Rubella seroprevalance among the girls (aged 7-15) in the primary-school period living in low and high socio-economic areas in Denizli, Turkey

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ABSTRACT

Objective: Immunity against rubella before women's reproductive age is a practical strategy to control congenital rubella syndrome (CRS). This study was designed to investigate the rubella seroprevalance among the female primary-school students living in low and high socio-economic areas in Denizli (Turkey).

Methodology: Two hundred seventy seven students were eligible for this comparative cross-sectional study (November 2003). Schools and classrooms were randomly included in the sample. The cut off points of blood sample were set as <10 IU negative; [3]10 - <15 IU indeterminate; [3]15 IU positive.

Results: Study was completed in 235 (84.8%) students. Rubella seropositivity was 74.0% (p=0.03). Rubella vaccination rate was 14.0% (high SES) and 7.8% (low SES). A significant difference continued among the graders even after multivariable adjustments (p<0.001).

Conclusion: Sporadic rubella vaccinations may not be a right option to control rubella among women in their reproductive age thus active immunization is important for public health in developing countries.

KEY WORDS: Rubella, Seroprevalance, Socio-economic class, Primary school girls.

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INTRODUCTION

Rubella is a frequent disease among children and young adults. It is generally mild and it leaves lifetime immunity. However, rubella in women in their reproductive age carries the risk of having babies with congenital rubella syndrome (CRS).[1] Early immunity against rubella among reproductive women is an important strategy to control CRS.

Before 2003, sporadic rubella vaccinations were possible among people who can afford it. However, there was a concern of the negative impact of this practice on rubella seropositivity among women in their reproductive age. This study aimed to determine rubella seroprevalence before MMR vaccinations were introduced in 2004 in Turkish national childhood vaccination scheme and to see the association between sporadic rubella vaccinations and seropositivity among female primary schools stu-

dents in two socio-economically different areas of Denizli, Turkey.

METHODOLOGY

This was a cross-sectional comparative study and completed in Denizli, Turkey in December 2003, with a sample size of 277 students. The sample size calculation was done in Epi Info program. The total size of the student population during the study was 5,816, approximately 3,000 female students. A sample size calculation with a 75%±5% seropositivity rate and a 5% α level gave a total of 196 subjects. The sample was selected by using a stratified (low (Kayhan) and high (Kinikli) socioeconomic classes clustered (3 schools in low, and 4 schools in high class section) random sampling technique.

To reach the total number, one primary school (consisting of 7-15 aged students) from each area and one classroom from each grade were randomly included in the sample. Before the study, permission from the Pamukkale University Instutional Review Board and a written informed consent from parents were obtained. A short survey asking the children's health history and rubella vaccination status was also completed by the parents. Approximately 3 cc blood samples was collected from the participants and sent to the PAU medical microbiology lab. Blood serums were separated and deposited in a place with a temperature of -20^0C until all samples were collected and worked up altogether. Rubella specific IgG (<10 IU, negative; ^{3}10 - <15 IU indeterminate; ^{3}15 IU positive) was studied with ELISA (using a Vidas brand machine and Biomerix brand kits). Percentages were calculated as usual. Chi-squared test was the choice for bivariate analyses and Logistic regression was run to adjust for confounding factors. Due to very high correlation between the grades in schools and age of the students, we only included the grade of the student in the model.

RESULTS

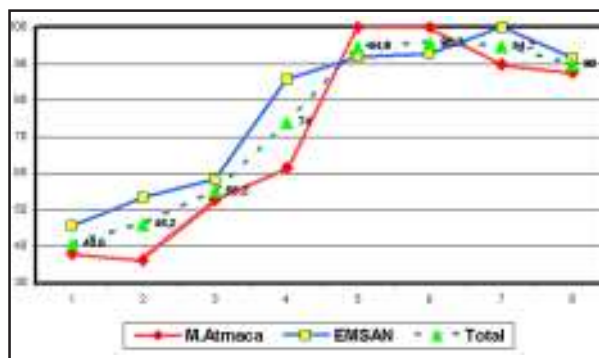The number of the eligible female students was 277; 17 students, because of not obtaining a consent form

Figure-1: Rubella seropositivity of female primary school students by schools and grades

from their parents, and 25 because of being drawed hemolysed blood samples were excluded from the analysis After the exclusions, the final number came down to 235. The overall seropositivity was 74.0%. There was statistically different seropositivity among schools, 67.8% in the low SES area school and 80.0% in the high SES area school. (p=0.03) (Table-I). The difference mainly came from the lower grades in both schools.

There was an observable trend which was statistically different in rubella seropositivity among the grades in both schools (p=0.001) (Figure 1). Rubella vaccination rates in both schools were 14.0% in the high and 7.8% in the low SES area school. Rubella seropositivity rate in vaccinated group was not significantly different from the seropositivity rate in the unvaccinated group (p=0.07) (Table-I). However, the rate became significantly different in early grades (1-4 grades) (P=0.03) (Table-II). Multivariable logistic regression indicated that the effect of rubella vaccination on seropositivity was not significant after adjusted for school and grades in the school. In multivariable logistic regression analysis, seropositivity was influential only for the grades of the school [CI 0.08(0.04-0.19) pP<0.01] (Table-III).

DISCUSSION

This study found that overall rubella seropositivity among female primary school students in two socioeconomically different areas of Denizli, Turkey

Table-I: Immunity against rubella among primary school female students by schools

Schools	Rubella seropositivity					Total	p value
	Positive		Negative				
	n	%	n	%		n	
Mehmet Atmaca (low SES)	78	67.8	37	32.2		115	0.03
Emsan (high SES)	96	80.0	24	20.0		120	
Total	174	74.0	61	26.0		235	

Table-II: Rubella seropositivity among female primary school students by grade in the school and rubella vaccination status

Grades	Rubella vaccination status	Rubella seropositivity				p value
		Positive		Negative		
		n	%	n	%	
1 - 4	(+)	55	51.4	52	48.6	0.03
	(-)	8	88.9	1	11.1	
5 - 8	(+)	100	93.5	7	6.5	0.58
	(-)	11	91.7	1	8.3	
Total	(+)	155	72.4	59	27.6	
	(-)	19	90.5	2	9.5	
		174	74.0	61	26.0	

Table-III: Multivariable logistic regression results in order to adjust for confounding factors

	OR (CI)	p value
Schools	0.65(0.33-1.27)	0.21
Grades	0.08(0.04-0.19)	<0.001
Rubella vaccination status	0.21(0.06-1.39)	0.21

was high before 2003 when two doses of MMR vaccinations were added to the routine childhood vaccination program in Turkey. This finding was comparable with the other studies from the different parts of Turkey. In preceding studies, the level of seropositivity against rubella in Turkey was reported as between 82.8% and 96.1% adolescent or pregnants.[2,3] In addition, one study searching for etiology of congenital deafness did not indicate any case due to CRS.[4] As a results, CRS was not believed to be a significant cause for child mortality and morbidity in Turkey before 2003.

In this study, we found that there was a significant age effect on rubella seropositivity in an environment without routine rubella vaccinations. Older female students showed significant seropositivity against rubella. A number of preceding studies similarly showed the age effect on rubella immunity.[2,3] One study found it as 85.6% among the 16-19 years of age group, and the seropositivity decreased with decreasing age, 81.8% among 13-15, 72.1% among 10-12, and 61.3% among 6-9 years of age group.[4] Reports from different studies included only female high schools students showed seropositivity rates between 93.8% and 96.1%.[5,6] The rates among young children were also lower. Precedingstudies reported that the rubella seropositivity was 86.2% among students between the 17-20, 86.0% among 1-20, and 93.5% among b12-17 years of age group.[7,8] In another study, it was 58.2% among 4-6 years of age.[9] Moreover, in the present study, we observed that seropositivity became over 90.0% after 5th grade. This finding indicated that most of the student in their first five years in the primary school got exposed to natural infection and became immune against rubella. The plateau observed after the 5th grade might indicate that a sufficient community immunity level had been reached.

According to a research in Ankara, Turkey, rubella seropositivity was found to be 92.6% for the unvaccinated adolescents in primary and high school period who come from moderate socio-economic background.[10] In a similar research in Istanbul, Turkey, it was established that 33.3% of the primary school students are sensitive to rubella.[11] Our current findings are below those of Istanbul and above those of Ankara. In a community research conducted in Ankara, rubella seropositivity among the unvaccinated girls turned out to be 15.3%, 6.6% and 1.3% for the age-range 9-10, 11-13, 14-16, respectively.[12]

The current study indicated that the schools in different SES areas of the city has different rubella seropositivity rates and this difference was more obvious among younger students. Despite natural disease being the most plausible explanation for higher rubella seropositivity among older students, the higher seropositivity rate among the high SES area school students in early grades might be partially explained by the almost double rubella vaccination rate among these individuals. The seropositivity rate gets equal after 5th grade in both schools.

Before 2003 rubella vaccination rate was very low in Turkey (approximately, 10.0% in this study, and several studies reported the similar rates). However, if anything was not done, there was a possibility of future increase in this rate due to changing economic structure of the country and serious advertisement of the companies. Eventually this would put babies at risk for CRS if their mothers could not afford rubella vaccine and did not get the chance to get exposed in their early ages because of the partially immunized community. One supporting finding on the legitimacy of this concern was reported from Greece.[13] An extensive epidemic of rubella in Greece occurred in 1993, followed by the delivery of a high incidence of infants with CRS (24·6 per 100 000 livebirths). Because at that time, rubella vaccination was only optional and before 1990, vaccine coverage was only 50.0- 60.0%, an upward shift was seen of age susceptibility to rubella, with infection occurring frequently among women of childbearing age.

In another study, Gabutti et al. found that rubella vaccination rate was 50.6% in a class in Italy, and the seropositivity rate after 4 years of age stopped and the seropositivity rate was only 64.9% among people 10-15 years of age. In another study from Austria, the rubella vaccination rate among school children between 10-14 years of age was 35% and on the other hand, the seropositity rate was only 82.3%.[14,15] WHO also is not currently advocating sporadic rubella vaccinations.[16] In view of these evidences, we believe that physicians need to be warned on this terrible possibility and a national policy banning sporadic rubella vaccination need to be adopted until routine rubella vaccination enters the national vaccination program. WHO also currently recommends the use of rubella vaccine in all countries with well-functioning childhood immunization programmes where reduction or elimination of CRS is considered a public health priority, and where resources may be mobilized to assure implementation of an appropriate strategy. In January, 2000, WHO held a meeting in Geneva directed towards prevention of congenital rubella syndrome, particularly in developing countries.[17] Strategies recommended included piggy-backing rubella with measles vaccine, or with measles and mumps, and most importantly ensuring that the vaccination program covered children of both sexes and adult women. According to WHO, countries with limited resources and documented very low susceptibility rates amongst their young females, as also reflected in low incidence of CRS, may be well advised not to start on any large-scale vaccination against rubella.

Limitations of the study: One shortcoming of this study is its cross sectional design. However, predetermined sufficient sample size and positive methodology used to determine rubella seroprevalence were the strengths. Also, small numbers in the evaluation of the association between previous rubella vaccination and seropositivity requires care in the interpretation of the results. Though in relatively small proportion, some parents refused to take part in the study, and some technical problems showed up, which can be considered as the constraints of this study. However, this study plays a critical role in shedding light on rubella seropositivity among the female primary school students before a routine vaccination for Rubella introduced in a developing country setting.

In conclusion, rubella susceptibility of our young women before 2003 did not cause an immediate concern. However, sporadic rubella vaccinations would not be an appropriate strategy to control rubella among women in their reproductive age. Partial immunity to the virus in a community could postpone the virus exposure to susceptible individuals and carry the risk of increasing susceptibility to rubella among women of childbearing age.

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