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SEROPREVALENCE STUDY OF RUBELLA-SPECIFIC IgG ANTIBODIES AMONG SCHOOL GIRLS IN HODEIDAH CITY, YEMEN

Ahmed M. Al-Kadassy*[1]

[1*]Department of Medical Laboratories, Faculty of Medical Science, Hodeidah University, Yemen.

ABSTRACT

Background: Rubella virus is an envelope, positive-sense, RNA virus. Itis a member of the Rubivirus genus in the family Togaviridae. Rubella is a viral disease causes German measles, a mild, self-limiting, febrile, exanthematous infection in children and adults. The most Complications of rubella infection occur if the infection acquired in the early months of pregnancy. Resulting in abortion, stillbirths and congenital rubella syndrome. There is need to determine the immunological status of rubella -specific IgG antibodies among schoolgirls after getting rubella vaccine, in Hodeidah city, Yemen. **Objective:** This study was designed to estimate the rubella seroprevalence IgG antibodies among vaccinated schoolgirls by (MR) vaccine, in Hodeidah city, Yemen. **Method:** 270 blood samples obtained from nine schools girls vaccinated by (MR) vaccine, whose ages ranged from 11 to19 years in Hodeidah city, during the period of December 2017 to November 2018. IgG antibodies of rubella virus were tested by commercial ELISA kits. **Result:** Overall, prevalence rate of 94.1 (254/270) of the subjects were positive for anti-rubella IgG indicating immunity to rubella infection, 5.9% were negative for anti-rubella IgG. **Conclusion:** Our results indicate a high rate of protective levels of rubella-specific IgG in school girls in Hodeidah city, Yemen. There is need to increase public awareness about the importance of rubella immunization against infection by rubella disease.

KEYWORDS

Rubella, Antibody, Seroprevalence, School girls and Yemen.

Author for Correspondence:
Ahmed M Al-Kadassy,
Department of Medical Laboratories,
Faculty of Medicine and Health Sciences,
Hodeidah University, Yemen.

Email: almohssen2003@yahoo.com

INTRODUCTION

Rubella is a viral illness caused by a togavirus of the genus Rubivirus. It is only known to infect humans and is responsible for the common childhood disease known as German Measles or Three Day Measles[1], Rubella is an infectious disease affecting all ages and sexes[2] Epidemiological surveys in the world indicate that

immunity level to rubella virus in different communities is related to the age, socioeconomic status, climate, as well as population size and density. Rubella occurs worldwide with a seasonal distribution. The peak incidence of infection is in late winter or early spring[3,4,5]. Rubella is usually spread through the air via coughs of people who are infected[6,7]. People are infectious during the week before and after the appearance of the rash[8].

Rubella virus has been considered to public health problem in developing countries. Infection during early pregnancy may result in a child born with congenital rubella syndrome (CRS) or miscarriage[6], Symptoms of CRS include problems with the eyes such as cataracts, ears such as deafness, heart, and brain[6]. Therefore, it is essential that girls develop immunity to rubella by the time they reach child bearing age to prevent such hazards. Immunity against rubella infection can achieved by giving rubella vaccine, which is safe, efficacious and cost effective.

A live attenuated vaccine against rubella was developed in 1968 and was licensed in the United States one year later, as part of universal childhood vaccination policy aiming at interruption of virus transmission and hoping to reduce the risk of women contracting to the infection during pregnancy[9]. MMR vaccine was licensed in the united kingdom in 1970, initially however, the selective vaccination policy adopted, was targeted towards prepubertal school girls 11-14 years in order to protect their future pregnancies. In 1988, this policy was further fostered by introducing an early childhood vaccination against rubella as part of measles and mumps (MMR) vaccine[10]. In Saudi Arabia the MMR vaccine licensed in 1982[11].

In Yemen measles and rubella vaccine (MR) was licensed in 2015, a nationwide measles and rubella campaign was launched in all governorates in Yemen to make sure children between the ages of 6 months to 15 years are protected against preventable diseases[12]. The aim of this study was to evaluate of immunity against rubella virus among schoolgirls after getting rubella vaccine. In Hodeidah city, Yemen, by using ELIZA technique.

MATERIALS AND METHODS

Study area

Hodeidah is one from the larger city in Yemen, and it is the capital city of the Tehama province. Known as bride of the red sea, also sometime referred to as the western coast. Hodeidah city is the center of Hodeidah governorate and located in westerner part from Yemen, and contain principal port on the red sea. It has a population of 2157552 people, it is in a tropical zone, and the weather is typically hot and humid, summer months of April to November are very hot with temperatures sometimes exceeding 38 to 40°C, during the rest of the year temperature range between 27-35°C. It is located on western a flat and narrow coastal plain between the foothills of the highlands and the red sea. Most of Hodeidah population is underline of poverty, almost 22% of people living in urban areas[13-15].

Study design

This is cross-sectional study was carried out between December 2017 to November 2018. 270 vaccinated school girls by MR vaccine aged range 11 to 19 years living in Hodeidah city.

Data collection

The data were collected by face-to-face interview using a pre-designed questionnaire, which was filled out for every girls under the study. The questionnaires include questions on socio-demographics like age, gender, birth, resident, father education, socioeconomic level, parent's occupation etc. Most the questions questionnaire was the yes/no questions which offer a dichotomous choice. The questionnaire first developed in English and translated into Arabic language. Each student consented to have a blood sample to perform the rubella IgG antibodies serological test.

Sample collection

About Five-ml of blood samples was drawn from each patient using a sterile needle and syringe, and drained into sterile anticoagulant-free test tube and allowed to clot. The clotted blood sample was centrifuged (3000rpm, 5 min) and the serum was transferred into cry vials and stored at -20°C until further analysis was made.

Serologic testing

The samples of serum were tested for rubella-specific IgG by using Enzyme linked immune sorbent assay (ELISA) test kit (Diamedix, Miami, Florida, United States of America). In accordance with the manufacturer's instructions. Positive and negative standard sera, accompanying the kit were included in each assay.

Ethical approval

The ethical approval for this research was obtained from the Ethical Review Committee in Faculty of Medicine and Health Sciences, Hodeidah University.

Statistical analysis

All obtained data was analyzed by computer-based software used SPSS version 20, for data compilation and calculations; the chi-squared test was used to determine the significance of difference between categorical variables. P-values < 0.05 were taken as significant.

RESULTS

In this study a total of two hundred and seventy school girls were tasted for anti-rubella IgG antibody by using ELISA technique, were randomly selected from Hodeidah School, with their age varied from 11-19 years old.

Table No.1 shows the prevalence rate of IgG against rubella virus by ELISA method among 270-school girls tasted for rubella virus antibody in Hodeidah city-Yemen, 94.1 percent of the subjects were positive for anti-rubella IgG which Indicating immunity to rubella infection, a high avidity of anti-rubella IgG signifying a previous infection.

Table No.2 shows that the socio-demographic characteristic of the school girls. According to the age groups, 109(40.4%) were (11-13) years old, 124(45.9%) were (14-16) years old, and 37(13.7%) were (17-19) years old respectively. 203(75.2%) of these girls were born in Hodeidah, 38(14.1%) of these girls were born in Taiz, 9(3.3%) of these girls were born in Hajjah, 4(1.5%) of these girls were born in Raimah, 7(2.6%) of these girls were born in Al Mahweet governorate and 9(3.3%) were born in other governorate. Most of school girls 261(96.7%) were live in urban. The education of father the most level were secondary 100(37%) of the total population of this study. More than half of fathers 151(55.9%) were special employee and more than three fourth of mothers 231(85.5%) were also unworked (house wife).

Table No.3 shows the relationship between sero-prevalence of anti-rubella IgG antibodies and some socio-demographic characteristics. Evaluation of age specific subgroups indicated high rubella IgG sero-positivity rate for age subgroups14-16. Most of the father subjects screened was Secondary 100(37.1%), university 63(23.3%), with high rate of only IgG positive found in girls with university education level of fathers. The most rate of IgG positive come from urban that equal 221(84.7%).

Table No.4 the lowest rate of positive IgG was in 26 September school in which it was 76.6% with OR=0.2, CI= (0.1-0.6) and this results was significant in which X^2= 8.5 PV=0.003.

The second low level of positive IgG was in Khawlah school in which the positive rubella IgG was 80% with OR= 0.17, CI = (0.1-0.5) and this result was significant in which X^2= 11, PV=0.0005.

The third low level of positive IgG was in Athban school in which it was 94.3% with OR= 1.0, CI = (0.3-3.8) and this result was non-significant in which X^2= 0.008, and PV= 0.9.

The highest rate of positive IgG was in AL-Saeed education complex, Nusaiban, Alzobairy, Alkods, Othman and Alwhdain which it was 100% in each school with OR= undefined, CI = undefined and this results was non-significant.

Table No.5 shows the associated odds ratio of contracting rubella) IgG positive) with different age groups, place of birth and economical level.

The lowest rate of positive IgG was in (14-16) age group in which hit was 92.7% with OR= 0.6, CI= (0.2-1.7) and this result was non-significant in which X^2= 0.77 and PV= 0.39.

The second low level of positive IgG was in (11-13) age group in which it was 93.6% with OR= 0.8, CI= (0.3-2.3) and this result was non-significant in which X^2 = 0.8, and PV= 0.77.

The highest rate of positive IgG was in (17-19) age group in which it was 100% with OR=undefined and CI= undefined and this result was non-significant. The lowest rate of positive IgG was in Hodeidah governorate in which it was 92.6% with OR=0.2, CI= (0.02-1.4) and this result closed to significant compare with other governorate which them highest rate of positive IgG with undefined OR and CI.

The lowest rate of positive IgG of rubella antibody was in moderate economical level in which it was 92.2% with OR= 0.2, CI= (0.1-1.6) and this result closed to significant in which $X^2 = 3.3$, PV=0.06.

The highest rate of positive IgG was in low economical level in which it was 98.4% with OR=6.1 and CI= (1-47) and this result was significant in which $X^2= 3.9$, PV=0.04.

Discussion

Rubella virus has been considered to public health problem in developing countries in recent years. In pregnant women, infection early during the first 16 weeks of gestation can result in miscarriage, fetal death, or an infant born with congenital birth defects known as congenital rubella syndrome (CRS)[16-19]. Many studies have been assigned to investigate the surveillance of (CRS)[1]. The World Health Organization (WHO) estimates that around 238,000 with CRS every year, the majority of whom live in developing countries[20-24]. The frequency of CRS varies in different parts of the world, depending on levels of naturally acquired immunity, overcrowding and immunization policies and practices[25-28].

The present study was performed to investigate the sero-prevalence and correlates of Rubella infection school girls in Hodeidah city, western Yemen.

The results of our study revealed that out of the total 270 girls, 154(94.1%) were seropositive and 16(5.9%) were sero-negative for IgG (Table No.1) Rubella antibodies aged from 11 to 19 years old. According to this results about 94.1% of schoolgirls in, Hodeidah city, have a good immunity against Rubella virus.

In Yemen only a few studies have investigated the prevalence of rubella viruses infection among schoolgirls carried out in Sana'a city, with high prevalence in age between 11-21 years[29,30] and to our knowledge, this is the first report on the seroprevalence of Rubella antibodies among schoolgirls in Hodeidah city, Yemen.

Our data showed a similar rate of positive as study for rubella in Sana'a city[29], Yemen among female at childbearing age (94.6%) with a susceptibility rate of 5.6%. It is also higher than that found in Sana'a city by Sallam, *et al*[30] among females at bearing age where prevalence rate of rubella was 85.4% and susceptibility rate was 14.6%. In addition when we compared our rate with international rates, our data showed roughly higher rubella prevalence rate that of Morocco, which has a prevalence rate of 85% with susceptibility rate of 15%[31]. It is also higher than that of Pakistan, which has a prevalence rate of 84.2% with a susceptibility rate of 15.8%[32]. In 2002, a study from Taiwan reported rubella sero-negativity rate of 5.7% among women of child bearing age after initiating nationwide rubella vaccination programs in 1986 and 1992 years to have all 15-year old school girls and females of child bearing age vaccinated against rubella[33]. Sero-prevalence of anti-rubella IgG was reported as 53% while IgM sero-positivity is 10% in all IgG seropositive women in Nigeria[34]. Previous study in Maharashtra, India show 76.4% sero-positive. In 2012, the Romania country had become affected with 20812 cases notified in that year (97.5/100000)[35].

Prevalence based on residence showed, 203(75.2%) of these girl were born in Hodeidah Governorates. Most of school girls 261(96.7%) were live in urban area. The Primary, Secondary education's level for fathers was more than two third 53(19.6%), 100(37.0%) respectively of the total population of this study. More than two third of father's 151(55.9%) were unemployed (Special Employee), and more than three fourth of Mather's 231(85.1%) were also unemployed (house wife). shows of most IgG that come from urban ware positive, 221(84.7%). With moderate Economic level 134(81%). (Table No.2-5) should be done to detect this relationship between antibody rubella with

variant factors, Likewise seroprevalence did not differ significantly between the different occupational groups, place of birth and type of residential house owned by the subjects.

It is noteworthy in this study that age, birth, resident, parents' education, socioeconomic level, parents' occupation, not associated with the risk of rubella virus positivity, because they did not reach significant levels.

Table No.1: Distribution of prevalence of rubella anti-antibodies IgG

Rubella Antibody markers	Positive/Negeativ		Interpretations
	Number	%	
Positive Anti-rubella IgG only	254	94.1	Immune
Negative IgG	16	5.9	Susceptible
Total	270	100	---

Table No.2: Socio-demographic variables of 270 school girls in Hodeidah city, Yemen

Variable	Frequency	Percent
Age		
11-13	109	40.4
zzz14-16	124	45.9
17-19	37	13.7
Total	270	100.0
Place of birth		
Hodeida	203	75.2
Taiz	38	14.1
Hagah	9	3.3
Raimah	4	1.5
AlMahweet	7	2.6
Other Governorates	9	3.3
Total	270	100.0
Education level of father		
Illiterate	29	10.7
Basic	25	9.3
Primary	53	19.6
Secondary	100	37.0
University	63	23.3
Total	270	100.0
Work of father		
Special employee	151	55.9
Employee	119	44.1
Total	270	100.0
Work of mother		
Un work	231	85.6
Work	39	14.4
Total	270	
Residence		
Urban	261	96.7
Rural	9	3.3
Total	270	

Table No.3: Distribution of rubella IgG with socio-demographical characteristic of the schoolgirls in Hodeidah city, Yemen

Variable	Participant		IgG Positive	
	No	%	No	%
Age				
11-13	109	40,4	102	93.6
14-16	124	45,9	115	92.7
17-19	37	13,7	37	100
Place of Birth				
Hodeidah	203	75.2	188	92.6
Taiz	38	14.1	37	97.4
Hagah	9	3.3	9	100
Raimah	4	1.5	4	100
Mahweet	7	2.6	7	100
	9		9	
Economic Level				
High	15	5.6	13	86.7
Between	180	66.7	147	81.7
Low	75	27.8	70	93.3
Literate	29	10.7	22	75.9
Basic	25	9.3	22	88
Primary	53	19.6	44	83.0
Secondary	100	37.0	84	84
University	63	23.3	58	92.1
Work of Father				
Special employee	151	55.9	128	84.8
Employee	119	44.1	102	85.7
Un Work	231	85.6	195	84.4
Work	39	14.4	35	89.7
Residence				
Urban	261	96.7	221	84.7
Rural	9	3.3	9	100

Table No.4: The Associated odds ratio of contracting rubella (IgG positive) with different school girls

Schools	No.	Positive IgG		OR.	CI.	X^2	PV
		No.	%				
Khawlah	30	24	80	0.17	0.1-0.5	11	0.0005
26 September	30	23	76.6	0.2	0.1-0.6	8.5	0.003
AL-Saeed Education Complex	30	30	100	Undefined	Undefined	2.1	0.14
Nusaibah	37	37	100	Undefined	Undefined	2.7	0.1
Athban	53	50	94.3	1.0	0.3-3.8	0.008	0.9
Alzobairy	35	35	100	Undefined	Undefined	2.5	0.1
Alkods	15	15	100	Undefined	Undefined	1.1	0.31
Othman	29	29	100	Undefined	Undefined	2.1	0.15
Alwahda	11	11	100	Undefined	Undefined	0.7	0.39

Table No.5: Shows the associated odds ratio of contracting rubella (IgG positive) with different age groups, place of birth and economical level

Factors	No.	Positive IgG		OR.	CI	X^2	PV
		No.	%				
Age							
11-13	109	102	93.6	0.8	0.3-2.3	0.08	0.77
14-16	124	115	92.7	0.6	0.2-1.7	0.7	0.39
17-19	37	37	100	Undefined	Undefined	2.7	0.10
Place of birth							
Hodeidah	203	188	92.6	0.2	0.02-1.4	3.1	0.07
Taiz	38	37	97.4	2.5	0.4-19	0.8	0.33
hajjah	9	9	100	Undefined	Undefined	0.5	0.4
Raimah	4	4	100	Undefined	Undefined	0.2	0.61
Mahweet	7	7	100	Undefined	Undefined	0.45	0.50
Economical level							
High	15	14	93.3	0.9	0.1-7	0.01	0.9
Moderate	180	166	92.2	0.2	0.1-1.6	3.3	0.06
Low	75	74	98.4	6.1	1- 47	3.9	0.04

CONCLUSION

The present study show that a high rate of protective levels of rubella-specific IgG in school girls, with the prevalence being at 94.1%.

The prevalence rate of Rubella antibodies was higher among 17-19 years were it count 100% comparing with 92.7% among 14-16 years. There is need to increase public awareness about the importance of rubella immunization against infection by rubella disease.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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