The Assessment of Affected Factors on Cytomegalovirus and Rubella Virus Prevalence in Females in Hamadan, Iran

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Abstract- Cytomegalovirus (CMV) and rubella are considered as dangerous viral infections to the fetus. The findings of this research can clear the possible progress made thus far toward prevention in this part of the country. The data of all referees to genetic center of Shahid Beheshti Hospital in Hamadan, including the rubella and CMV tests were recorded in questionnaires and analyzed by logistic regression models. Univariate and multivariate logistic regression were utilized to assess the affected factors on CMV and Rubella separately. STATA and SPSS16 statistical software were used with setting P-value as 0.05. Logistic regression analysis indicates a statistically significant relationship between CMV IgM and on occupation (P=0.045), pregnancy (P=0.03) and years of referring the patients (P<0.001). The results of multivariate logistic regression analysis showed that job was significantly affected on the CMV infection [OR (95% C.I) = 1.71(1.1-2.83)]. Univariate logistic regression showed that age (P=0.001), the residential area (P=0.03), pregnancy (P=0.03), the marital status (P=0.022) and years of referring the patients (P<0.0001) has a significant effect on rubella IgG. However, multivariate logistic regression analysis also showed that residential status (OR=1.77) and age (OR=0.63) were significantly affected on the Rubella infection. The high level of IgG positivity against rubella in females may highlight the considerable impact of increasing public vaccination in this part of Iran. Also, the current data demonstrating frequency of primary infections with CMV in females which support the conclusion that regular prenatal screening tests is justified.

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Keywords: Cytomegalovirus; Rubella; Epidemiology; Immunology; Prevention and control; Iran

Introduction

Pregnant women are treated by many biological agents, which are potentially harmful to the fetus (1). Pregnant women and their infants with intrauterine growth retardation are screened for TORCH an infection which stands for toxoplasmosis, other (infections), rubella, cytomegalovirus and herpes (2). Cytomegalovirus (CMV) and rubella are accounted as dangerous viral infections to the fetus. The pathogenesis of fetal infection due to CMV is diverse which includes thrombocytopenia, brain anomalies, fetal infection with hepatitis and other asymptomatic infection (3). It is reported that CMV infects between 0.3 and 2.4% of neonates born worldwide which makes it the most common cause of intrauterine infection (4). Of infected neonates, about 7% have symptoms and signs at birth like retinitis, hepatosplenomegaly, microcephaly, thrombocytopenic purpura which are recognized as cytomegalic inclusion disease (4). For the period of the first year of life, about 20% of such children die. Over 90% of the rest will suffer with serious health problems, including hearing loss and mental retardation (4).

The rubella virus provides a plausible mechanism as human teratogen and the infection among pregnant women plays a role in the serious consequences for the fetus (5). The virus can cause fetal damage which is known as congenital rubella syndrome (CRS) (6).

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The main aim of this research is to understand the epidemiologic features of the risk factors interfering in birth defects in females referred to Shahid Beheshti Hospital in Hamadan, a western province in Iran. This study has chosen two areas of birth defects including CMV as a cause of cytomegalic inclusion disease and rubella virus as a cause of congenital rubella syndrome (CRS) (7). This research can help in understanding the potential role of rubella vaccination which indicates the seroprevalence of rubella over the past few years of the study. It can also clear the possible progress made thus far toward prevention and also led to the development of prevention strategies in this part of the country (8).

Materials and Methods

A cross-sectional study of pregnant and nonpregnant females which referred to genetic center of Shahid Beheshti Hospital in Hamadan, the capital of a western province in Iran, during years 2005-2009 was conducted. This center serves as referral for patients and females before and after pregnancy. The data of all referees including the rubella and CMV tests was recorded in questionnaires and analyzed by SPSS version 13.

Result

In the period of this study, (2005-2009), totally 5735 recorded questionnaires of pregnant and nonpregnant females which referred to genetic center in Shahid Beheshti hospital in Hamadan province, Iran was surveyed. Some data in the questionnaires was missed so that we analyzed the existing available data. 77.1% of referred people were the residents in urban areas while 22.9% were living in the rural areas. The rate of married women was 55% and 45% of females were single. Based on the present study, the 95.5% of referred females were not pregnant. The analysis of data indicated that the highest exposed age group in this research was 18-27 years old with 69%. Other age groups were <=17, 28-37 and 38-47 with 18.5%, 11.8% and 0.8% respectively. In view of occupational positions of people referred to center, the rate of housewives, students, Non-governmental organization (NGO) and governmental groups were as 71%, 21.6%, 5.1% and 2.4%. The rate of referrals was increased from 16.4% in 2005 to 23.8% in 2009. Although 0.05% of females in the study reported the background of rubella infection, however, 6.9% of them reported abortion incidence with unknown reason.

The records showed that 36 individuals (1.9%) were reported to be exposed with CMV. Also, 94.1% of females were seronegative for CMV with 4% doubtful cases. The analysis of data indicated that the highest exposed age group in this research was 18-27 years old with 69%. 1.9% of females were reported to be exposed with CMV. Univariate logistic regression was utilized first to assess the affected factors on CMV and Rubella separately. Univariate logistic regression indicated that job (P=0.045), pregnancy (P=0.03) and years of referring the patients (P<0.001) significantly affected on CMV IgM. Nevertheless, the results of multivariate logistic regression analysis showed that job was significantly affected on the CMV infection [OR (95% C.I) = 1.71(1.1-2.83)] (Tables 1).

Tables 1. Affected Factors on CMV in

variable	OR	95% C.I for OR	
		Lower	Upper
Residential statute	0.61	0.31	1.21
Pregnancy	0.57	0.27	1.19
Abortion	1.17	0.6	2.3
Age	0. 9	0.59	1.37
Education	1.1	0.76	1.57
Job**	1.71	1.1	2.83
Marriage statute	0.8	0.33	1.95

Regarding to IgG positivity against rubella, 93.9% of females in the current study showed IgG positivity against rubella. Univariate logistic regression showed that age (P=0.001), the residential area (P=0.03), pregnancy (P=0.03), the marital status (P=0.022) and years of referring the patients (P<0.0001) had a significant effect on rubella IgG. However, multivariate logistic regression analysis showed that residential statute (OR=1.77) and age (OR=0.63) were significantly affected on the rubella infection (Table 2).

Tables 2. Affected Factors on Rubella

variable	OR	95 % C.I for OR	
		Lower	Upper
Residential statutes**	1.77	1.13	3.04
Pregnancy	0.55	0.17	1.80
Abortion	1.02	0.48	2.15
Age**	0.63	0.45	0.89
Education	1.03	0.81	1.33
Job	1.16	0.85	1.58
Marriage statute	1.15	0.80	1.65

**statistically significant (p-value<0.05)

Discussion

During of this study epidemiologic features of

CMV/rubella were investigated in females in Hamadan. In 2003, Rubella public vaccination was conducted in Iran which targeted both males and females in the range of 5 to 25 years old (9). This study showed that 77.1% of referred females were the urban residents. This may be attributable to differences in the access of the residents in urban areas to this centre or maybe because of the presence of more educated people in the cities. The current research showed that the rate of married and single women which referred to the hospital consultants in genetic center were almost the same as 55% and 45% respectively. This may show the importance of medical consultation before and after marriage for females in this province. The presence of 95.5% of not pregnant females in the center may show the raising awareness of maternal-fetal conflict. As the results showed, the highest exposed age group in this research was 18-27 years old. It could be concluded that females realize that advanced maternal age increases the risk of maternal diseases. In view of occupational positions, the higher rate of housewives (married women who do not work) was 71%. This point out the possibility that the tending of housewives to pregnancy is high or shows the broad awareness of this group of females acquired by media in this region. The rate of referrals was increased from 16.4% in 2005 to 23.8% in 2009. This seems a promising outcome which may show the increased referrals according to increasing population in this area. The background of rubella infection reported by 0.05% of females, but 6.9% of them reported abortion incidence with unknown reason/s. Assuming the accurate report of rubella infection background, there are other factors involved in abortion incidence in this area which are unidentified. In view of CMV IgM positivity, 1.9% of females were positive. A research which was performed in Russian pregnant women showed that fewer women had remained susceptible to primary CMV infection in pregnancy in comparison to Western Europe and North America (10). A report from Saudi Arabia in pregnant women confirmed the presence of CMV total IgG antibodies in 92.1% (11). Since IgM positivity shows the active infection, another finding to emerge from the present study is that the latter seropositivity should be considered remarkably for public health authorities. The current data demonstrating frequency of primary infections with CMV in females which support the conclusion that regular prenatal screening tests is justified. It also becomes possible to speculate that the people in this area of Iran are not familiar with the roots of CMV transmission. Hence, the routine program for CMV screening among all antenatal cases is still a controversial matter (12) so that it is not suggested by any public health system for the reason of its cost/benefit ratio. Univariate logistic regression indicated that job (P=0.045), pregnancy (P=0.03) and years of referring the patients (P<0.001) significantly affected on CMV IgM. 7.1% of nongovernmental staff were positive for CMV IgM compared with students, governmental staff and housekeepers with 0%, 1.2% and 2% respectively (not shown). The results of multivariate logistic regression analysis showed that job was significantly affected on the CMV infection {OR (95% C.I) = 1.71(1.1-2.83)} (Table 1).

The results indicated that housekeepers were at risk of CMV affliction 1.71 times more than other jobs. The significant difference of high percentage of IgM-positive women in housekeepers may be due to lower levels of education. The data obtained in this research indicated that the majority of females under the current study were seronegative against CMV; however pregnancy increased risk of the incidence of CMV in pregnant women by 3.357 times more than in non-pregnant women (Figure 1).

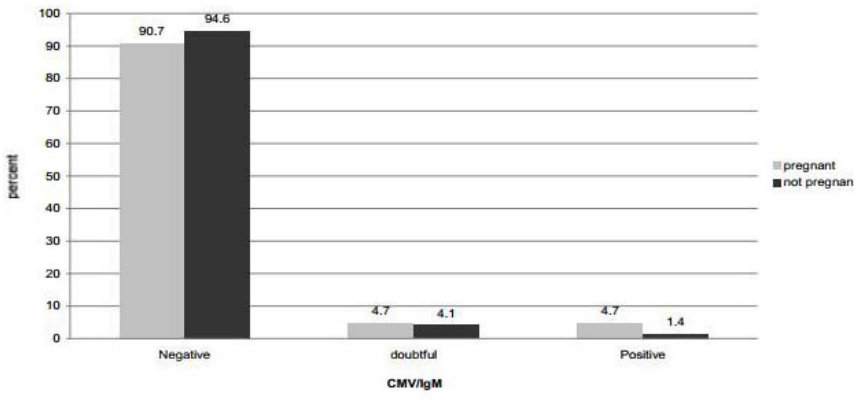

Figure 1. Distribution of CMV/IgM cases in females in Hamadan province according to pregnancy status from 2005 to 2009

This may show the role of sexual contact in transmission of CMV infection. It seems that knowledge of high-risk behavior, the epidemiology and pathogenesis of CMV infection is necessary in this part of the country. Also, there were significant differences among years of study so that in 2005 and 2008 the positive percentages were 3.9% in comparison with 2006 and 2007 with 0% and 2009 with 1.9% positivity (Figure 2). This remains an open question and needs to be clarified.

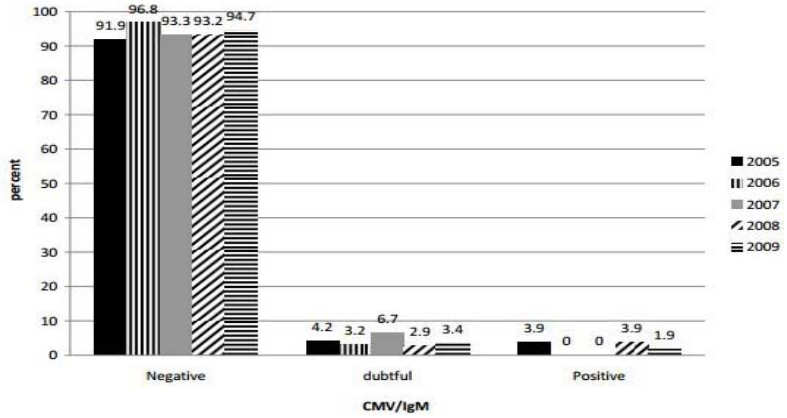

Figure 2. Distribution of CMV/IgM cases in females in Hamadan province according to the year of the report from 2005 to 2009

Univariate logistic regression showed that age (P=0.001), the residential area (P=0.03), pregnancy (P=0.03), the marital status (P=0.022) and years of referring the patients (P<0.0001) have significant effects on rubella IgG. However, multivariate logistic regression analysis also showed that residential status (OR=1.77) and age (OR=0.63) were significantly affected on the rubella infection (Tables 2).

In the current study there were significant differences between different age groups so that the rubella IgG was positive in 95.1% of females less than 18 while in females in the age group 38-47 years old, it was 85.7%. Also, the rate of seronegativity in females was less than 18 and in the age group 38-48 was 0.4% and 7.1% respectively (Figure 3).

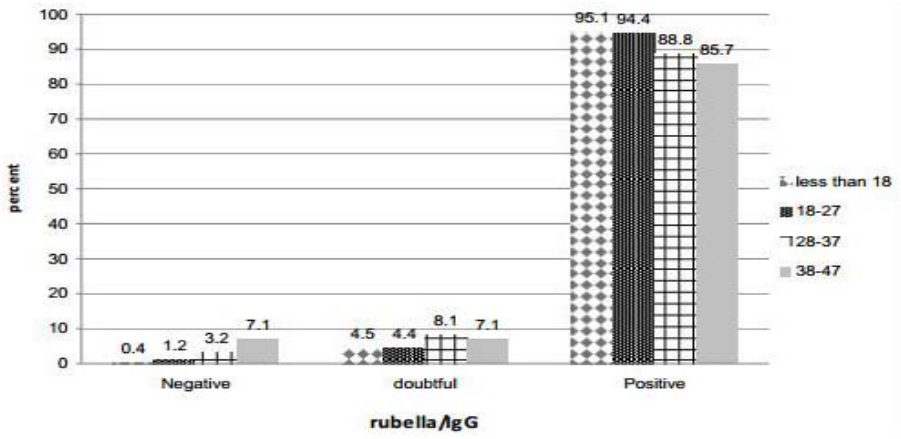

Figure 3. Distribution of rubella/IgG cases in different age groups in Hamadan province from 2005 to 2009

In other word, the risk of incidence to rubella was decreased in older people. The latter results are consistent with the rubella public vaccination which has started in Iran since 2003 in young females. Seropositivity status was significantly associated with the residential status. A large portion in urban (93.3%) and rural population (96.3%) under this study had the background of rubella encounter. Whereas the seronegativity in urban residents (1.4%) was twice more than rural inhabitants (0.7%) (Not shown). This could be due to the lack of knowledge of rubella prevention in rural areas inhabitants.

The results in this research showed that the majority of females under the current study had seropositivity against rubella. However, regarding to seronegativity, pregnancy increased risk of the incidence of rubella by 2.4 times more than in non-pregnant women which remains to be elucidated (Figure 4).

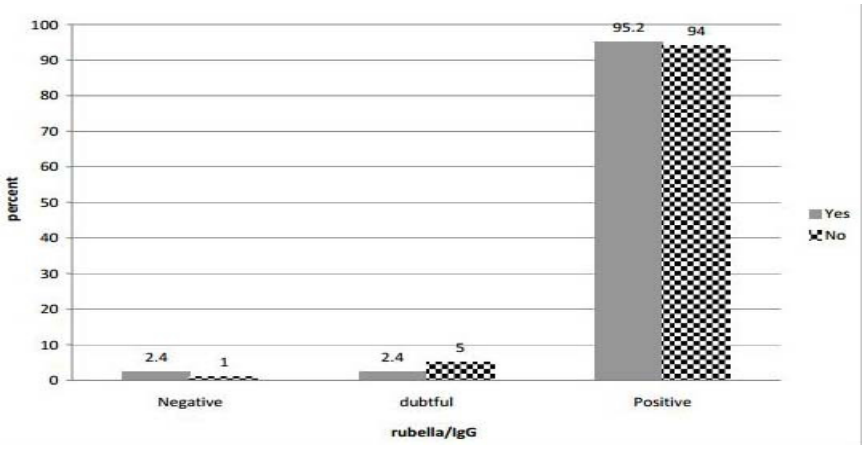

Figure 4. Distribution of rubella/IgG cases in Hamadan province from 2005 to 2009 according to pregnancy

In view of marital status, married females were 2.5 times less immunity than singles (not shown). The reason remains the subject of debate. The seronegativity of rubella was almost decreased during the period of study so that in 2009, the seronegativity was decreased 35 times in comparison to 2006 (Figure 5). This may show the successful vaccination program in this area which has started since 2003.

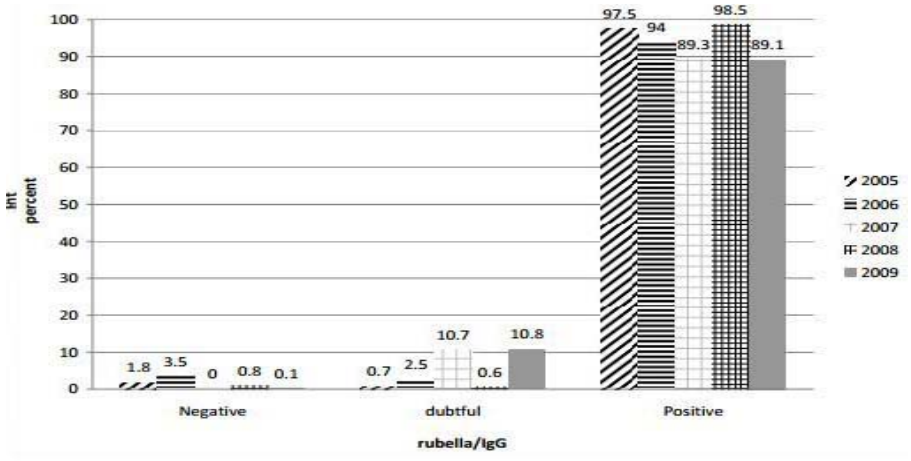

Figure 5. Distribution of rubella/IgG cases in Hamadan province from 2005 to 2009 according to the year of report

The overall prevalence of anti-rubella IgG antibodies of females in the current study was 93.9%. According to the mass public vaccination which started from 2003 in the country, the high level of immunity may highlights the considerable impact of increasing public vaccination in this part of Iran. Another study in Shiraz, Iran confirmed the rubella seropositivity among women as 96.2% (13). However, screening for rubella infection should be reserved for women (12) before and after the marriage. A report from Saudi Arabia in pregnant women confirmed the presence of rubella IgG antibodies in 93.3% (11). A study performed in Puerto Rico showed that 5.4% of women were susceptible to rubella (14). Similar study in Ibadan, Nigeria reported 1 in 4 pregnant women susceptible for congenital rubella malformation (15).

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The limitation that we were faced in this research was the missing data. This made it difficult to make a firm conclusion, but it does not change the validation of our findings. It is essential to note that there can be always some aspects of research that could be observed by whatever limitations of research one faces. Also, this study was a start point for further investigation.

To eliminate CRS, high regular vaccination coverage remains particularly important (8). Our data raise the hope for this approach to be possible. Thus, it is advised that local health authorities to make continued efforts in the field of rubella vaccination to the unexposed people and also increase the number of rubella vaccinations throughout this part of Iran as the most rational prevention strategy. Moreover, it is essential to provide women with sufficient information about the risks of rubella and CMV infections during pregnancy (16). Education of pregnant women about rubella and CMV is necessary, thus they can evaluate the risk and make choices of serologic test. In this research, we have presented evidence that show the successful comprehensive attempts on controlling the rubella infection. This has been undertaken in the latest few years and should be continued. Together with the observations discussed earlier it seems that it is time the hygiene authorities to employ multiple strategies to provide further efforts and policies to control and prioritize recognizing the CMV infection in Iran as the subject of intensive investigation. The findings of the current study are encouraging, but further survey will be needed to optimize our diagnostic approach in other parts of Iran which confirms the real distribution of CMV and rubella infection national wide.

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