third trimester is probably no greater than that associated with uncomplicated pregnancies. Infants with congenital rubella syndrome, who were infected with rubella before birth, may be able to infect others for usually about a year, and can therefore transmit rubella to those susceptible persons caring for them. Infected persons who exhibit no signs or symptoms

may transmit rubella, and 30%-50% of all rubella infections are not recognized as rubella disease.³

Congenital infection with rubella virus can affect all organ systems. The most common is Deafness and often the sole manifestation of congenital rubella infection, especially if rubella occurs after the 4th month of gestation. Other common congenital defects of congenital rubella infection are Eye defects (cataract, glaucoma, retinopathy and microphthalmia) and Cardiac defects, may manifest as neurological abnormalities and other abnormalities, like bone lesions, splenomegaly, hepatitis, and thrombocytopenia with purpura.⁴

Rubella vaccination has emerged as the most effective public health measure against the well-known crippling consequences of congenital rubella infection. Despite a safe and effective vaccine being available for more than two decades, in India, so far there has been no clear-cut policy regarding rubella immunization of children either at 15 months or young girls at child bearing age.⁵ Studies from India and abroad have found that 10-20% women in childbearing age are susceptible to rubella.^{6,7} Between 6-12% of babies born with congenital malformations or infections have serological evidence of rubella.^{8,9}

METHODS

Study was a cross-sectional in design and conducted in degree colleges (a health science college/medical college and a general stream). The study population comprised of all fresh entry students of 1st year of both health sciences and general stream colleges. Only 1st year students were included to get baseline immunity. This excluded exposure to rubella in health care settings in course of their training.

The study was conducted from Oct 2013 to Sep 2015. A Pilot study was conducted for testing the questionnaire. The inputs obtained were incorporated to refine the questionnaire and data collection technique.

Ethical Issues: Details of the study were presented to the Institutional Ethical Committee. Various aspects involved in the study were discussed and ethical clearance was granted for the study. Written informed consent was taken from the study participants before collecting data.

Data collection tool: Data was collected on the pre-tested structured questionnaire. Students were given the patient information sheet and after taking the written informed consent the questionnaire was administered and data collected on the study subject.

The Data collection instrument was divided into the following three parts: 1) Section A (Demographic details); 2) Section B (Past history and family history regarding rubella); and 3) Section C (Laboratory investigation)

Demographic details: In this section, the general information related to the study subjects like name, age, gender, address, phone number. Details regarding father's and mother's age, occupation and education were also collected along with the total family income and number of family members.

Past history and family history regarding rubella: This section included details on the past history and family history related to rubella. The past history was considered positive only for those participants whose diagnosis was confirmed by physician as 'rubella infection'.

Lab investigations: The blood samples were withdrawn from the study participants by a trained lab technician under all aseptic conditions and the samples were sent to the Department of Microbiology for estimation of IgG antibodies by ELISA. Participants whose blood samples were found to have anti-rubella IgG concentration less than 10 IU/ml were considered seronegative. Seronegative participants were considered susceptible to rubella.¹⁰

Statistics

Data collected was entered simultaneously into Microsoft excel worksheets designed and coded appropriately. The data collected was analysed using appropriate statistical tests, with the help of SPSS Version 20. Percentages and proportions were calculated.

RESULTS

Out of total 220 study participants, 141 (64.1%) were males and 79 (35.9%) were females. Maximum participants were 19 years of age (40.5%). The median age was 19.5 years with range 18 to 24 years. Maximum participants were from urban areas (59.1%) while 40.9 % were from the rural areas.

As per Kuppaswamy's socioeconomic status scale maximum participants 143 (65%) belonged to upper-middle class, followed by upper class (25.9%). Only 7.7% and 1.4% study participants belonged to lower-middle class and upper-lower class respectively.

Total 183 (83.2%) participants were sero-positive showing rubella virus IgG antibody in the serum while 37 (16.8%) study participants were found to be sero-negative or susceptible to rubella.

Only 04 (1.8%) study participants gave positive history of having had rubella in the past. 209 (95%) participants responded that they didn't suffer from rubella in the past while 7 (3.2%) were doubtful about the history of rubella.

The table 1 shows gender wise distribution of rubella antibody. The sero-positivity of rubella was higher among males (86.5%) as compared to females (77.2%). However the difference was not statistically significant ($\chi^2 = 3.137, p=0.077, df = 1$).

The association of native place of residence with the sero-positivity of study participants is depicted in the table 2. Out of total 130 participants from urban area, 111 (85.4%) were found to be positive for rubella IgG antibody while out of total 90 participants belonging to rural India, 72 (80%) were found to be positive for rubella IgG antibody. The sero-positivity of rubella was found to be higher among participants from urban area as compared to participants belonging to rural India. However the difference was not statistically significant ($\chi^2 = 1.102, p=0.294, df = 1$)

Table 1: Association between gender and status of rubella virus IgG antibody

Gender	Status of rubellavirus IgG antibody		Total
	Positive (%)	Negative(%)	
Male	122 (86.5)	19 (13.5)	141
Female	61 (77.2)	18 (22.5)	79
Total	183 (83.2)	37 (16.8)	220

($\chi^2 = 3.137, p=0.077, df = 1$).

Table 2: Association between native place of residence and status of rubella virus IgG antibody

Native place of residence	Status of rubella virus IgG antibody		Total
	Positive (%)	Negative (%)	
Urban	111 (85.4)	19 (14.6)	130
Rural	72 (80.0)	18 (20.0)	90
Total	183 (83.2)	37 (16.8)	220

($\chi^2 = 1.102, p=0.294, df = 1$)

Table 3: Association between socio-economic status class and history of rubella immunisation

Socio-economic group	History of rubella immunisation		Total
	Present	Absent	
High	53 (26.5)	147 (73.5)	200
Low	3 (15.0)	17 (85.0)	20
Total	56 (25.5)	164 (74.5)	220

($\chi^2 = 1.27, p=0.26, df = 1$)

Maximum sero-positivity was found among participants belonging to high socio-economic group (83.5%). There was no statistically significant association between socioeconomic status and the sero-

positivity to rubella virus antibody ($\chi^2 = 0.01, p=0.93, df. = 1$).

Out of 151 participants who had ≤ 4 members in their family, 123 (81.5%) participants had rubella IgG antibody present in their serum while out of 69 participants who had > 4 members in their family, 60 (87%) had rubella IgG antibody present in their serum. There was no statistically significant association between number of family members and status of rubella virus IgG ($\chi^2 = 1.024, p=0.312, df = 1$).

The association of socioeconomic status using Kuppaswamy's Socio- economic Status Scale and the history of immunisation against rubella has been depicted in table 3. Out of 200 participants belonging to high socio-economic, 53 (26.5%) were vaccinated against rubella. Whereas, out of 20 study participants belonging to low socio-economic group, only 03 (15%) were immunised against rubella. However the difference was not statistically significant ($\chi^2 = 1.27, p=0.26, df = 1$).

DISCUSSION

In our study, of the total 220 participants, 183 (83.2%) tested positive but 37 (16.8%) were found to be susceptible to rubella Infection. Studies from India and abroad have found that 10-20% women in childbearing age are susceptible to rubella^{6,7,11,12} which is in concordance to the present study. However a low level of susceptibility cannot be taken to mean as no risk of CRS. As per the WHO guidelines even when susceptibility levels in women are below 10 per cent, CRS can occur.¹³ In the present study as only 25.5% participants gave history of immunisation, implies the rest 57.7% participants had acquired immunity to rubella through natural infection. This high overall seropositivity rate in the absence of routine immunisation suggests a continuous transmission of endemic rubella virus, posing a threat to non-immune pregnant women.

In the present study, seropositivity rates were found to be higher among participants of upper socio-economic class (83.5%) than participants of lower socio-economic class (80%). There was no statistically significant association between socioeconomic status and the sero-positivity to rubella virus ($\chi^2 = 0.01, p=0.93, df = 1$). This finding is similar to the findings of a study from Turkey where no correlation was found between socioeconomic status and rubella seropositivity.¹⁴ However this finding is in contrast to the findings by other studies^{15,11,16} which showed a decline in the immune status with rising socioeconomic status. The difference in the finding could be due to reason that the above studies were community based in contrast to our study which was institution based.

In the present study, 26.5% study participants belonging to upper socio-economic status were immunised against rubella; whereas those belonging to lower socio-economic status group only 15% study participants were immunised. However the difference was not statistically significant ($\chi^2 = 1.27$, $p=0.26$, $df = 1$). Similar findings of low immunisation history among both upper and lower socio-economic participants was also found in other studies.^{17, 11, 16} This indicates that the need for immunization to control Rubella has not been duly recognized in India.

The endemicity of rubella has been well established in India. However, no official data is available regarding the prevalence of acquired and congenital rubella infection, as it is not a notifiable disease.¹⁷ In India, pregnant women belonging to low socio-economic group may be exposed to a variety of infections due to poor environmental and hygienic conditions. Maternal infections which have been considered as significant factors in the causation of poor pregnancy outcome elsewhere have not assumed much significance in India since their prevalence and effect on pregnancy outcome have not been studied so far. Data is scanty because of the technical difficulties in isolating the organisms and the requirement for use of commercial diagnostic kits, which are expensive.¹⁵

Maternal rubella is now rare in many developed countries that have rubella vaccination programmes. However, in many developing countries congenital rubella syndrome (CRS) remains a major cause of developmental anomalies, particularly blindness and deafness.⁶ WHO have provided recommendations for prevention of CRS, and, encouragingly, the number of countries introducing rubella vaccination programmes has risen. However despite a safe and effective vaccine being available for more than three decades, in India, so far there has been no clear-cut policy regarding rubella immunization of children either at 15 months or young girls at 9-12 years.¹⁵

CONCLUSION

Presence of over 16% susceptible college students to rubella suggests the possibility of transmission among non-immune individuals. This low level of susceptibility does pose a threat to non-immune pregnant women in turn posing a threat for CRS. There is therefore a need for reviewing the necessity of rubella vaccination in National Immunisation Schedule. Larger studies may be conducted to determine the prevalence of rubella related maternal complications and congenital rubella syndrome in

the country. There is a requirement of development of well designed, structured, IEC programme about rubella, its complications and prevention, targeted for different population groups.

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