

# Seroprevalence Rubella Antibodies among young females and women of Reproductive age group and pregnant women in Mosul City, Iraq

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## ABSTRACT

**Background:** To determine the seroprevalence of Rubella antibodies among women of reproductive age.

**Methods:** A cross sectional descriptive study was conducted between the period of February 2017 to February 2018. The subject of study is women with childbearing age was taken on from Kirkuk General Hospital. (450) women with age between (14 – 48) years were involved in the study. For each woman an information sheet included questions about women age, educational level, residency, economic status and vaccinations status was completed by interview. Of each participant in the current study, a blood sample of 3 ml was collected through intravenous using a sterile and dry test tube. Sera samples were tested for detection of "IgM" and "IgG" antibody specific for Rubella virus by enzyme-linked immunosorbent assay "ELISA".

**Results:** In our study 720 women in childbearing age were investigated for rubella IgG and IgM these 266 (36.94%) were positive for rubella IgG antibodies and 9 (1.25%) for rubella IgM antibodies.

**Conclusion:** This study displayed an insignificant relationship between rubella seroprevalence and age, residency, and parity.

**Keywords:** Rubella antibodies, pregnant women, reproduction

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## INTRODUCTION

The Rubella virus is an encased, positive-sense, RNA virus, genus Rubivirus, of the family Togaviridae which causes German measles, a mild, self-limiting, febrile, exanthematous infection in children and adults<sup>1,2</sup>. The most serious effects of the rubella infection occur in pregnant women during the first trimester of gestation, resulting in abortions, still births and congenital rubella syndrome. Rubella virus is a biological teratogen of the TORCH complex and is transmissible in utero<sup>3,4</sup>. Congenital rubella syndrome (CRS) causes heart defects, ocular abnormalities, deafness and mental retardation. Approximately 100,000 children are still born with CRS even though rubella vaccination has strongly decreased such incidences<sup>5,6</sup>. Accurate diagnosis of acute primary rubella infection in pregnancy is imperative and requires serologic testing, since a significant number of cases are subclinical<sup>7,8</sup>. Two strategies for immunization against rubella have been applied in different countries for the direct protection of adolescent girls and adult women<sup>9</sup>. The first vaccine against measles was introduced in 1969, the one dose of the vaccine led to the production of an antibody in about 95% of people exposed to infection. Antibody levels persist for at least 18 years in the majority of recipients and the failure rate does not exceed 5%<sup>10</sup>. Although reinfection may occur in immunized pregnant women, these reinfections have resulted in only 8% risk of CRS in the first trimester of pregnancy<sup>11</sup>. The main aim of this investigation is to assess prevalence of anti-rubella antibodies among three important sample of population adolescent females and married women and pregnant women in Kirkuk City, Iraq.

## METHODS

This is a cross sectional descriptive study carried out in the outpatient clinic for obstetrics and gynecology at Kirkuk General Hospital for the time period February 1st to September 1st of 2017. The initial sample consisted of 450 women who were randomly selected from the following three groups: 150 pregnant women, 150 married women, and 150 unmarried women. All of the participants were aged between 18 and 44 years at the beginning of the study, were apparently healthy and willing to participate in the study, and resided in urban and rural areas. After obtaining written informed consent from the sample, a questionnaire was utilized to conduct the study. The questionnaire consisted of the socio-demographic particulars such as age, occupation, duration of pregnancy, and vaccination status. A variety of methods are used to assess seroprevalence of rubella. Each has its advantages and drawbacks. It was decided that the best method to adopt for this investigation is enzyme-linked immunosorbent assay or ELISA. Sera samples were tested for detection of IgM and IgG antibody specific for Rubella virus. Three ml Blood samples were obtained intravenously with consent and using a sterile and dry test tube. Data management and analysis was performed using SPSS 20. Prevalence of IgG Antibody was calculated using percentages. It was considered that quantitative measures would usefully supplement and extend the qualitative analysis. P value > 0.05 insignificant, P < 0.05 significant (\*) & P < 0.01 highly significant (\*\*).

## RESULTS

**The Socio-Demographic Characteristics:** It is apparent from Table 1 that 58.4% belonged to 26-35 year age group

followed by 26% who belonged to 36-45 year age group. It is interesting to note in this data that 48.4% of the study subjects were illiterate, 27.3% had Secondary school graduates and 24.3% had Diploma or Bachelor degree school education as shown in Table 3. Almost 66.7% of females were married and 33.4% were unmarried. 33.3% of them were pregnant and more than half of them were in the 3rd trimester. In relation to their occupation, the majority of the women 70.2% were housewives.

**The Prevalence IgG:** The total prevalence rate of negative IgG Antibody was 16%. The higher percentage of IgG –ev Antibody was found among pregnant women in their 3rd trimester, aged between 16-25 years, 43%, 39.6% 7.5% respectively. The majority of women with negative IgG were housewives (65.9%), from rural areas (72.4%), and were illiterate (62.6%).

Table 1: Rubella seropositivity according to age groups

Age	No	(%)	IgG Antibody				Chi square	P
			No	-ve (%)	No	+ve (%)		
16-25 y	70	(15.6)	1	0.2%	69	15.3	17.284	0.000
26-35y	236	(58.4)	37	8.3%	199	44.3		
36-45y	144	(26)	34	7.5%	110	24.4		
Total	450	(100)	72	16%	378	84%		

Table 2: Rubella seropositivity according to Marital Status

Marital status	No	(%)	IgG Antibody				Chi square	P
			No	-ve (%)	No	+ve (%)		
Unmarried	300	66.7	41	9.1	259	57.5	3.646	0.056
Married	150	33.3	31	6.9	119	26.5		
Total	450	(100)	72	16%	378	84%		

Table 3: Rubella seropositivity according to Educational level

Educational level	N	(%)	IgG Antibody				Chi square	P
			No	-ve (%)	No	+ve (%)		
Diploma or College	109	24.3	18	4	130	28.9	13.01	0.00
High school	123	27.3	14	3.1	122	27.1		
Illiterate	218	48.4	40	8.9	126	28		
Total	450	(100)	72	16%	378	84%		

Table 4: Rubella seropositivity according to Economic status

Economic status	N	(%)	IgG Antibody				Chi square	P
			No	-ve (%)	No	+ve (%)		
High	88	19.5	25	5.5	126	28	1.417	0.492
Middle	125	27.8	18	4	120	26.7		
Low	237	52.7	29	6.5	132	29.3		
Total	450	(100)	72	16%	378	84%		

Table 5: Rubella seropositivity according to residency

Residency	N	(%)	IgG Antibody				Chi square	P
			No	-ve (%)	No	+ve (%)		
Rural	225	50	45	10	81	18	50.606	0.000
Urban	225	50	27	6	297	66		
Total	450	100	72	16	378	84		

Table 6: Rubella seropositivity according to parity

Parity	No	(%)	IgG Antibody				Chi square	P
			No	-ve (%)	No	+ve (%)		
PrimiGravida	66	44	9	2	130	28.9	44.639	0.000
2nd Gravida	33	22	18	4	126	28		
3rd Gravida	45	30	18	4	86	19.1		
4th Gravida	6	4	27	6	36	8		
Total	450	(100)	72	16%	378	84%		

Table 7: Rubella seropositivity according to obstetric performance

Previous Obstetric Performance	N	(%)	IgG Antibody				Chi square	P
			No	-ve (%)	No	+ve (%)		
Normal pregnancy outcome	122	42.4	8	2.8	174	60.4	22.579	0.000
Adverse pregnancy outcome	166	57.6	24	8.3	82	28.5		
Total	288	100	32	11.1	256	88.9		

## DISCUSSION

In recent years, a great number of serological studies have been conducted to assess the seroprevalence of the rubella infection around the world<sup>1</sup>. Rubella screening is based on anti-rubella IgG and IgM antibody detection by ELISA as it the best method<sup>22,23</sup>. In the present study, the ELISA technique was used to determine seroprevalence of rubella antibodies among women as comparable with other studies<sup>1,2,13,14,15</sup>. In the existing investigation, the seroprevalence of the rubella virus was found to be 84.7% in the sample; therefore, 16% of women in the present study were non-rubella immune [NRI] and were susceptible to rubella infection. Thus, about a quarter of Kirkuk women are at risk of developing primary rubella infection. Rubella is transmitted through the respiratory path and its incubation period is 13 to 20 days, during which time a viremia occurs and the virus disseminates throughout the body, making its transmission from human to human more viable. The NRI prevalence rate was higher than that expected in society conducting rubella immunization program. Despite vaccination programs in effect, 5-10% of women of child bearing age are susceptible to rubella infection<sup>24</sup>. The increase of NRI may be due to disruption of the vaccination program during the period from 1992 to date. Statistics from the World Health Organization (WHO) show that this virus is present in Iraq with 15 cases of confirmed congenital anomalies in 2010<sup>16</sup>. The prevalence rate of NRI demonstrated in this study (25.3%) was higher than that which was reported in previous studies conducted in another Iraqi province, such as Babylon<sup>17,18</sup>, Diyala, [19], Kirkuk [20], Baghdad<sup>21</sup>, Waset<sup>22</sup>, and ThiQar<sup>23</sup>. These results match those observed in earlier studies in other Middle Eastern countries, which revealed that NRI was reported in Qatar<sup>24</sup>, Tunisia<sup>25</sup>, Saudi Arabia<sup>26,27</sup>, Libya [28], Sudan<sup>29</sup>, Yemen<sup>30</sup>, and Syria<sup>31</sup>. Additionally, the findings of the current study are consistent with many studies conducted around world, (Taiwan<sup>32</sup>, Turkey<sup>33,34,35</sup>, Malaysia<sup>36</sup>, Iran<sup>37,38</sup>, Mozambique<sup>39</sup>, South Africa<sup>40</sup>, Haiti<sup>41</sup>, Brazil<sup>42</sup>, Burkia Faso<sup>43</sup>, Bangladesh<sup>44</sup>, Nigeria<sup>45,46,47</sup>, Cameroon<sup>48</sup>, Colombia<sup>49</sup>, Nepal<sup>50</sup>, Croatia<sup>51</sup>, Sri Lanka<sup>52</sup>, Singapore<sup>53</sup>, India [54], and Kenya<sup>55</sup>. However, the findings of the current study do not support the previous research that reported seroprevalence of rubella in Canada [56], USA<sup>57</sup>, Switzerland<sup>58</sup> Italy<sup>59</sup> Russia [60]. In the present study, the most interesting finding indicated that positive IgG rate was 91.67% among low socioeconomic status group and 72.50% among high socioeconomic status group which is statistically significant ( $p < 0.05$ ). A possible explanation for these results may be that the crowded living environment in poorer residents increases the chance of exposure to rubella infection. The findings observed in this study mirror those of the previous studies that have examined the incidence of rubella specific IgG antibody in the different Indian socioeconomic status groups. The results of this study show IgG antibody positive in 55.9% in the upper socioeconomic status group and 67.3% and 71.8% in middle and lower socioeconomic status group respectively<sup>54</sup>. Another important finding was found in Bangladesh where a sample population from the lower socioeconomic class showed higher prevalence of the rubella antibody (69.2%) than the observed upper class

sample (55.6%)<sup>44</sup>. Caidi et al<sup>61</sup> detected that the seroprevalence of rubella in rural and urban areas were 81.5% and 85% respectively, but no statistical differences were recorded between the examined groups. Also, Figueiredo et al<sup>62</sup> investigated seroprevalence of rubella antibodies in a 15 to 39 year aged sample population in the municipality of Guaratinguetá, Brazil. They detected a significant disparity between seropositivity in urban and rural zones and the prevalence of seronegativity in rural areas which discloses susceptibility to potential and continued circulation of the virus in this zone. This is also in accordance with Nuretal's<sup>63</sup> observation which showed high rubella seroprevalence among women in the reproductive age group in a rural district in Ankara, Turkey. In our study the seropositivity of rubella IgG antibodies was more in women with history of previous adverse pregnancy (40%) as compared to women with normal, previous obstetric performance (29.1%). Statistically, the difference between these two groups is insignificant which matches those results observed in earlier studies such as Singla et al<sup>54</sup> from Amritsar, India, and Jubaida et al,<sup>44</sup> from Bangladesh. In accordance with the present results, previous studies have demonstrated that in Delhi, 5022 samples from pregnant women were evaluated over 15 years, and the seroprevalence of rubella infection was higher in women with bad obstetric history (87%) compared to those with normal pregnancy outcomes (83%)<sup>74</sup>.

## CONCLUSION

The present study was designed to determine the prevalence of anti-rubella antibodies in women among three population samples in Kirkuk, Iraq: adolescent females, married women, and pregnant women. One of the more significant findings to emerge from this study is that a program for the prevention and elimination of the rubella virus in Kirkuk supports a free antibody testing in populations as well as proceeds to vaccinate non-protected girls and women of childbearing age.

## RECOMMENDATIONS

This research uncovers many questions in need of further investigation. There is a need for medical examinations to recurrently check for measles in all women who want to conceive and who qualify under childbearing age, as well as to examine pregnant women before birth and to vaccinate those who are seronegative to decrease morbidity and mortality associated with the rubella virus in infants. Considerable amount of work will need to be done to determine the factors that may be associated with low and high seroprevalence of anti-rubella antibodies among women.

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