Study of rubella antibody levels among mothers and their newborn babies following normal delivery versus mothers and their newborn babies following cesarean section

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Abstract:

Background: *Rubella* is generally asymptomatic in healthy adult, but during the first trimester of pregnancy often leads to fetal death or severe congenital defect, so it is considered as an important public health problem.

Objective: This study was conducted to determine *rubella* antibody levels among group of women with normal delivery with their newborn babies and another group of mothers with cesarean section and their newborn babies, and its relation to various epidemiological, medical and obstetric problems

Method: Serum specimens of 166 women with vaginal deliveries and 32 women with cesarean section and their babies were screened for *rubella* antibody levels by Mico ELISA method.

Result: *Rubella* antibody levels were < 1.00 (optical density) in 54.2% of women with vaginal delivery (group one) and 71.9% of women in group two (women with cesarean section), Age (significant for group two), mother education, and crowding index were negatively correlated with antibody levels in both groups. Germen measles vaccination had negative correlation with *rubella* antibody titers in both groups (significant for group one), while weight of newborn babies was significantly correlated with *rubella* antibody titer among babies in-group two.

Conclusion: Weakly positive antibodies were found to be higher among women and their babies following cesarean section than the group of women with normal deliveries and their babies, negative correlation were found between antibody levels and age of mothers, educational level, crowding index.

Keywords: *Rubella* antibody levels and mothers at delivery.

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Introduction:

Rubella infection is generally an asymptomatic childhood disease but during the first trimester of pregnancy often leads to fetal death or severe congenital defect (*congenital rubella syndrome, CRS*) [(1)]. While the inclusion of *rubella* vaccination into routine childhood immunization will decrease *rubella* virus circulating among young children, it will not have immediate impact on the transmission of *rubella* among adults or the occurrence of CRS [(2)].

Worldwide, it is estimated that there are more than 100,000 infants born with *congenital rubella syndrome* (*CRS)* each year. In 1998, standard case definition for surveillance of *CRS* and *rubella* were developed by the World Health Organization (WHO) [(3)]. If applied appropriately, vaccination against *rubella* protects the susceptible person in 95% of the cases [(4)]. Nearly 50% of *CRS* can be prevented via vaccination of the sensitive women, based on the recommendations of Advisory Committee on Immunization Practices (ACIP) [(5)]. Enzyme Linked Immune Sorbent Assay (ELISA) is the most commonly preferred test against *rubella* antibodies in immunized subject [(6)].

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In Iraq *rubella* vaccination had been adapted in the MMR vaccine and also for schoolgirls, but there is no vaccination program for adult women or serological testing for *rubella* antibodies for pregnant women. Since 2003 many programs (vaccination programs is one of them), which were running regularly in our country, were affected by the current situation leading to missing of opportunities for having proper vaccination. Also antibodies following vaginal delivery suppose to be higher than those following cesarean section because of uterine contraction that lead to higher level of antibodies delivered to the baby during vaginal delivery. For these reasons and because of the bad consequence of this disease on the reproductive health of women this study was done to determine *rubella* antibody levels among group of women with normal deliveries and their newborn babies and another group with cesarean section and their newborn babies, and its relation to various epidemiological, medical and obstetric problems

Materials and subject:

The study sample was divided into two groups, group one includes 166 mothers with normal vaginal deliveries and their newborn babies, group two include 32 mothers delivered by cesarean section and their babies. Data on the demographic, socioeconomic characters of the family, medical & obstetric history of the mother during pregnancy was obtained through well-structured questionnaire form. Both groups were taken from the Al-Kadhimiya Teaching hospital during the period from December 2004- July 2005. Blood obtain from both mothers and babies to measure *rubella* specific IgG antibody levels via micro ELISA technique.

Standardization procedures were carried out for the antigen (*Rubella* Ag from Virion), conjugate (Antihuman IgG Fab specific, peroxides conjugate, Sigma), and antisera, the optical dilutions were found to be 1/10, 1/500, 1/2 respectively, ELISA test was used following the WHO standard method [7] using the above antigen in proper concentration for coating micro wells as a solid phase.

The test was carried out on the above samples in the Medical College\ Al-Nahrain University under the supervision of the microbiology department.

Sample values that lie below the cut-off value (mean negative +2SD) were considered negative, and those that were equal to or greater than cut-off value were considered positive. Because we did not have the reference standard to express the results in International units, the antibody levels to *rubella* (absolute optical density values) were divided into the following groups [10].

- Less than 1.00 = weak positive
- 1.00 -1.99 = positive
- Over 2.00 = strong positive

Analysis of data was done using SPSS statistical program version 11.0 to obtain frequencies, percentages, t- test and correlation test were done as test of significant, P value of ≤ 0.05 was considered significant

Result:

Rubella antibody levels were < 1.00 (optical density) in 54.2% of women with vaginal delivery (group one) and 71.9% of women in-group two (women with cesarean section), while it was the reverse for antibody titer of > 1.00 table (1). There were no significant differences between the mean *rubella* antibodies in-group one and two (P > 0.05) and again between babies in the two groups table (2). Majority of mothers in both groups were in the age group 20-29.9 years (58.4%, 50.0% respectively), also higher percentage of mothers in both groups were with education < 6 years (58.4%, 62.5% respectively), women in the second

group had higher crowding index in the 3-5, > 5 than those with normal deliveries (37/5%, 15.6% compare to 24.1% and 8.4%), history of germen measles vaccination, and urinary tract infection during pregnancy were higher in group two than group one (46.9%, 21.9% compare to 30.1, 10.8%), premature deliveries represent 9.0% in the study sample, all of them were in group one, and only one baby had birth weight < 2.5 kg among the second group compare to 10.8% in the first group table (3A&B).

Age (significant for group two), mother education, and crowding index were negatively correlated with antibody levels in both groups, germen measles vaccination had negative correlation with *rubella* antibody titers in both groups (significant for group one), while weight of newborn babies was significantly correlated with *rubella* antibody titer among babies in group two (table 4).

Table (1): Distribution of blood level of *antirubella* antibodies among group of mothers and their newborn babies following normal vaginal delivery and cesarean section

Variables	Normal vaginal deliveries		Cesarean section	
	Freq	Percent	Freq	Percent
Rubella antibody level\ mothers				
< 1.00	90	54.2	23	71.9
1- 1.99	45	27.1	5	15.6
≥ 2.00	31	18.7	4	12.5
Total	166	100.0	32	100.0
Rubella antibody level\ babies				
< 1.00	87	52.4	22	68.8
2- 1.99	47	28.3	5	15.6
≥ 2.00	32	19.3	5	15.6
Total	166	100.0	32	100.0

Table (2): Comparison between blood level of *antirubella* antibodies among group of mothers and their newborn babies with normal delivery and another group with cesarean section

Variables	Normal deliveries	Cesarean section	Significant
Rubella antibody levels\mothers			
Mean	1.23	0.96	T= 1.43
Minimum	0.06	0.05	P > 0.05
Maximum	3.10	2.67	
STD*	0.81	0.72	
ST Error**	0.06	0.13	

Rubella antibody levels\ babies			
Mean	1.27	0.98	T= 1.44
Minimum	0.01	0.20	P > 0.05
Maximum	3.10	3.10	
STD*	0.84	0.80	
ST Error**	0.07	0.14	

*= Standard deviation
**= Standard error

Table (3A): Distribution of mothers following normal delivery and cesarean section according to some demographic and socioeconomic variables

Variables	Normal deliveries		Cesarean section	
	Freq	Percent	Freq	Percent
Age\ years				
< 20	23	13.9	4	12.5
20-29.9	97	58.4	16	50.0
≥ 30	46	27.7	12	21.9
Total	166	100.0	32	100.0
Residency				
Urban	93	56.0	14	43.8
Rural	73	44.0	18	56.3
Total	166	100.0	32	100.0
Mother education				
< 6 years	97	58.4	20	62.5
≥ 6 years	69	41.6	12	37.5
Total	166	100.0	32	100.0
Crowding index				
< 3	112	67.5	15	46.9
3-5	40	24.1	12	37.5
> 5	14	8.4	5	15.6
Total	166	100.0	32	100.0

Table (3B): Distribution of mothers with normal delivery and cesarean section according to some obstetric and medical problems

Variables	Normal deliveries		Cesarean section	
	Freq	Percent	Freq	Percent
History of germen measles vaccination				
Yes	50	30.1	15	46.9
No	116	69.9	17	53.1
Total	166	100.0	32	100.0
URI \ pregnancy				
Yes	18	10.8	7	21.9

No	148	89.2	25	78.1
Total	166	100.0	32	100.0
Weight of newborn /kg				
< 2.5	18	10.8	1	3.1
≥ 2.5	148	89.2	31	96.9
Total	166	100.0	32	100.0
Gestational age / weeks				
≥ 37	151	91.0	32	100.0
< 37	15	9.0	---	---
Total	166	100.0	32	100.0

Table (4): Comparison between *antirubella* antibodies level and different demographic, socioeconomic, medical and obstetric problem among mothers and their newborn babies with normal delivery and cesarean section

Variables	Normal delivery		Cesarean section	
	Rubella antibody levels\ mother	*Rubella* antibody levels\ babies	*Rubella* antibody levels\ mother	*Rubella* antibody levels\ babies
Age\ years				
Person correlation	-.048	-.o74	-.485**	-.470**
Significant	.536	.341	.005	.007
Number	166	166	32	32
Residency				
Person correlation	.011	.020	.021	.066
Significant	.884	.798	.909	.719
Number	166	166	32	32
Mother education				
Person correlation	-.011	.019	-.247	-.157
Significant	.883	.808	.172	.391
Number	166	166	32	32
Crowding index				
Person correlation	-.060	-.034	-.006	-.066
Significant	.442	.666	.974	.719
Number	166	166	32	32
German measles vaccination				
Person correlation	-.175*	-.236**	-.236	-.173
Significant	.024	.002	.194	.343
Number	166	166	32	32
URI \ pregnancy				
Person correlation	-.128	-.084	.141	.107
Significant	.099	.282	.442	.561
Number	166	166	32	32
Weight of newborn				
Person correlation	-.020	.035	.322	.410*
Significant	.795	.657	.073	.020
Number	166	166	32	32

Discussion:

Rubella is generally asymptomatic in healthy adults but leads to *congenital rubella syndrome in* fetus, so it is Considered as an important public health problem [8].

In this study 54.2% of mothers, 52.4% of babies in the first group and 71.9% of mothers, 68.8% of babies in the

second group had weak *rubella* IgG antibodies, this result is higher than the result found by Turgut et al [2] 2004 in Turkey (17.2% were seronegative for *rubella* antibodies). In 1995-96, WHO conducted a review of *rubella* immunization strategies. Worldwide, 78 countries (more than one-third) reported a national policy of using *rubella* vaccine. This was closely related to each country's economic status. Based on the United Nations country classification, *rubella* vaccine is used in 92% of industrialized countries, 36% of those with economics –in- transition, and 28% of developing countries [9], in 2002 only 124 (58%) of 214 countries or territories around the world had implemented a *rubella* vaccination program [10]. An Australian study found that women born in Asia, sub-Saharan Africa and South America were 5 times as likely as other women to be seronegative for *rubella* virus [11]. Results of the present study are very striking one and might indicate improper vaccination, other point is that *rubella* antibodies decline over time and may increase the risk of reinfection [12]. In a study involving Korean children 18.8% of those who had been vaccinated and 13.8% of those with natural immunity were found to be seronegative for *rubella* virus after 3 years, an Italian study shows that wild-type *rubella* virus reinfected 9.8% of vaccinated girls within 5 years [11]. Obstetricians should always check *rubella* serologies in women of reproductive age if they have been vaccinated, *rubella* serology should also be checked in all pregnancies even if the patients were seropositive during their prior pregnancies [13].

Both mother educational level and crowding index were negatively correlated with antibody levels (except for babies of mothers with normal delivery in association with mother education). This is an expected result since crowded environment and low educational level may be risk factors for diseases such as *rubella* because of easy transmission and inaccurate knowledge about the disease transmission and its impact on health problems. The test used in this study was implemented as a screening test to detect past exposure and no further action was taken for women who had weak or negative *antiarubella* antibodies.

Conclusion and recommendation: Weakly positive antibodies were found to be higher among women and their babies following cesarean section than the group of women with normal delivery and their babies, negative correlation were found between antibody levels and age of mothers, educational level, crowding index.

Because *rubella* antibodies wane over time, screening for *rubella* susceptibility is recommended at the first prenatal visit for all pregnant women, standing orders for *rubella* vaccination after delivery and reinforcement of *rubella* vaccination program may increase immunization status among women in reproductive age

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