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Full Length Research Paper

Seroprevalence of rubella among women of childbearing age in Algeria. Is there a need for a rubella vaccination?

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Controlling congenital rubella is one of the targets of the World Health Organization. Most countries currently include rubella vaccine in their national immunization programmes, but not yet in Algeria. The aim of this study was to determine the sero susceptibility of rubella **infection among women of childbearing age and the feasibility of establishing an organized prevention program in Algeria. This prospective, cross-sectional study was examined in healthy women of childbearing age (who gave informed consent) living in both an urban and a rural region of the eastern of Algeria. 834 sera were collected between March 2005 and March 2007, and were screened for rubella immunoglobulins G (IgG) using the ethylene diamine tetra-acetic acid (ELISA)-based quantitative assay in the Microbiology Laboratory at the Teaching Hospital of Setif. The mean age of the women was 32 years (range: 18 to 48) and 39.2% were pregnant. None of the women ever had previous** rubella **vaccination. The global seroprevalence determined with a commercial enzyme immunoassay among 834 WCBA was 68.6% (95% CI: 65.3 to 71.7%), leaving a high proportion of susceptibility (31.4%).The distribution of this prevalence appeared stable with no significant difference between the years of study, age groups, and residence . The lack of data on rubella and congenital rubella syndrome in Algeria should encourage medical authorities to establish a national rubella surveillance network in order to develop a strategy to survey and control congenital rubella syndrome (CRS) in the country. The present study which is the first national level data on seroprevalence of rubella among women of childbearing age, suggests the need for a policy to immunize all adolescent girls and/or women of childbearing age group against rubella before conception to control CRS.**

Key words: Rubella, seroprevalence, women childbearing age, vaccination, Setif, Algeria.

INTRODUCTION

Rubella is a mild illness usually seen in children, Its public health importance results from infection during the first 11 weeks of gestation in pregnant women, which carries a significant risk of spontaneous abortions, fetal deaths, stillbirths and a constellation of birth defects known as congenital rubella syndrome (CRS) (up to 90% of infants will develop cataracts, deafness, heart defects, mental retardation, and insulin dependent diabetes mellitus (Cutts et al., 1997). An estimated 20,000 cases of CRS occurred in the US in 1964 to 1965 during rubella epidemic before the vaccine became available (Watson et al., 1998).

Active immunization programs using live, attenuated virus have eliminated or greatly reduced rubella incidence and CRS in some developed nations (Centers for Disease Control Prevention, 1994; Peltola et al., 1994)

In Algeria the national prevalence of rubella infection, whether in- or out-of pregnancy and CRS is unknown, and there is no surveillance system for CRS exists.

The objectives of this seroprevalence study were: to

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Table 1. Titers of rubella IgG among the evaluated women.

Number (%)	Titer of rubella IgG (IU)
262(31.4)	<10
331(39.7)	10 – 59
176(21.1)	60 -109
40(4.8)	110-159
14(1.6)	160 -209
9(1.1)	210 – 259
1(0.1))	260-300
1(0.1)	>300
834(100.0)	Total

determine the level of rubella immunity and sensitivity rate of rubella among women of childbearing age (WCBA) in different areas of the country and to discuss the necessity to include vaccine against rubella in the Algerian National Immunisation Program.

MATERIALS AND METHODS

834 WCBA (15 to 49 years), 417 participants living in both urban and nearby rural setting, were sampled between March 2005 and March 2007.

Setif is a town in north-eastern Algeria, it is a city located 300 km in the east of Algiers, with urban population of approximately 286.715 and 82.400 WCBA.

Aïn El Kebira is a city located 27 km north far from Setif with both urban and rural population of approximately 40.554 and 11.655 WCBA.

The sample size of 417 volunteers WCBA from each of the two cities were counselled and had their bio data recorded in a standard questionnaire including age, sex, place of residence, marital status, employment, parity, pregnancy, history of exanthema and lymphadenopathy.

Ten millilitres of blood were collected by an aseptic technique into bottles containing ethylene diamine tetra-acetic acid (EDTA) anti-coagulant. The sera obtained after centrifugation were stored at 18°C until used.

They were screened for rubella IgG antibodies using commercially available enzyme immunoassay the Enzygnost® anti-Rubella-Virus/IgG, Behring at the Laboratory of the Teaching Hospital of Setif. According to the manufacturer's instructions; samples with IgG antibody concentration ≥10 IU/ml were regarded as seropositive or exposed cases (previous or current), while samples with IgG concentration <10 IU/ml were considered seronegative or unexposed

Data management

The data were entered into Epi info 3.3.2 (version 6 CDC Atlanta – OMS – ENSP France). Statistical analyses were performed using the chi-square or Fisher's exact test when the predicted number of observations in either cell was less than 5, and statistical significance was defined as $p<0.05$. We used the t test to compare continuous variables.

RESULTS

Study population

A total of 834 women of childbearing age, living in Setif and Ain el kebira were sampled. The median age was found to be 32 years (range: 18 to 48) most of them were younger than 35 years (65.58%), 98.6% were married, 95.9% house wives 54.4 %), urban inhabitants.

97.6% reported having giving birth and 39.2% were pregnant and none of the examined women were vaccinated against rubella. There were 1.1% of WCBA who had a history of an exanthema disease and 2.8% had history of lymphadenopathy.

Rubella seroprevalence

Among these 834 WCBA, the overall seroprevalence of rubella IgG antibodies was 68.6% (95% CI: 65.3 to 71.7%).

The quantitative analysis for rubella IgG showed a noticeable variability in the values of antibodies that ranged between 0 and 307 UI IU/ml. The results showed that among the 572 immune women, 69.9% had a titer between 10 and 109 IU/ml (Table 1).

As shown in Table 2, no statistical differences were found in women with rubella positive specific IgG antibody levels by age.

379 (69.3%) women with positive IgG seromarkers were less than 35 years of age, while 193 (67.2%) were above 35 years of age. There was no statistically significant difference between the age groups (Table 3). The mean age of women with positive (32.08) and negative rubella serology (32.3) was not significantly different. In addition, there was no significant relationship between rubella seroprevalence and sociodemographic characteristics such as marital status, place of residence and occupation (Table 3).

29.4% of pregnant women were found to be negative for specific rubella IgG antibody. The seroprevalence was significantly different neither between pregnant and no pregnant women nor by parity (Table 4).

Of the women with history of exanthema disease or lymphadenopathy, respectively 88.9 and 69.6% had immunity to rubella. But no statistically association was found between rubella seroprevalence and history of exanthema disease or lymphadenopathy ($P > 0.05$) (Table 5).

Table 2 . Distribution of rubella seropositivity and percentage of natural immunity by age group.

Natural immunity (%)	Rubella IgG antibody level(IU/ml		Age group (year)
	Number seronegative (%)	Number seropositive (%)	
59	7(2.7)	10(1.7)	15 - 20
70	50(19.1)	116(20.3)	21 - 25
67	64(24.4)	131(22.9)	26 - 30
72	46(17.6)	123(21.5)	31 - 35
64	54(20.6)	108(18.9)	36 - 40
67	41(15)	84(14.7)	≥41
	262(100.0)	572(100.0)	Total

Table 3. Seroprevalence of rubella according to age and sociodemographic characteristics.

Characteristics	Rubella Seroprevalence	Distribution of p value	Means (standard deviation)	P means	Adjusted odds ratio (95% CI)
Age ≤35years	379(69.3)	NSD	27.8(4.3)	NSD	–
Age >35 years	193(67.2)		40.4(3.4)		
Sétif city	300(52.4)	< 5 %	–	–	1.4 (1– 1.9)
Ainel Kébira city	272(47.6)				
Urban	327(56.6)	NSD	–	–	–
Rural	248(43.4)				
Married	565(68.7)	NSD	–	–	–
single	7(58.3)				
House wife	26(76.4)	NSD	–	–	–
With occupation	546(68.3)				

NSD:no significant difference.

Table 4. Distribution of rubella seroprevalence according to obstetrical characteristics.

Obstetrical charactéristics / Parity	Rubella seroprevalence	Distribution of p value	Means (standard deviation)	P (means)
0	12 (60,0)	NSD	0(-)	NSD
1-6	509(69,5)		2,6(1,5)	
>6	51 (62,2)		8,3(1,5)	
Pregnant	231(70.6)	NSD	–	–
Not pregnant	341(67.3)			

DISCUSSION

The importance of rubella infection for public health relates to its teratogenic effect in pregnant women (De Santis et al., 2006). In this study, we assessed the immune status against rubella infection in WCBA, and showed that a high percentage of participants (31.4%) were non immune for rubella.

To our knowledge this is the first published data in Algeria concerning epidemiology of rubella among

Table 5. Distribution of rubella seroprevalence according to medical history.

Medical history	Number seropositive (%)	P-value	OR (IC 95%)
Exanthema disease history	8(88.9)	NSD	-
Lymphadenopathy history	16(69.6)	NSD	-

Abbreviations: OR, Odds ratio; CI, confidence interval.

Women of childbearing age. Currently, the vaccination against rubella is not integrated into the Algerian National Immunisation Program, so seroprevalence observed in our study is mainly due to circulation of the virus. In developing countries such as Algeria, pre-marriage counseling is not effectively provided and there are no mandatory tests before or during pregnancy.

The seropositivity determined in this study was nearly similar to those reported in non vaccinated women in Morocco (70%) (Caidi et al., 2009; Mrabet et al., 2006), and in Nigeria (70%) (Onyenekwe et al., 2000). Our sensitivity rate of fertile women was much higher than those reported in women of childbearing age from Egypt 7.8% (Younes et al., 1991) and Syria 14.4% (Barah and Chehada, 2010).

Seroprevalence usually increases with age, according to our results, rubella immune status among women of childbearing age was nearly stable.

All age groups had a statistically similar seroprevalence indicating that contact with the virus may occur before 18 years of age.

Although increasing age has been associated with an increased percentage of rubella seropositivity in other studies (Dayan et al., 2005; Dykewicz et al., 2001; Palihawadana et al., 2003), no significant increase with age was found in a seroprevalence study among WCBA in Switzerland (Zufferey et al., 1995) and among Turkish women (Aksit et al., 1999; Pehlivan et al., 2007).

In our study, there was no significant difference between the seropositivity according to residence.

These results determine that the virus circulation is the same between different groups, in our rural and urban areas and that woman of both areas are at similar risk of infection with rubella virus.

There were many studies reporting no relationship between rubella seropositivity and area of residence (Caidi et al., 2009; Odelola et al., 1977; Seker et al., 2004; Turgut et al., 2004). However, lower rubella incidence of seropositivity in rural females, probably due to lower population density, was observed in different studies (Sasmaz et al., 2007).

A woman's risk of acquiring the infection should expectedly increase with increasing parity, due to the longer duration of interaction with an infectious environment of their children.

But we did not find correlation between the level of IgG and the parity of the mothers, probably because rubella is not so contagious. Therefore, women may not be infected even if they have contact with more children; no significant increase in rubella seropositivity with parity was observed among WCBA in Switzerland and Nigeria (Bukbuk et al., 2002; Lee and Bowden, 2000; Zufferey et al., 1995). However, lower rubella susceptibility rates in parous women have been found in England (Tookey et al., 2002).

There were no statistically significant difference between the rates of rubella immunity and history of previous exanthematous disease or lymphadenopathy data from different parts of the world are in agreement with our results (Pehlivan et al., 2007; Sasmaz et al., 2007).

The aim of our study was to estimate the sensitivity rate of WCBA to rubella and we found that in our study population 31.4% of women were nonimmune, to rubella.

According to the WHO definition (WHO/V&B, 1999), our results allow to classify our area among countries with the highest susceptibility rates (>25%) among women of childbearing are at risk of developing CRS, and our country is considered to be among the countries that are at risk of developing CRS in which the rate of sensitivity to rubella is ≥ 10% among women of fertile age.

The high proportion of women of childbearing age susceptible to rubella and especially pregnant women indicates a high risk of CRS in Algeria and their unborn babies are vulnerable to congenital rubella syndrome. Unfortunately, there are no medications for mothers with active infections and if a woman had contact with rubella in early pregnancy, the CDC recommended that the patient and her physician make the final decision regarding continuing the pregnancy.

Our data did not estimate the risk of CRS in Algeria without further clinical information and medical follow-up of newborns.

The lack of data about this under-recognised public health problem of CRS should also encourage Algerian medical authorities to develop their own surveillance program.

Data acquired in this study show that one in three women aged between 15 and 49 years, is susceptible to rubella infection. There is need to protect this set of people considering the potential dangers of congenital anomalies associated with rubella infection during pregnancy.

Thus, the vaccination of women in childbearing age is very important.

CONCLUSION

This study provides the first national level data on the rubella seroprevalence and will serve as a baseline, the susceptibility of WCB age was found to be high. The findings however should be confirmed by a nationwide serological study including younger girls to evaluate the seroprevalence and to determine the age of immunisation.

Assuring immunity against rubella in women of childbearing age can achieve the goal of reduction to complete prevention of CRS.

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