Seroprevalence of Rubella among Female Healthcare Students in a tertiary care teaching hospital

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Abstract

Introduction: Rubella is a disease caused by Rubella virus which can affect anyone of any age and is generally a mild disease, rare in infants or those over the age of 40. Rubella is notorious for causing congenital rubella syndrome (CRS). It occurs in newborns born to a woman who gets rubella infection in pregnancy. Women gain immunity against Rubella following either a natural Rubella infection or a *Rubella* vaccination. Some girls or women reach the child bearing age group without any immunity against Rubella. This makes them vulnerable to giving birth to children with CRS. The available survey data reveals 6 to 47% seronegativity in this age group. Hence the age group of 16- 20 years females was targeted for the study.

Aims & Objectives: To find out the immunity status (IgG) against Rubella in the health care students (medical and paramedical) of our teaching hospital.

Materials and Method: Serum samples from 180 healthcare students in a tertiary care teaching hospital were tested for Rubella specific IgG antibodies by ELISA.

Result: Out of the 180 subjects tested, 21(12%) were susceptible to Rubella infection. The remaining had protective levels of antibodies against Rubella.

Conclusion: Seronegativity among child bearing age group was and is being documented regularly. Routine immunization with Rubella vaccine is the only end point to CRS. Inclusion and adherence of the same in the National immunization schedule will help eradicate this disease. Constant serosurveillance is required to assess the immunity status among the child bearing age group.

Keywords: Rubella, Congenital Rubella Syndrome, Healthcare students, ELISA

Introduction

Rubella or German measles is an acute childhood infection, usually mild and of short duration, accompanied by low grade fever, lymphadenopathy and maculopapular rash. In 1941, Norman Mc Allister Gregg an Australian ophthalmologist reported cataracts in 78 infants, many of whom were also affected by congenital heart disease and failure to thrive. Most of the mothers of these children had contracted *Rubella* during the early months of pregnancy.[(1)]

Infection during the first trimester of pregnancy leads to still births and spontaneous abortions. Infection *in utero* has direct consequences to the developing fetus in the form of a constellation of symptoms collectively called Congenital Rubella Syndrome (CRS) which comprises of cardiac, cerebral, ophthalmic and auditory defects. It may also cause prematurity, low birth weight, and neonatal thrombocytopenia, anemia and hepatitis. The risk of major defects or organogenesis is highest for infection in the first trimester.**[(2)]**

WHO estimates that worldwide more than one lakh children are born with CRS each year, most of them in the developing countries. In southern India it was found that CRS was the cause of 26% of cases of children born blind with congenital cataracts.**[(3,4)]** Since Rubella is a vaccine preventable disease vaccination will ensure a safe motherhood and a well baby. Women gain immunity following a natural infection or *Rubella* vaccination, There is documentation, that antibody levels decline over time in the vaccinated and age wise seropositivity to *Rubella* decreases with increasing age.[(5)] Serosurveys in different parts of India have found that 6–47% of women are susceptible for Rubella infection.[(6)]

Seroprevalence and incidence of Rubella in and around New Delhi, India, conducted by National Institute of Communicable Diseases (NICD), New Delhi, substantiated the fact that though immunity status against Rubella in women of childbearing age group increased steadily from 1988 to 2002, approximately 10 to 15% of women in the childbearing age were fertile grounds for Rubella virus and were at high risk of contracting infection during pregnancy**.[(4)]**

Rubella has not been eradicated neither is *Rubella* a notifiable disease in India. Rubella is endemic in India. Periodic outbreaks are being reported in various parts of the world. Under the measles outbreak surveillance program in Maharashtra, the National Institute of Virology, Pune confirmed that out of the 98 samples suspected for Measles 61 were found positive for Measles and 12 for Rubella, 24 were mixed outbreaks.**[(7)]** Similarly global outbreaks are also being reported like the one in Romania during 2003; out of the 150 CRS cases suspected seven had confirmed positive Rubella IgM antibodies.[(8)] Another instance was the outbreak that occurred in Netherlands &

Canada during 2004-05 when CRS in the form of deafness was reported in 11 (eleven) out of 14 (fourteen) cases along with 2 (two) fetal deaths in an Orthodox Protestant Community that was against vaccination.[9]

Outbreaks such as this can be prevented only if the National immunization schedule which is considered the most supreme tool in the prevention of vaccine preventable disease adheres to Rubella vaccination at 9 months and a booster dose during the child bearing age in its regular schedule. Seroepidemiological surveys of *Rubella* are an important tool to find the proportion of population susceptible to *Rubella* and the risk of acquiring CRS. Limited studies have probed the problem of *Rubella* in the child bearing age group in India.

With this background, this study was done to find out the immune status of the female health care students against *Rubella* who have joined the Medical & Paramedical courses in our institution as they are in to enter the child bearing age group and they are also the future mothers.

Materials and Method

The study was a cross sectional study, conducted over a period of 2 months in our tertiary care hospital. A total of 180 medical and paramedical female students within the age group of 18 -25 yrs, irrespective of their immunization status from a tertiary care teaching hospital in Puducherry were enrolled as subjects of the study. Permissions from the Institutional Scientific & ethical committee, & hospital authorities were obtained before the conduct of the study. An informed consent from the study subjects was taken before the collection of samples. Samples were collected by simple random sampling method. Para medical students who volunteered to get themselves tested were from the nursing & medical lab technology courses. A detailed history with importance to subjects who had a previous history of rash, fever, lymphadenopathy or arthralgia was taken. Subjects who were aware of their vaccination status with MMR or *Rubella* vaccine during their infancy or adolescence were also taken into account.

Under aseptic precautions, 3 ml of venous blood was collected in plain vacutainers. Samples were made to stand & serum separated after centrifugation. Samples were labeled & stored at – 20˚C till tested. Freezing & thawing was restricted to the minimum. Serum was tested for the presence of IgG antibody against *Rubella* by ELISA method. IgG ELISA kits for *Rubella* were procured from CAL BIOTEC, USA. Manufacturer's guidelines were strictly followed while testing the samples. Results were read in an Automatic ELISA reader (Robonik) with an optical density of 450nm.

Fig. 1: ELISA reader

Fig. 2: ELISA washer

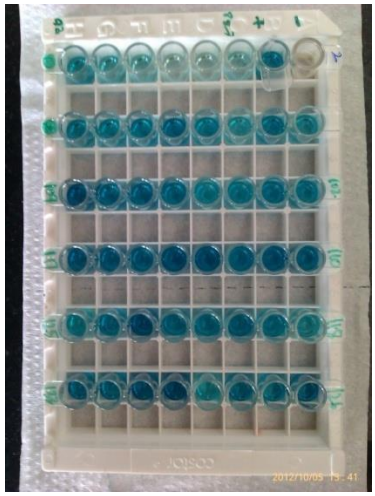

Fig. 3: Wells with conjugate

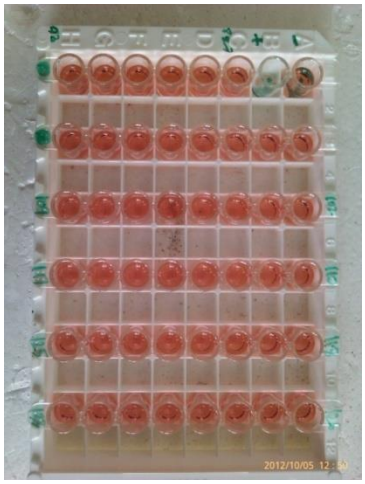

Fig. 4: Wells with substrate

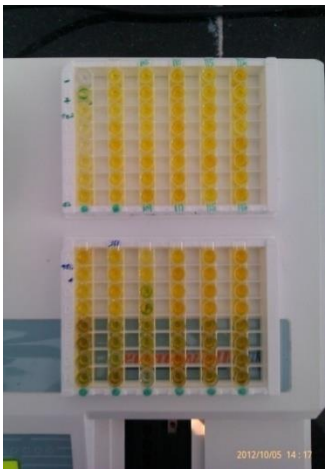

Fig. 5: Wells with stop solution

Results

A total of 180 subjects were included in the study. Out of the 180 subjects 132 (73.3%) were from the Medical community and 48 (26.6%) belonged to the Para medical community.

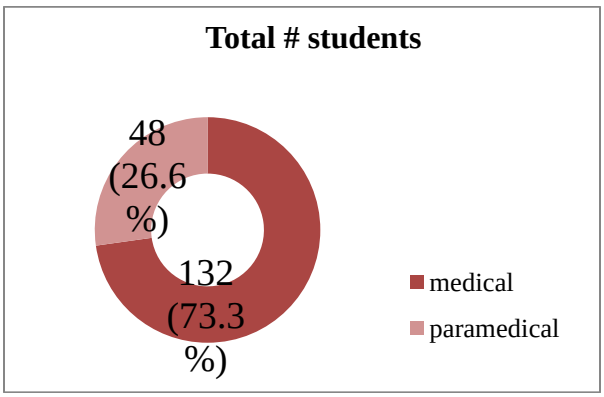

Fig. 6: Pie diagram showing the distribution of student population

Out of the 132 students from the medical community who were tested for Rubella specific IgG, 20(15.1%) of them did not have any detectable IgG antibodies to Rubella indicating that they were virgin to Rubella infection. 112(84.8%) had detectable IgG antibodies to Rubella indicating that they were immune to Rubella infection. All the 48 Para medical students were found to be immune to Rubella.

Table 1: Prevalence of *Rubella* specific IgG antibodies in medical & paramedical students

Subjects	IgG +ve	IgG -ve	Total
Medical students	111 (84%)	21(15.9%)	132
Paramedical students	48 (100%)	0	48
Total	159	21	180

The antibody index of the students was compared. 39(30%) medical students had an antibody index between 1.1 – 2 & 72 (55%) had more than 2.8. 17% of the paramedical students had between 1.1 – 2 and 40 (83%) had more than 2.

Table 2: Comparison of IgG Antibody index in Medical and Paramedical students

Subjects	IgG Antibody index			Total
	1.1 - 2	> 2	< 0.9	
Medical students	39 (30%)	72 (55%)	21 (16%)	132
Paramedical students	8 (17%)	40 (83%)	0	48
Total	47	112	21	180

Only 10 (7.5%) students from the medical community & 15(31.2%) from paramedical were able to give a clear history of positive Rubella vaccination. All the others vaguely remembered their immunization record. Subjects who were immunized were IgG positive and had a good antibody index, highest being 2.5.

Table 3: Immunization status in medical and paramedical students

Students	Immunization known	Immunization unknown	Total
Medical	10(15.1%)	122(85%)	132
Paramedical	15(31.2%)	33(68.7%)	48
Total	35	145	180

Discussion

Majority of women are immune to Rubella by the time they reach childbearing age due to exposure to Rubella infection or immunization. Epidemics occur periodically among children during the winter and spring, which spreads to susceptible women and makes the situation more vulnerable if they are in their 1st trimester which sometimes leads to a child born with CRS. A current and conclusive data on the prevalence of Rubella among various age groups from different

parts of the population and the incidence of CRS are not available. In this study a total of 180 blood samples were collected from medical students and paramedical students. Out of the 180 students, 132 (73.3%) were medical students and 48 (26.6%) were paramedical students studying nursing and medical lab technology courses. The age of these students ranged from 18 – 22 yrs.

All the 180 samples were tested for the presence of Rubella specific IgG antibodies. It was found that 21 students did not possess protective antibodies against Rubella. These 21 students belonged to the medical community. There was an overall seronegativity to Rubella by 12% and seronegativity among the medical community was 16%. Students belonging to the paramedical community were immune to Rubella. The reason for the seronegativity could be an inefficacy of the vaccine which was used to vaccinate this group during infancy or they were not vaccinated with MMR during their infancy or this group was not all exposed to clinical or subclinical infection with Rubella virus or their immunity had waned as age advanced as this effect has been documented by falling, antibody levels over time in the vaccinated and age wise seropositivity to *Rubella* decreasing with increasing age.[5] Similar studies conducted with 124 medical and paramedical students of the child bearing age group in Jubilee mission medical college, Kerala by C. Valsan et al. in 2009 revealed an overall seronegativity of 33.8%.[10] In the present study there is a lower rate of seronegativity when compared to the above mentioned study. This could be attributed to the increase in awareness among the common population regarding the disease. There were students among this group who were vaccinated during their adolescent age. The schools where they had undergone their higher education were aware about the disease and its ill effects and had vaccinated all the students in the respective age group irrespective of the primary immunization. Twenty medical students and fifteen paramedical students of the study group were vaccinated against Rubella in their respective schools. While checking their antibody index it was found that students who were vaccinated during their adolescent age had an antibody index more than 2 (two). A second dose of the vaccine when given during adolescence irrespective of the first dose could give an individual maximum protection against Rubella infection. We live in an era where due to the intense immunization of all children below 5 yrs by the Pulse Polio program with Polio vaccine has led us to the verge of eradicating Polio, this disease also has to be considered for eradication due its teratogenic effect.

Now Rubella will no more be a neglected disease. During the study period, vaccine against Rubella was not included in the Universal immunization schedule. Now the government is committed on eradicating the disease. The government of India has launched on February 7th 2017 a pan India Measles- Rubella campaign program to prevent childhood disease involving states like Karnataka, Tamil Nadu, Pondicherry, Lakshadweep and Goa. The MR vaccine campaign targets around 41 crore children across the country, the largest ever in any such campaign. All children aged between 9 months and less than 15 years will be given a single shot of Measles-Rubella (MR) vaccination irrespective of their previous measles/rubella vaccination status or measles/rubella disease status. This drive should be able to eradicate the disease and give the population a safe place to live. A constant surveillance program is required to monitor the seroprevalence of this disease among the child bearing age so that every seronegative woman can be vaccinated and can go into labour with an assuarance that they will be delivering a normal child.

Conclusion

In this study 180 health care students were tested for the presence of Rubella specific IgG antibodies. 132 were medical students and 48 were paramedical students. 21 (12%) students did not possess protective antibody levels; rest of them had Rubella specific IgG antibodies. These 21 were medical students. All the 21 students are susceptible to Rubella infection during the time of pregnancy if they are not vaccinated. There was an overall seronegativity of 12% and seronegativity among the medical students was 16%. Students from the paramedical community were found to be immune to Rubella. It was also found that 35 students in the whole group were aware of their immunization status; they had received a second dose of Rubella vaccination. This was found to have an antibody index of more than 2 (two).

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