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ORIGINAL ARTICLE

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Rubella serology in Indian adolescent girls and its relation to socio-economic status

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OBJECTIVE(S) : To evaluate the rubella immune status amongst adolescent girls (15-18 years), and correlate it with socio-economic status.

METHOD(S) : This community based, cross sectional study comprised of 230 adolescent unmarried girls (115 girls of high socioeconomic status and 115 girls of low socioeconomic status). ELISA method was used to estimate the immunity status of rubella IgG in their serum samples.

RESULTS : Overall seronegativity was 17.83%, indicating vulnerability to acquire rubella. It was 9.56% in the lower socioeconomic status group and 26.09% in the higher socioeconomic stauts group, and the difference was statistically significant (P<0.001). None of the girls gave history of MMR or rubella vaccination.

CONCLUSION(S) : High seronegativity and susceptibility to rubella, especially in high socio-economic group of adolescent girls was prevailant in the study. A policy of immunization with MMR or rubella vaccine of susceptible, non-immune adolescent girls is highly desirable in order to prevent rubella and congenital rubella syndrome.

Key words : rubella, congenital rubella syndrome, adolescent girls, rubella IgG, socio-economic status

Introduction

Rubella as a clinical entity was first described by German authors in the mid 18th century and they called it Rothein [1]. Although it is a mild exanthematous illness, because of the immense teratogenic potential of the virus, it can have disastrous consequences in women of reproductive age group if contracted during pregnancy. The disease has not been a major concern for most practitioners the world over, but for doctors in the field of Obstetrics and Neonatology it is of major concern. The congenital rubella syndrome (CRS), an important sequela to infection of the mother during pregnancy comprises of growth retardation, eye defects, deafness, cardiac defects, microcephaly, mental retardation, hepatomegaly, hepatitis, bone lesions, interstitial pneumonitis, diabetes mellitus and psychiatric disorders [2].

One hospital study from Madurai reported 46 CRS infants with sequelae seen between 1993-2001 [3]. Another study reported that 52/342 (15.2%) infants suspected to have congenital infection from 1991-93 had CRS [4]. Seroepidemiological studies have shown that rubella has a worldwide distribution. Studies among infants with malformations and those with congential cataracts confirm the presence of rubella infection in India [5].

The exact disease load in the community cannot be made out clinically as more than half of all cases are subclinical. Hence an active surveillance is required to determine the number of cases and to segregate the population into those immune to rubella and those who are susceptible to the infection and hence at risk of having acute infection during pregnancy resulting in fetal CRS. More than two decades have passed since epidemiological surveys have been done

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for rubella in adolescent girls in India [4-7]. This study was planned to estimate the immune status in otherwise healthy adolescent girls, and the relation of seronegativity or susceptibility to socio-economic status.

Material and Methods

Two hundred and thirty adolescent girls, in the age group of between 15 and 18 years were included in this cross sectional, community based study. They were divided in two group of – Group A – 115 girls of high socio-economic status studying in public schools, and Group B – 115 girls of low socio-economic status from the urban slums. High socioe-conomic group corresponded to upper and upper middle class; and low socio-economic group corresponded to lower middle class, upper lower and lower class of Kuppuswamy scale [8].

Informed consent for serum testing for rubella IgG was taken from the parents of the adolescent girls. Those found seronegative were counseled for active immunization. History of MMR or rubella vaccination was also elicited.

Methodology - Estimation of serum IgG levels was done by sandwhich ELISA.

Procedure - 5 mL of venous blood was taken by aseptic venipuncture. The serum was separated by centrifugation and submitted to ELISA.

Material used – Antigen coated microtiter strip, wash concentrate, assay buffer, tetramethyl benzidine chromogen solution (TMB), calibrator 1 to 5, negative control, low positive control, positive control, enzyme labeled II antibody, stopping solution, adhesive films, and polythene bags.

Microtitration strip was marked. Serum samples were diluted 1:101, distributing 10 µL of serum into 1mL of assay buffer and 100 µL of each diluted serum sample was pipetted along with calibrators and controls into appropriate wells, leaving one well for blank. The wells were covered with protective film and incubated for 30 minutes at 37^0 C. Each well was aspirated and washed 4 times for 30 seconds with washing solution and100 µL of enzyme labeted II antibody was added into each well. The wells were covered with protective film, and incubated for 30 minutes at 37^o C. Wells were again washed and aspirated 4 times for 30 seconds and 100 µL of TMB solution was added to each well and incubated for 15 minutes at room temperature. Then 100 µL of stopping solution was added to each well. Absorbance of solutions in the wells was read within 30 minutes using a microplate reader set to 450 nm with background wavelength correction set at 600 or 620 nm.

Test result - The index value of the test sample was calculated by dividing the optical density value. Index value of more than 1 was considered positive. If the second sample gave higher index value, it indicated increasing antibody response. A value 2 times higher than the first value was significant [9].

Statistical analysis was carried out for continuous variables by using student t test while chi square test was used for categorical variables.

Results

Out of 230 girls, 189 (82.17%) were detected to be rubella IgG seropositive and 41 seronegative (Table 3). None of the adolescent girls gave history of immunization with MMR in childhood or rubella vaccine in adolescence.

Age - The seronegativity of rubella IgG in different age groups of 15 to 18 years varied from 15.12% in 16 year group to 23.08% in 18 year group, the overall seronegativity being 17.83%. There was no statistical correlation.

Socioeconomic status : The percentage of seronegativity (susceptibility) for rubella infection in the higher socioeconomic status Group A was 26.09% while in the lower socioeconomic status Group B it was 9.56% (Table 1). The difference between the two was statistically significant (P = 0.001).

Table 1. Rubella IgG seronegativity in adolescent girls of high and low socio-economic status.

Socio-economic status	Seropositive	Seronegative	
	No. of girls	No. of girls	Percentage
High (115 girls)	85	30	(26.09%)[a]
Low (115 girls)	104	11	(9.56%)[a]

[a] P = 0.001

Discussion

Rubella infection has an incubation period of 2 to 3 weeks with an average of 18 days. A large percentage of infections (50 to 65 %) are asymptomatic. In a typical case, postauricular and posterior cervical lymphadenopathy appears as early as 7 days before the rash. Rash, often the first indication of disease in children, appears on the face on the first day and disappears altogether by the 3rd day. It is absent in subclinical cases [10]. The immunity to acute infection starts developing in 5 to 10 days of infection when IgM appears, which peaks at around 20

days, starts falling by 4-5 weeks and disappears by 4-5 months but low levels may last upto 1 year. IgG especially IgG_1, starts appearing in about 15-20 days of infection, peaks at 1 month, maintains a high level for a year, then falls but persists practically for life.

The purpose of the study was to delineate the number of susceptibles in low and high socio-economic groups who are at risk of contracting rubella and producing offsprings with CRS.

Two decades back, Seth et al [7], reported that the percentage of seropositive girls in the age group of 15-19 years in urban Delhi was 79.5% whereas it was 70% in rural areas of Delhi. In the same age group, the percentage of seropositivity was 83.9% in Chandigarh [11], 79.3% in Lucknow [6], and 60% in Calcutta [12]. In our study, inspite of better awareness of immunization against communicable diseases, the percentage of seropositivity is still 82.17% in the age group of 15-18 years. Thus, with respect to rubella, no significant change has occurred in the immune status in Delhi. This clearly reflects a lack or failure of policy regarding rubella immunization.

Gutierrez et al [13] studied rubella seropositivity in 24,331 Mexican women between 10 and 44 years of age. 79.96% women were seropositive and the figure increased with age. They correlated seropositivity to socioeconomic status and found that it was 82.5% in the higher socioeconomic group and 77% in the lower socioeconomic group. In our study, 82.17% girls were immune to rubella. The percentage of seronegativity for rubella infection in the lower socioeconomic status group was 9.56% while it was 26.09% in the higher socioeconomic status group and the difference between the two is statistically significant (P = 0.001). This could be explained on the basis of high chances of rubella infection due to close contact or overcrowding and acquisition of natural immunity in the lower socioeconomic group.

The contradictory results of rubella immune status with respect to the socio-economic status in the western countries and in our study can be explained on the basis of wider availability, affordability, acceptability and greater knowledge of rubella vaccine in the west. We found that out of 230 girls, none had a history of MMR vaccination in childhood or rubella vaccination in adolescence. This again shows the lack of awareness about the disease and the vaccine, and lack or failure of national policy.

CRS could be significantly controled by rubella vaccination, especially in the high socioeconomic group. The incidence of rubella decreased from 0.45/100,000 in 1990 to 0.1/ 100,000 in 1999 [14]. In 1989, the U.S. established the goal to eliminate indigenous rubella and CRS by 2000. The aim of rubella vaccination policy is to prevent women from acquiring rubella while they are pregnant. The protection against rubella infection and CRS can be achieved through either universal immunization of all preschool children against rubella with MMR vaccine or combined immunization of all preschool children, and susceptible adolescents and adults with MMR and rubella vaccine [15-17]. The Indian Academy of Pediatrics, in 2001, has recommended combined immunization for measles, mumps and rubella of all children at 15 to 18 months of age. This vaccine has not yet been included in the national immunization schedule.

The best results can be achieved only by combined immunization policy as adopted by Denmark, Sweden, most of the European countries and United States, where the first dose is offered as MMR vaccine at 15-18 months of age and the second dose as MMR vaccine or only rubella vaccine exlusively to girls at 12-14 years of age. Vaccines where available, should be affordable, and effective prevention guidelines should be workable in poorer nations. Indians need to collect reliable and accurate data of perinatal infections, to prioritise and tackle those that have serious public health problems and socio-economic impact. For vaccination, the RA 27/3 strain is ost widely used and is administered subcutaneously.

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