

Assessment of Immune Susceptibility to Rubella Among Pregnant Women in Hilla City

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Abstract

Background: Rubella (German measles) is a viral infection, which is contagious disease and self-limiting. Nonimmune adult women may be infected during pregnancy; the 1st-trimester rubella infection is very dangerous and may lead to miscarriage or severe fetal malformation (congenital rubella syndrome). That is why basic epidemiological data concerning rubella (immunity and seropositivity) is necessary for health planners and health-care providers in preventive medicine. **Objective:** The main objective of the study was to assess the immune susceptibility to rubella among pregnant women by checking serum immunoglobulin (Rubella IgG) using enzyme-linked immunosorbent assay (ELISA) test. **Materials and Methods:** The study protocol was approved by the Ethical Committee of Babylon University, College of Medicine. A cross-sectional study was to investigate the seroprevalence of rubella infection and associated possible risk factors among pregnant women. A total of 100 pregnant women in their first trimester of pregnancy were enrolled from four different primary health-care centers in Al-Hilla city. Filling a prepared structured questionnaire followed by ELISA test to detect IgG against rubella in the blood samples was collected. **Results:** A total of 100 pregnant women with a mean age of 24.78 ± 5.74 years who are in their first trimester of pregnancy, the study shows that 58 (58%) of the pregnant women have negative IgG against rubella (none immune), whereas the remaining 42 (42%) have positive IgG (either by previous infection with rubella or through vaccination). Living in rural area was highly significant among the seronegative pregnant women, 32 out of 58 seronegative women (55.2%), 41 (97%) of the seropositive group had regular vaccination program, whereas 36 (62%) of the seronegative group had irregular or unknown vaccination history, and 18 (31%) have no vaccination at all with a $P < 0.001$. The primary level of education was dominant among all the studied women with a $P = 0.017$. **Conclusion:** A high percentage of women of reproductive age group, mainly those living in the rural area are considered (at risk) population which necessitates an action by the health services provider.

Keywords: Congenital rubella syndrome, epidemiology, pregnant women, rubella virus, seroprevalence

INTRODUCTION

Rubella infection during pregnancy is a serious health issue that requires special attention for control and prevention, which will by itself prevent the sequel presented by congenital rubella syndrome (CRS) and congenital infection. CRS is associated with congenital cataract, deafness, mental retardation and cardiac defect,^[1] as well as *in utero* infection may be associated with later on development of autism, diabetes mellitus, or thyroiditis.^[2] There are many laboratory tests used for diagnosis; either by viral isolation through cell culture which can be done during infection, but it is very expensive test and not recommended.^[3] Other detection methods of Rubella virus include polymerase chain reaction technique by testing the body secretions such as the nasal, throat, urine, and cerebrospinal fluid.^[4]

The most widely used diagnostic method of rubella infection is the serological test by enzyme-linked immunosorbent assay (ELISA) for detection of immunoglobulin M (IgM) and IgG antibodies levels,^[5] which is sensitive, accurate, and appropriate diagnostic method.^[6]

The aim of the study was to assess the prevalence of anti-rubella IgG positivity in women sera in the reproductive age group, which helps to validate their immunity against rubella or to prove their need for protection by vaccination (after delivery).

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MATERIALS AND METHODS

In a cross-sectional study within a 5-month period, a sample of 100 pregnant women (in their 1st trimester of pregnancy) were collected from four primary outpatient clinics (during their regular antenatal care), their age ranges (17–40) years, and their verbal consent was taken to participate in this study after thorough explanation of its purpose.

Data were collected using a predesigned questionnaire, then collection of blood samples (3 ml) from each patient was done. The sera were separated and stored in deep freezing until use. ELISA technique was utilized for measurement of rubella IgG antibodies using rubella IgG-specific ELISA kit.

Limitations of the study

Convenient sampling does not represent the whole population.

Statistical analysis

Statistical analysis was carried out using SPSS version 21 (SPSS, IBM Company, Chicago, USA) was utilized computer software for analysis of data. Categorical variables were presented as number and percentage, continuous variables were presented as mean and standard deviation, and Chi-square test was used to show the association between categorical variables.

Ethical considerations

The study protocol was reviewed and granted permission by the Ethical Committee University of Babylon, College of Medicine, and the Health Directorate.

RESULTS

The studied group consisted of pregnant women (i.e., in the reproductive age group) with a mean age of 24.78 ± 5.74 years, and age ranges between 17 and 40 years. Figure 1 reveals that 58 (58%) of the pregnant women who participated in the study have negative IgG against rubella (none immune), whereas the remaining 42 (42%) women have positive IgG (either by previous rubella infection or through vaccination).

At the same time, Figure 2 shows that 56 (56%) of the studied group were in their 2nd month of pregnancy; gestational age between 4th to 8th weeks of pregnancy. The remaining 44 (44%) women were in their 3rd month of gestation; the 9th–12th weeks of gestation.

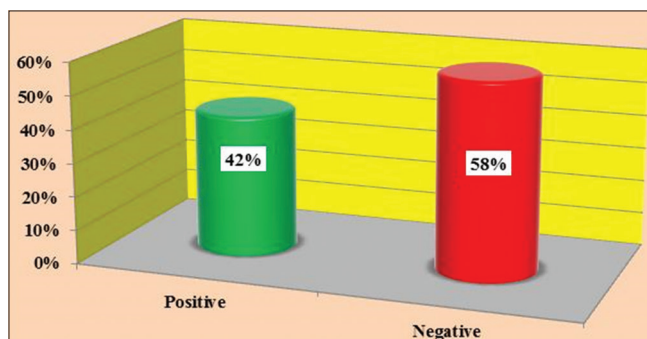


Figure 1: Distribution of the studied pregnant women by immune susceptibility to rubella (immunoglobulin G)

In Table 1, 32 of total 58 seronegative patients (55.2%) live in rural area, which is highly significant. Forty (69%) of seronegative women and 22 (52%) of the seropositive women had primary level of education with a $P = 0.017$.

Table 2 shows that 41 (97.6%) women of the seropositive had regular vaccination program, whereas 36 (62.1%) women of the seronegative had irregular or unknown vaccination history, and this result has high statistical importance and $P < 0.001$.

All of the seronegative patients have negative history of rubella infection among their children and do not have knowledge about the risk of rubella infection to their fetuses with a very high significant value.

DISCUSSION

The high number of seronegative results, 58 (58%) women in

Table 1: Association between maternal sociodemographic factors and immune susceptibility to rubella (immunoglobulin G)

Sociodemographic factors	Number of women according to IgG levels		χ^2	P
	Positive IgG, n (%)	Negative IgG, n (%)		
Residence				
Rural	4 (9.5)	32 (55.2)	22.032	<0.001*
Urban	38 (90.5)	26 (44.8)		
Total	42 (100.0)	58 (100.0)		
Educational level				
Illiterate	2 (4.8)	3 (5.2)	-	0.017* ^f
Primary	22 (52.4)	40 (69.0)		
Secondary	12 (28.5)	15 (25.8)		
Higher education	6 (14.3)	0 (0%)		
Total	42 (100.0)	58 (100.0)		
Employment				
Employed	6 (14.3)	5 (8.6)	-	0.519 ^f
Homemaker	36 (85.7)	53 (91.4)		
Total	42 (100.0)	58 (100.0)		

*Very highly significant, *Highly significant, ^fNot significant according to Fisher's Exact test. IgG: Immunoglobulin G

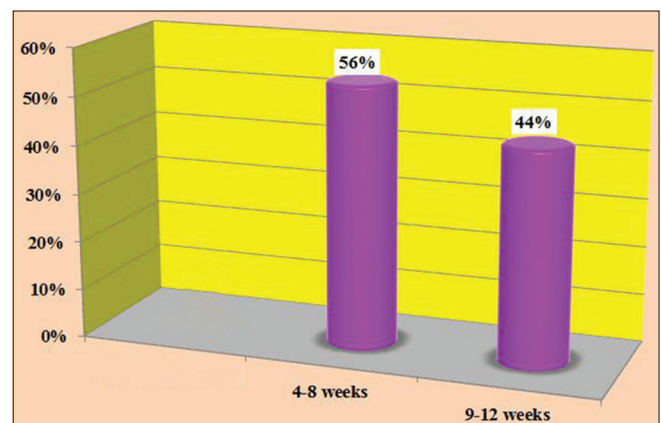


Figure 2: Distribution of studied pregnant women by weeks of gestation

Table 2: Association between maternal history of rubella vaccination, infection, and knowledge and maternal immune susceptibility to rubella (immunoglobulin G)

Study variables	Number of women according to IgG levels		χ^2	P
	Positive IgG, n (%)	Negative IgG, n (%)		
History of rubella vaccination				
Regular	41 (97.6)	4 (6.9)	81.045	<0.001*
Irregular or unknown	1 (2.4)	36 (62.1)		
Not at all	0	18 (31.0)		
Total	42 (100.0)	58 (100.0)		
History of previous rubella infection in her children/relative				
Present	26 (61.9)	0	48.52	<0.001*
Absent	16 (38.1)	58 (100.0)		
Total	42 (100.0)	58 (100.0)		
Knowledge about risk of rubella infection during pregnancy				
Yes	33 (78.6)	3 (5.2)	56.961	<0.001*
No	9 (21.4)	55 (94.8)		
Total	42 (100.0)	58 (100.0)		

*Very highly significant, IgG: Immunoglobulin G

this cross-sectional study, highlights the high risk of congenital rubella infection among pregnant women with all of its sequel, and the most important is the CRS, other studies published for Iraqi researchers. Hammoud *et al.* published a study in 2012; they found that 20 out of 186 (10.7%) women were seronegative against rubella among the studied group (pregnant and none pregnant women from Babylon).^[7] Another study which was done in Al-Najaf Governorate/Iraq, they studied the seroprevalence of rubella IgG among women who had abortions; their results showed that 230 out of 300 (77%) women with abortion were IgG positive, while IgM antibodies were detected in only 14 out of 300 (4.6%) aborted women (2009);^[8] whereas Aljumaili *et al.* found that IgG and IgM were positive in 435 (80.9%) and 18 (3.3%), respectively, among the whole studied (538) women from Kirkuk/Iraq in 5 (1.7%) and 261 (89.1%), respectively, in (293) women who had poor obstetric history (2014).^[9] In our study, history of abortion is insignificantly associated with seropositivity against rubella.

Different results presented by different researchers may be explained by outbreaks of rubella infections in some areas than others that provide immunity among the infected individuals, especially in the urban areas; where the primary schools are crowded by children that facilitate the rapid and mass spread of the disease among the population, the interrupted vaccination, poor vaccination coverage in some rural areas, or poor compliance of the people with the vaccination program, and sometimes by the unavailability of the vaccine because of the condition of Iraq. Some countries surrounding Iraq, the data are different; for example, in Jeddah (Western region of Saudi Arabia) where screening for rubella immunity was performed among pregnant women attending the prenatal clinic, most of the women 9410 out of 10,276 (91.6%) were immune or IgG positive, whereas the remaining 866 (8.4%) were susceptible.^[10] In Iran, the published studies show that women in child-bearing age are immune with a seroprevalence between 85% and 98%.^[11-13] Rubella virus infection was linked

as an etiological factor with spontaneous abortion in Bandar Abbas/South of Iran.^[4]

In Turkey (the northern neighbor of Iraq), published studies showed that the seroprevalence of rubella is 88% by Gündem and Kalem^[14] and 73%–80% from the age of 18–50 years by Demirdal *et al.*,^[15] while an old study in Turkey by Güner *et al.*^[16] showed that the seroprevalence of rubella immunity among unvaccinated pregnant women was 82% which reflects natural immunity by rubella infection and gave warning of that (18%) of women in reproductive age group were susceptible to rubella during pregnancy, there are many studies from different countries show high seroprevalence because of effective vaccination program and booster at adolescent age group.

CONCLUSIONS

In this study, a large number of the seronegative women are from rural areas and have poor knowledge about the risk and hazards of rubella infection to the fetus during the first trimester period, and this should alert the health service providers to take any action by universal vaccination of the girls at the secondary schools and provide educational material and to improve knowledge about the health problems and health risks that might affect the pregnancy outcome, especially in noneducated population.

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Conflicts of interest

There are no conflicts of interest.

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