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Seroprevalence of varicella-zoster virus among pregnant women in two teaching hospitals, Tehran, Iran

Mahshid Talebi-Taher[1], Maryam Kashanian[2], Katayoon Khalili[3]

[1]Antimicrobial Resistance Research Center, Infectious Diseases Department, Rasoul-e-Akram Hospital, Iran University of Medical Sciences, Tehran, Iran. [2]Department of Obstetrics and Gynecology, Akbarabadi Hospital, Iran University of Medical Sciences, Tehran, Iran. [3]Department of Internal Medicine, Iran University of Medical Sciences, Tehran, Iran.

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ABSTRACT

Background and Objective: Varicella zoster virus (VZV) can cause life-threatening disease in pregnant women. The aim of this study was to identify the VZV immune status in pregnant women and also determine the validity of self-reported history for chickenpox.

Methods: Serologic testing for VZV was performed for 400 pregnant women attending prenatal care at clinics located in two teaching and referral hospitals in Tehran, Iran. The Enzyme Immunoassay method was used to assess IgG antibodies against VZV.

Results: A total of 400 pregnant women, aged 16-43 years (median: 27 years, mean: 27.6 ± 5.9 years), were examined in which 361 (90.3%) were found to be seropositive. Sensitivity, specificity and positive and negative predictive values of patients' self reported history were 51.8%, 71.7%, 94.4% and 13.8% respectively.

Conclusion: Serologic screening for VZV in pregnant women seems crucial. We suggest considering the pregnant women as the target group for future immunization programs in Iran.

Keywords: Varicella zoster virus, seroepidemiology, pregnant women, Iran

INTRODUCTION

Varicella (chickenpox) is a highly contagious infection caused by varicella zoster virus (VZV) which spreads through respiratory droplets and direct contact with the fluid in vesicles (1). The childhood disease is a mild and self-limiting viral infection, but in adults, pregnant women and immunocompromised patients, the disease could be more serious and life threatening (2). The main risk of being infected by VZV in this group is pneumonitis which has a mortality rate of about 14% (3).

Differences in immunity against VZV, among pregnant women from tropical and temperate countries have been reported. Most people who live in countries with temperate climate are infected with VZV before they reach adolescence, so chickenpox occurs only rarely during pregnancy (4).

A study in England showed that VZV antibody prevalence was 93.1% in white pregnant British women while 86.8% in Bangladeshi women (5). The difference may imply an increased risk of varicella infection during pregnancy for women who live in tropical area.

Knowles *et al.* identified that 6.9% of Irish and other western European women were susceptible to VZV, compared to 19.7% of women from central and

* Corresponding author: Mahshid Talebi-Taher MD, MPH. Address: Infectious Diseases Department, Antimicrobial Resistance Research Center, Rasoul-e-Akram Hospital, Iran University of Medical Sciences Sattarkhan St., Niayesh, Tehran, Iran.
Tel: +98-21-66507056
Fax: +98-21-66506864
E-mail: mtalebitaher2000@yahoo.com

Table 1. Serologic results of 400 pregnant women.

Age (Years)	Total n (%)	Serologic Result n (%)		P Value
		Positive	Negative	
≤ 20	45 (11.3)	35 (77.8)	10 (22.2)	0.001
21-25	117 (29.3)	101 (86.3)	16 (13.7)	
26-30	123 (30.8)	116 (94.3)	7 (5.7)	
≥ 31	114 (28.6)	108 (94.7)	6 (5.3)	

eastern Europe, sub-Sahara Africa and Asia (6). The prevalence of varicella-zoster antibodies in pregnant women in Catolonia (Spain) and central Italy was 96.1% and 80.9% respectively (7-8).

Pourahmad *et al.* study on immune status of engaged women in Iran revealed that 72.7% of individuals with mean age of 20.4 ± 4.9 years were seropositive for VZV. Indeed, they showed that positive predictive value (PPV) for self-reported history of chickenpox in women was 79.5% and the negative predictive value (NPV) of a negative or uncertain disease history was 30.5% (9).

As VZV vaccination is not part of routine nationwide immunization of Iran, the aim of recent study was to identify the VZV immune status in a group of Iranian pregnant women attending prenatal care clinics located in two referral hospitals in Tehran and to determine the sensitivity and specificity of self-reported history of varicella infection in the mentioned group of patients.

MATERIALS AND METHODS

The recent cross-sectional study has been conducted on pregnant women, referring to the prenatal care clinics of Shahid Akbarabadi and Rasoul-e-Akram teaching hospitals in Tehran, during March to September 2010.

A signed informed consent was obtained from each patient prior to enrollment in the study. Exclusion criteria were having acute varicella infection, patients undergoing immunosuppressive therapy or transfusing blood during the last year.

Age, gestational age and the patients' history of varicella infection were documented.

Separated serum of each patient's blood sample was stored at -20ºC centigrade after collecting and has undergone Enzyme Immunoassay (EIA) for varicella-specific IgG through commercial virus-specific IgG EIA kits (varicella IgG EIA Well, Radim, Italy; sensitivity 100%, specificity 88%).

Serum classifications were performed using Optical Density (OD) values, referenced by the manufacturer's instruction. Optical densities less than 0.20 and more than 0.7 were considered negative and positive respectively. Sera with ODs more than 0.20 and less than 0.70 were considered equivocal and subsequently negative.

The study protocol was approved by the local ethics committee of Iran University of Medical Sciences.

Statistical analysis was performed using the SPSS 15.0 software.

Descriptive indices and chi square test were used for statistical analysis. Sensitivity, specificity, PPV and NPV were calculated for patients' medical history. Correlations with $p < 0.05$ were considered statistically significant.

RESULTS

Four-hundred pregnant women, with a mean age of 27.6 ± 5.9 years (16-43 years), were enrolled in our study. Among these 361 individuals (90.3%) were serologically positive for VZV antibody. The mean age of cases with positive and negative serology were 27.9 ± 5.8 and 24.5 ± 5.4 years respectively ($p = 0.001$). The detailed serologic results are shown in Table 1.

Sensitivity, specificity, PPV and NPV of the history of varicella for the seropositivity are demonstrated in Table 2.

Table 2. Varicella serology in two groups with positive and negative history of VZV infection.

History of VZV infection	Total	Seropositive n (%)	Seronegative n (%)	Sensitivity	Specificity	PPV	NPV
Positive	198	187 (94.4)	11 (5.6)	51.8	71.7	94.4	13.8
Negative	202	174 (86.1)	28 (13.9)				

DISCUSSION

The recent study demonstrated that 90.3% of pregnant women were immune against VZV infection. In European countries, VZV antibody prevalence among pregnant women varies from 80.9% in Italy to 98.8% in Lyon-France (5, 7-8, 10-12). Adults and adolescents in tropical countries have lower seroprevalence in comparison with those living in temperate climates (13).

In Iran with various climate zones, the seropositivity prevalence was varied from 72.7% in Jahroum to 87.9% in Tehran (9, 14-15). In another study conducted in Tehran, seroprevalence of VZV antibody was 52.8% in 24-25 years old medical students. The findings confirmed the significant high risk of infection in adolescence (16).

On the other hand and in compatible with other studies, (7-8) we found that varicella seroprevalence rates steadily increases from 77.8% among pregnant women younger than 20 years old to 94.7% in women older than 30 years which confirmed the remarkable circulation of VZV in the older age group of pregnant women.

In the recent study we have also assessed the validity of self-reported history of chickenpox considering the serological evidence of varicella immunity in pregnant women. In consistent with previous studies (17-18) our results showed that self-reported positive history of varicella continues to be a strong predictor of varicella immunity with the positive predictive value of 94.4%, whereas a negative or uncertain history was a poor predictor (NPV = 13.8%).

Pourahmad *et al.* showed that self-reported history of varicella had a PPV of 79.5% (9). PPV in another study among heath care workers was reported as 84.9% (14).

Saadatian-Elahi and colleagues reported a PPV of 99.5% for self-reported history of varicella infection in a 486 sample of pregnant women in Lyon-France (11). Linder *et al.* demonstrated that a woman with positive history of chickenpox had a PPV of 95.8%, and a woman with a lack of history had a NPV of 6.8%. They concluded that mothers exposed to VZV during pregnancy can be reassured that most likely they are immune against varicella (19).

It seems that both PPV and NPV of self-reported chickenpox history are impacted by the prevalence of varicella in the population. PPV will decline if varicella susceptibility in the community increase (17). Our results showed that people in Iran are more susceptible to VZV infection in comparison to western countries, so we can not rely on self-reported history in different groups of population. What is the best approach in Iran? We need more data about the seroprevalence of VZV among different groups of Iranians before obtaining any decision about further strategies in our country. It seems that universal screening is more costly but more effective than the routine verbal screening in Iran.

In conclusion, chickenpox is no longer a childhood infection and VZV continues to circulate among pregnant women. Experiences of developed countries revealed that widespread introduction of VZV vaccination results a decrease in the incidence of varicella infection and makes more protection in pregnancy (20-21). We suggest considering the pregnant women as the target group for future immunization programs in Iran.

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