Original Article

Seroprevalence of Rubella Virus among Pregnant Women in Relation with Sociodemographic Change in Sylhet District of Bangladesh

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Abstract

Background: Clinical or subclinical infection of rubella in pregnant women can give rise to congenital rubella infection of her baby. **Objectives:** The purpose of the study was to see the prevalence of rubella virus specific IgG antibody among pregnant women. **Methodology:** This cross-sectional study was conducted in the Department of Microbiology in collaboration with the Department of Obstetrics & Gynaecology at Sylhet MAG Osmani Medical College, Sylhet, Bangladesh during the period from January to December 2019 for a duration of one year. By simple random sampling pregnant women with the age between 16 to 38 years attending antenatal clinic were selected according to inclusion and exclusion criteria. Anti-rubella antibody (IgG) titre was measured by Enzyme-Linked Immunosorbent Assay (ELISA) method. **Results:** A total number of 207 individuals were included in this study. Among them 186(89.9%) participants had protective immunity and 21(10.1%) participants had no protective immunity against rubella. Protective immunity was higher in age group 26-30 years and then it was declined as age increases (p=0.042). Protective immunity was found in 61 (82.43%) participants of 1st trimester, 64 (94.12%) participants of 2nd trimester and 61(93.85%) participants of 3rd trimester(p=0.031). Protective immunity was in 103 (90.35%) urban participants and 83 (89.25%) in rural participants (p=0.794). Protective immunity was found in 70 (93.33%) participants of lower class, 97 (90.65%) participants of middle class, 19 (76%) participants of higher class (p=0.042). **Conclusion:** In conclusion, the substantial percentage of pregnant women are susceptible for rubella infection.

Keywords: protective immunity; antibody; rubella infection; vaccination

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Introduction

Rubella is an acute febrile illness characterized by a rash and lymphadenopathy and caused by rubella virus[1]. Rubella is considered one of the most teratogenic viruses during pregnancy. Congenital infection depends on the time of exposure to the virus[2]. In the first 10 weeks of gestation congenital rubella syndrome occurs in about 90.0%, at 11 to 12 weeks about 50.0% and at 13 to 16 weeks about 33.0%. After 17 to 18 weeks defects due to rubella are rare. The risk of congenital malformation again rises to 60.0% at 31 to 36 weeks[3].

The worldwide pandemic of rubella in 1962 to 1965

highlighted its importance. The last major rubella epidemic in the United States occurred from 1964 to 1965. An estimated 12.5 million people got rubella, 11,000 pregnant women lost their babies, 2,100 newborns died, and 20,000 babies were born with congenital rubella syndrome[1]. This pandemic stimulated the development of a safe and effective rubella vaccine. World Health Organization established goal to eliminate rubella and CRS by 2020. CRS rates are highest in the African and South-East Asian regions where vaccine coverage is lowest[4]. Worldwide over 100,000 babies are born with CRS every year[5]. In Bangladesh, a study was carried out in 2003 to 2004 on 134 pregnant women. The overall prevalence of seropositivity for IgG was 84.3% and 15.7% were seronegative[6]. A study conducted in Ethiopia showed that seropositivity was higher in urban area than in rural area[7].

Rubella vaccine is available as combined measles, mumps and rubella (MMR) vaccine, or measles and rubella (MR) vaccine[5]. In October 2012, Bangladesh replaced a single antigen measles vaccine with a measles-rubella (MR) vaccine in the routine immunization schedule at 9 and 15 months of age. Unfortunately, adolescent and adult girls of child bearing age, who are presently at risk are not included in this programme[8]. It is advisable that all women of child bearing age are screened for rubella antibody and susceptible women should be included in the routine vaccination programme. The vaccine is live and therefore contraindicated in pregnancy and pregnancy should be avoided in the month after vaccination[9]. Hence, active surveillance is required to determine the seropositivity of rubella in pregnant women and to identify those who are at risk of giving birth to congenitally malformed babies. Therefore, the present study is carried out to detect the seropositivity of IgG for rubella in pregnant women to see their immune status and vulnerability to rubella infection.

Methodology

Study Settings and Population: This cross-sectional observational study was conducted in the Department of Microbiology in collaboration with the Department of Obstetrics & Gynaecology, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh. The study was carried out during the period from 1st January 2019 to 31st December 2019 for a duration of one year. All pregnant women with the age between 16 to 38 years attending antenatal clinic in the Department of Obstetrics & Gynaecology.

Study Procedure: Study population was selected on the basis of some enrollment criteria. Inclusion criteria were pregnant women in the age group of 16 to 38 years and persons excluded who were diagnosed case of diabetes mellitus, AIDS, malignancy and taking immunosuppressant drugs or steroid therapy. After selection of study population who were mostly available, easily accessible and convenient to include were identified against a serial number. All the participants were thoroughly informed about their roles and the procedure of this research work. Data were collected by predesigned data collection sheet. Informed written consents were obtained from all the subjects. All information was kept confidential with due respect to the participants wish and without any force or pressure. After taking all aseptic precautions 3 ml of venous blood was drawn by sterile disposable 5 cc syringe into a vacutainer tube and was allowed to clot at room temperature for about 30 minutes. Serum was separated by centrifugation at 3000 rpm for 10 minutes and then 100 µL of serum was transferred carefully into Eppendorf tube, properly capped, labelled and stored at -20^{0C} until further analysis. Serum IgG antibody against rubella virus was measured by Enzyme-Linked Immunosorbent Assay (ELISA) method following the instructions provided by manufacturers package insert. Manufacturer of the reagent: Rubella IgG ELISA EIA-1800, DRG International, Inc., Lot no RN-59479 and 60091, USA. All reagents were kept in proper temperature before use. All steps of procedure were completed without interruption.

Statistical Analysis: All data were processed and analyzed with the help of SPSS (Statistical Package for Social Sciences version 21). Quantitative data were expressed as mean and standard deviation and qualitative data as frequency and percentage. Association was analyzed by Pearson's Chi square (X^2) test. A probability (P) value of <0.05 was considered statistically significant.

Ethical Clearance: Approval of the research protocol and ethical permission were obtained from the Ethical Review Committee of Sylhet MAG Osmani Medical College, Sylhet. All the ethical committee guidelines were followed during the study period.

Results

A total number of two hundred seven pregnant women were recruited after fulfilling the selection criteria. The mean ± SD of serum IgG level was 47.61 ± 30.84. In this study protective immunity was determined as serum IgG level of 15 IU/ml. Out of 207 participants 186(89.9%) cases had protective immunity against rubella and

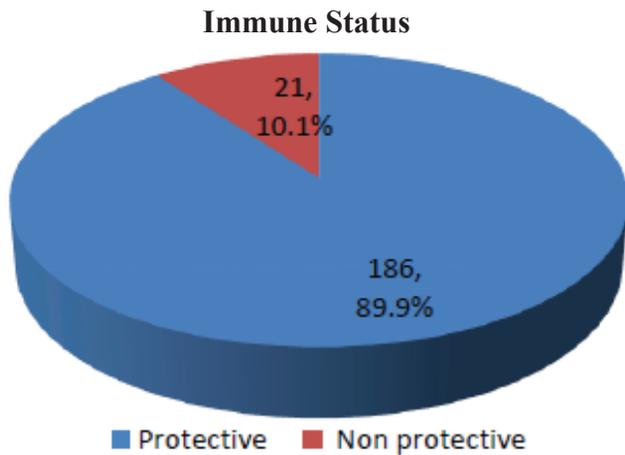21(10.1%) cases had no protective immunity against rubella (Figure I).

Figure I: Pie chart showing Distribution of the Participants according to Protective immunity against Rubella

Protective immunity against rubella was found in 39 (90.69%) participants of aged between 16-20 years, in 63 (92.64%) participants of aged between 21-25 years, in 58 (93.55%) participants of aged between 26-30 years and in 26 (76.47%) participants of aged between 31-38 years. Protective immunity differed significantly in different age group (p=0.042) (Table 1).

Table 1: Protective Immunity against Rubella in Different Age Group

Age Group Years	Protective Immunity	Non-Protective Immunity	Total	P value
16 to 20	39 (90.69%)	4 (9.31%)	43(100.0%)	
21 to 25	63 (92.64%)	5 (7.36%)	68(100.0%)	0.042
26 to 30	58 (93.55%)	4 (6.45%)	62(100.0%)	
31 to 38	26 (76.47%)	8 (23.53%)	34(100.0%)	
Total	186	21	207	

Protective immunity against rubella was found in 103 (90.35%) urban participants and 83 (89.25%) rural participants. Protective immunity did not differ significantly among different residential area (p=0.794) (Table 2).

Table 2: Protective Immunity against Rubella in Different Residence

Residence	Protective immunity	Non protective immunity	Total	P value
Urban	103(90.35%)	11(9.65%)	114(100.0%)	0.794
Rural	83(89.25%)	10(10.75%)	93(100.0%)	
Total	186	21	207	

Protective immunity against rubella was found in 70 (93.33%) participants of lower class, in 97 (90.65%) participants of middle class, in 19 (76%) participants of higher class. Protective immunity differed significantly among different socioeconomic status (p= 0.042) (Table 3).

Table 3: Protective Immunity against Rubella in Different Socioeconomic Status

Socioeconomic status	Protective immunity	Non protective immunity	Total	P-value
Lower Class	70(93.3%)	5 (6.67%)	75(100.0%)	
Middle Class	97(90.6%)	10(9.4%)	107(100.0%)	0.042
Higher Class	19(76.0%)	6(24.0%)	25 (100.0%)	
Total	186	21	207	

Protective immunity against rubella was found in 61 (82.43%) participants of 1st trimester, in 64 (94.12%) participants of 2nd trimester, in 61 (93.85%) participants of 3rd trimester. Protective immunity differed significantly among different trimester (p=0.031) (Table 4).

Table 4: Protective Immunity against Rubella in Different Trimester

Trimester (Weeks)	Protective immunity	Non protective immunity	Total	P-value
Up to 12	61(82.43%)	13(17.57%)	74(100.0%)	
13 to 24	64(94.12%)	4(5.88%)	68(100.0%)	0.031
25 to 38	61(93.85%)	4(6.15%)	65(100.0%)	
Total	186	21	207	

Discussion

To see the immune status of Rubella among pregnant women 207 participants were selected. All pregnant women attending antenatal clinic in the Sylhet MAG Osmani Medical College Hospital were the target population. By simple random sampling those who fulfilled the selection criteria were enrolled as the study

population. Among 207 participants, 186 (89.9%) had protective immunity and 21 (10.1%) had no protective immunity against rubella infection. A study conducted by Wondimeneh et al in Ethiopia showed that the overall protective immunity was 89% and 11% of the pregnant women were non protective which is almost similar to this study[10]. Another study conducted in Iran in 2013, where 88.9% had protective immunity and 10.4% had no protective immunity against rubella[11].

This study showed that protective immunity against rubella was found in 39 (90.69%) participants of aged between 16 to 20 years; 63 (92.64%) participants of aged between 21 to 25 years; 58 (93.55%) participants of aged between 26 to 30 years and in 26(76.47%) participants of aged between 31-38 years. Protective immunity differed significantly in different age group (p=0.042). It was also supported by other studies which showed that protective immunity was higher in 20 to 30 years age and decreased after 30 years[6,12]. Protective immunity against rubella was found in 61 (82.43%) participants of 1st trimester, 64 (94.12%) participants of 2nd trimester, 61(93.85%) participants of 3rd trimester. Protective immunity differed significantly among different trimester (p=0.031). It was also supported by other studies which showed that seropositivity was lower in 1st trimester and higher in 2nd and 3rd trimester[6,7,13,14].

Protective immunity against rubella was higher in urban area (90.35%) than rural area (89.25%) but this did not differ significantly between different residence (p=0.794). It was also supported by other studies which showed that seropositivity rate was higher in urban area than in rural area[7,15].

In this study protective immunity against rubella was found in 70 (93.33%) participants of lower class, 97 (90.65%) of middle class, 19 (76%) participants of higher class. Protective immunity differed significantly among different socioeconomic status (p= 0.042). It was also supported by other studies which showed that seropositivity rate was much higher in lower socio-economic status group, and lower in upper socioeconomic status group[6,16,17].

Conclusion

This study showed that protective immunity against rubella declined as age increases, it was significantly higher in lower class but no significant difference between rural and urban area. Protective immunity was significantly lower in 1st trimester and the substantial percentage of pregnant women were susceptible for rubella infection. Therefore, rubella vaccination programme especially for female of reproductive age will reduce prevalence of rubella infection and rubella related complications.

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