

Estimation of Rubella virus antibodies among aborted women in Ibb City-Yemen

Abstract

German measles is a public health disease caused by rubella virus resulting in adverse consequences among pregnant women as congenital rubella syndrome (CRS) including abortions. Abortion is one of the most common health problems in the world. So, this study purposed to estimate prevalence of rubella virus antibodies among aborted women in Ibb city, Yemen. A cross-sectional investigation was accomplished from January 2022 to June 2022. 150 serum samples were collected from aborted women attending the obstetrics and gynecology department of various hospitals to analyze rubella virus IgG and IgM antibodies by Electro-Chemiluminescence Immunoassay (ECLIA). Demographical and clinical features were collected using a questionnaire. The data were analyzed using GraphPad software and P values ≤ 0.05 were considered statistically significant. With regards to the prevalence of rubella virus antibodies among aborted women, 149 cases (99.3%) of aborted women were rubella IgG antibodies positive. Rubella virus IgM antibodies were negative (100%) in all aborted women. The prevalence of rubella virus IgG antibodies in the age 26-30 was less than in other age groups. Moreover, the seroprevalence of rubella virus IgG was higher in rural aborted women (100%) compared to urban ones. Demographical and clinical features among aborted women were not statistically significant concerning rubella IgG positive results. In conclusion, the low rate of rubella IgM and a high proportion of rubella IgG for the most aborted women in this study suggest that rubella infection might indicate a previous infection.

Keywords: rubella, CRS, IgG, IgM, aborted women, Ibb, Yemen

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Abbreviations: Ig, immunoglobulin; ECLIA, electro-chemiluminescence immunoassay; CRS, congenital rubella syndrome; RNA, ribonucleic acid

Introduction

German measles is a public health illness caused by rubella virus. It is an RNA virus that belongs to the *Rubivirus* genus and *Matonaviridae* family.¹⁻⁴ It is an infectious disease transmitted through respiratory droplets from person to person or through placenta from mother to her fetus.³⁻⁶

The average incubation period is 14 days and a range of 12-23 days. The first symptom is a maculopapular rash, which appears on the face and then extends to the body surface, lasting almost three days. Other symptoms include fever, reddened eyes, headache, post-auricular adenopathy, arthralgia, tiredness, cough and runny nose.⁷

Rubella virus infection during pregnancy can result in severe consequences such as abortion, stillbirth, and serious birth defects, known as congenital rubella syndrome (CRS).³ CRS birth defects may include low birth weight, microcephaly, mental retardation, hearing impairment, bone alterations and developmental delay. Other CRS defects may include heart defects (persistent ductus arteriosus and pulmonary stenosis) and may cause eye defects (retinitis, cataracts, glaucoma, and microphthalmia).^{3,8,9} Hepatomegaly, jaundice thyroiditis, autism, and diabetes mellitus are considered as late symptoms of CRS.^{1,6,7}

Annually, 100,000 newborns were born with CRS.⁷ 90% of newborns with CRS were born to females infected by the rubella virus in the first trimester of pregnancy.^{1,10}

Countries that have used vaccine since the 1960s, there succeeded in controlling CRS.^{3,7,11} According to the WHO Eastern Mediterranean

Region report, the rubella virus vaccine was not part of the expanded programme of immunization in Yemen until 2015.¹²

In addition, there are no previous studies available to investigate the role of the rubella virus on abortion in Yemen. Most previous studies have focused on rubella antibodies among females at childbearing age, during pregnancy and schoolgirl, as well as cytomegalovirus antibodies.¹³⁻¹⁷ Accordingly, our study aimed to estimate rubella virus antibodies (IgG and IgM) seroprevalence among aborted women attending the obstetrics and gynecology department of various hospitals in Ibb city, Yemen.

Material and methods

This descriptive cross-sectional study was conducted between January and June 2022. The study participants included 150 aborted women (aged 18-40 years) were attended obstetrics and gynecology departments of different hospitals in Ibb city, Yemen.

Serum samples were separated from blood and then the sera were analyzed for rubella IgG and IgM using Electro-Chemiluminescence Immunoassay (ECLIA) technique on Cobas e411 analyzer depending on the company's protocol (Roach Diagnostic GmbH, Mannheim, Germany). All serum samples were tested at the Zain Medical Laboratories (ZML).

A standardized questionnaire administered via face-to-face interview was used to get information on sociodemographic, residence and clinical features of the aborted women. The questionnaire was translated into Arabic, the mother tongue of Yemen.

The ethical clearance for this research was granted by the Medical Laboratories Department, Faculty of Allied Medical Sciences, The National University ethical committee after due process was followed. The Ethics Research Committee is aligned with the Declaration of

Helsinki for the Protection of Human Subjects. Aborted women were informed about the study and consented before study enrolment. A consent to use the survey data was also obtained.

The data obtained from the results of the laboratory analysis and the questionnaires were analyzed using GraphPad prism version 5.01 (GraphPad Inc. USA). The results showed that percentages (%) and *P* values. The *p* value was used to estimate the correlation between the prevalence rates and the collected data. *P* values ≤ 0.05 were considered statistically significant.

Results

Briefly, the seroprevalence of rubella virus IgG antibodies among aborted women were 149 (99.33 %), whereas rubella virus IgM antibodies were negative in this study as revealed in Table 1. The results were revealed statistically significant (*P*-value <0.0001).

Table 1 Estimation of rubella virus antibodies among aborted women, Ibb city-Yemen

Serological results	IgG positive		IgM positive		<i>P</i> -value
	No.	%	No.	%	
Positive	149	99.33	0	0	<0.0001
Negative	1	0.67	150	100	

The age range of the aborted women was 15 to 40 years, while the mean age $\pm$ SD was 26.6 ± 5.2 years; third (33.3%) were 26-30 of age as presented in Table 2. Concerning educational level, 57 (38 %) had a primary level of education (29 were illiterate, 45 were secondary and 19 university education). The majority of aborted women lived in the rural area of Ibb (80; 53.3%) while 70 (47.7%) lived in the urban areas. Regarding socioeconomic status, more than two-thirds 107 (71.33%) were middle (30 low and 13 high). More than three-quarters of the participants 116 (77.33 %) reported having an abortion during the first trimester compared with the second and third trimesters 28 (18.86 %) and 6 (4 %), respectively.

Table 2 Sociodemographic characters and rubella virus antibodies prevalence among 150 aborted women in Ibb city, Yemen

Variable	Participants		IgG positive		<i>P</i> value
	(No.)	(%)	No.	(%)	
Age					
15-20	20	13.3	20	100	0.9845
21-25	49	32.7	49	100	
26-30	50	33.3	49	98	
31-35	25	16.7	25	100	
36-40	6	4	6	100	
Residence					
Rural	80	53.3	80	100	0.9505
Urban	70	47.7	69	98.57	
Education Level					
Illiterate	29	19.3	29	100	0.9993
Primary	57	38	57	100	
Secondary	45	30	44	97.7	
University	19	12.7	19	100	
Socioeconomic status					
Low	30	20	30	100	0.9993
Middle	107	71.33	106	99.06	
High	13	8.67	13	100	
Abortion time (trimester)					
First	116	77.33	115	99.14	0.9995
Second	28	18.67	28	100	
Third	6	4	6	100	

The seroprevalence of rubella virus IgG antibodies among 150 aborted women were shown in Table 2. Regarding age, all groups showed 100 % IgG passivity except 26-30 years, which revealed 98 %. The rate of rubella IgG antibody prevalence was higher in rural areas than urban areas with percentages 100% and 98.57 %, respectively. It is noted that the prevalence of rubella virus IgG antibodies in all participants at all educational levels were high. Likewise, the prevalence of IgG according to socioeconomic status 99.14 % of aborted women in the first trimester were IgG positive while in the third and second once were 100% of rubella IgG positive. All variables were non-statistically significant.

Among the aborted women, 143 (95.33%) had a history of a previous abortion and 7 (4.67%) had no previous abortion. Out of 143 (95.33%) with an abortion history, rubella IgG antibody was positive in 142 (99.3%) as presented in Table 3. The majority of aborted women had a previous history of abortion, where 46 %, 36.67 %, 7.33 % or 5.33 % had one, two, three or four times, respectively. Most participants were rubella IgG antibodies positive. These results were significant (*P* value = 0.0001). Additionally, according to history of congenital defects such as heart defects and premature birth, the seroprevalence of rubella IgG was 100 % positive among all aborted women, but it was not statistically significant. As presented in Table 3, out of 59 aborted women with arthritis, rubella IgG was positive in 58 cases (96.3 %). Out of 36 and 4 aborted women with arthritis and lymphadenopathy, rubella IgG was positive in all cases (100 %). These differences were not statistically significant.

Table 3 Seroprevalence of rubella IgG among aborted women according to symptoms associated with rubella infection

Symptoms	Participants		IgG Positive		<i>P</i> -value
	No.	%	No.	%	
Abortion history					
With	143	95.33	142	99.3	0.9509
Without	7	4.67	7	100	
Number of last abortion					
None	7	4.67	7	100	0.0001
1	69	46	68	98.55	
2	55	36.67	55	100	
3	11	7.33	11	100	
4	8	5.33	8	100	
Congenital defects					
Heart defect	4	2.67	4	100	0.9999
Premature birth	6	4	6	100	
Symptoms					
Skin rash	36	24.7	36	100	0.9983
Arthritis	59	30.6	58	98.3	
Lymphadenopathy	4	2.67	4	100	

Discussion

The present study was conducted to investigate the seroprevalence of rubella virus antibodies (IgG and IgM) among aborted women attending the obstetrics and gynecology department of various hospitals in Ibb city; Yemen. We observed an overall seroprevalence of rubella virus IgG 99.33%, while seroprevalence of rubella virus IgM was negative in all aborted women. The high prevalence of rubella IgG among aborted women as well as the rubella vaccine in Yemen started in 2015¹² indicating previous exposure to viral infection and the high percentage of immunity due to viral infection. The prevalence of rubella IgM antibody observed in this study almost agreed with that

described in Odisha, India.³ No past study has studied the association between abortion and rubella virus infection in Yemen and different countries. Reports from various countries showed the prevalence of rubella among schoolgirls, pregnant women and women at productive age (child bearing age).^{13–15,18–22} In the current study, there was no statistically significant difference between the rate of rubella virus antibodies and residence age, socioeconomic status, education levels, abortion time, congenital defects and symptoms. On the other hand, there was a significant between rubella IgG antibody and a previous number of abortions.

Conclusion

Overall, our study showed a high prevalence of rubella virus IgG among aborted women in Ibb city, Yemen. This outcome indicates that they had immunity against rubella virus. Furthermore, the results revealed that the prevalence of rubella IgG among women living in rural was more than urban. Other studies recommend using another technique like PCR to detect the risk of rubella virus infection among aborted women. Additional studies assessing the causal agents of abortion in Ibb city and new cities in Yemen, with suitable sampling and sample numbers are required.

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Conflicts of interest

The authors have no conflict of interest to declare.

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