

Full Length Research Paper

Seroepidemiology of varicella-zoster virus among pregnant women in Hamedan, Iran

Mojgan Mamani¹, Mehrangiz Zamani², Seyyed Hamid Hashemi¹, Marjan Akhtari³ and Amin Niayesh³

¹Department of Infectious Diseases, Hamedan University of Medical Sciences, Hamedan, Iran.

²Department of Obstetrics and Gynecology, Hamedan University of Medical Sciences, Hamedan, Iran.

³Student Research Center, Hamedan University of Medical Sciences, Hamedan, Iran.

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Varicella is a highly contagious illness that is severe and associated with a greater risk of complications and death in adults than in children. The disease in pregnant women may result in congenital varicella syndrome. The aim of this study was to determine the immunity level against varicella-zoster virus among pregnant women in Hamedan, Iran. During a cross-sectional study, blood samples of 270 pregnant women who were referred to the Fatemeh hospital during a six-month period were taken after they filled out the relevant questionnaires and the agreements. The level of IgG against varicella-zoster virus was measured using ELISA method. The collected data was analyzed by SPSS 16. Out of 270 pregnant women, 210 (78.5%) had protective levels of IgG against varicella-zoster virus and 21.5% were not immune against it. Immunity development had no significant relationship with the place of residence, education, job and the history of infection with chickenpox in the examined person as well as, her maternal education and occupation. Our results seem to indicate that pregnant women in this region need special care when it comes to contacts with chicken pox patients, given the sensitivity of a significant portion of this group to the primary varicella infection.

Key words: Varicella-zoster virus, seroepidemiology, pregnancy, immunity.

INTRODUCTION

Varicella is caused by primary infection with varicella-zoster virus (VZV). The virus is highly contagious and transmitted via respiratory droplet and direct contact with other people. Varicella could affect non-immune adults. Severity of infection increases with age and often causes serious morbidity and absence from work (Akram et al., 2000). Following infection with Varicella, more than 95% of people produce anti-varicella antibody. These antibodies could be detected with serologic tests that indicate immunity to varicella during life (Bartoloni et al., 2002).

Although, varicella is a self-limited disease, it can

cause complications and death in children. Mortality and morbidity are more common in adults (Mallet et al., 2004; Meyer et al., 2000). Without vaccination 10,000 hospital admissions and 90 to 100 deaths had been registered in United States, half of whom were seen in adults (American Academy of Pediatrics, 1995; Centers for Disease Control and Prevention, 1996). Also, statistics of admission in Canada had been similar to this census (Varughese, 1996).

In tropical countries, for reasons that are not yet entirely clear, varicella occurs mainly among young adults. The population of women who are susceptible to VZV during their pregnancy period is higher in these regions, due to late seroconversion, who in-turn, pass on the virus to their fetus. This may cause congenital varicella syndrome in the child (Lee, 1998).

*Corresponding author. E-mail: mamanimojgan@yahoo.com.
Tel: +98 918315 6757. Fax: +98 811 826 9808.

Varicella is more severe in adults than in children and associated with a greater risk of complications and death (Preblud, 1998). Varicella occurring during pregnancy is a growing clinical and public health concern (Grant, 1998). The fetuses and neonates of pregnant women who are affected by varicella may develop congenital or neonatal disease, with high case-fatality rates (Pastuszak et al., 1994; Sauerbrei and Wutzler, 2000). Furthermore, the primary infection with varicella-zoster virus during early stages of pregnancy could lead to further infectious complications such as pneumonia and encephalitis (plans et al., 2007). In a recent study in Iranian population, 28.6% of health care workers were found to be seronegative (Talebi-Taher et al., 2010). Other studies in different age groups indicate that the seroprevalence of varicella-zoster antibodies increased with age (Sharifi and Emadi, 2005; Ziyaeyan et al., 2010; Motamedifar et al., 2006). These studies also indicate low immunity levels in studied population.

Despite vaccination against Varicella-zoster in many developed countries and high immunity to varicella-zoster in these areas, varicella vaccine has not been included in the routine immunization program in Iran. The aim of this study was to determine the prevalence of antibodies against VZV among pregnant women referred to Fatemeh hospital in Hamedan, Iran.

MATERIALS AND METHODS

During a six month period between September, 2009 and February, 2010 all pregnant women who referred to the Fatemeh hospital were included. Fatemeh Hospital is a referral center for obstetrics and gynecology located in Hamedan, West of Iran. Serum sample was obtained from each subject and stored in -20°C until performing tests. Anti-VZV immune globulin G was measured by ELISA using a specific kit, and titers above 12 U/mL were considered positive (IBL, Hamburg, and Germany). A questionnaire including demographic data such as age, place of residence (urban vs. rural areas), employment status, educational level (considered at the literacy level) and history of chicken pox was fulfilled, and informed consent was obtained from all subjects. The study was approved by the Research Committee of Hamedan University of Medical Sciences.

Statistical analysis was performed using the SPSS software (version 16). Mean comparisons for continuous variables were done using *t* tests. Proportion comparisons for categorical variables were done using χ^2 tests, and the Fisher exact test was used when data were sparse. Significance was set at $P < .05$ using 2-sided comparisons.

RESULTS

Totally 270 pregnant women were studied; the mean age of them was 25.5 ± 5.8 years. Positive levels of antibody were found in 210 (78.4%) of pregnant women. The frequencies of sero-positivity according to studied factors are shown in Table 1. There was no significant relation between immunity to chicken pox and variables of location of living, level of education, job and history of previous chicken pox.

DISCUSSION

In this study, the seroprevalence of varicella in pregnancy was 78.4%. This is among the lowest rates reported from other countries so far. Most studies have reported higher seropositivities of varicella in pregnant women as well as, the women of childbearing age. The prevalence of VZV IgG in pregnant women is reported as 92% in Newfoundland, Canada (Ratnam, 2000), 96% in Catalonia, Spain (Plans et al., 2007), 98% in Lyon, France (Saadatian-Elahi et al., 2007), 97% in the Eastern part of Germany (Sauerbrei et al., 2007), 96.2% in South-Western Finland (Alanen et al., 2005), and 88.7% in Ireland (Knowles et al., 2007). Also, the prevalence of VZV IgG in women of childbearing age is reported as 88.4% in Bolivia (Bartoloni et al., 2002), 98.5% in Argentina (Dayan et al., 2004), and 80.9% in Italy (Alfonsi et al., 2007). As in our study, however, the lowest rate of immunity to varicella among pregnant women (74.4% seropositivity) was reported from Saudi Arabia (Ghazi et al., 2002). These discrepancies in the prevalence of VZV antibodies could be explained by using the universal varicella vaccination of infants and adolescents in developed countries. Our result also highlights the need for particular notice regarding preventive measures for pregnant women. However, the cost effectiveness of routine serological tests and chicken pox vaccination in women prior to marriage or pregnancy merit further investigations.

One of the matters noticed for screening and immunization of women in reproductive age, is history of chicken pox mentioned by the person herself (Plourd and Austin, 2002). In this present study, 31.7% of pregnant women mentioned history of chicken pox, among them 84.7% had immunity to varicella; and 68.3% of pregnant women didn't mention history of chicken pox, among them 75.4% had immunity to varicella. Plourd and Austin studied 1,085 pregnant women presented for prenatal registration at Naval Medical Center, San Diego. They reported that of the 940 patients with history of varicella, 904 (96.2%) and 21 (2.2%) of them had positive and negative antibody titer, respectively and also 15 (1.6%) of the cases had an equivocal titer. Based on their results, they inferred a strong correlation between the mother's serum immunity during pregnancy and a reported history of chickenpox. They concluded that given adequate grounds for education, universal screening does not seem necessary (Plourd and Austin, 2002).

Silverman et al. (1996) studied women at the time of their first prenatal visit. They analyzed the blood of eighty-one patients for the presence of varicella antibodies. Their test set consisted of two groups of women: those who provided a negative history of prior infection, and those with an uncertain history of previous infection. Between these two groups, 93.8% of women with an uncertain history of prior infection showed serologic varicella immunity, a significantly higher rate than 46.9% of women who provided a negative history of

Table 1. Prevalence of varicella antibodies in pregnant women in Hamedan.

| Variables | n | Prevalence of VZV (%) | P. value |
|------------------------|-----|-----------------------|----------|
| Age (years) | | | |
| ≤24 | 130 | 78.5 | 0.540 |
| 25-29 | 76 | 82.9 | |
| 30-34 | 38 | 71.1 | |
| >34 | 26 | 76.9 | |
| Habitat | | | |
| Urban | 158 | 77.2 | 0.560 |
| Rural | 112 | 80.2 | |
| Educational level | | | |
| Educated | 105 | 76.2 | 0.457 |
| Uneducated | 165 | 80 | |
| Employed | | | |
| Yes | 7 | 71.4 | 0.465 |
| No | 263 | 78.7 | |
| History of chicken pox | | | |
| Yes | 86 | 84.7 | 0.172 |
| No | 183 | 75.4 | |

prior infection. They concluded that women with positive histories of varicella infection could be excluded from prenatal screenings. They suggested it might be prudent to screen women with uncertain histories only as needed because most of them would be immune. They thought women with negative VZV histories might benefit most from routine prenatal screening because fewer than half would actually be non-immune. The authors made no mention of the role of varicella vaccine (Silverman et al., 1996). Unlike Plourd and Austin (2002) and Silverman et al. (1996), Karunajeewa and Kelly (2002) recommended that serologic tests be done in all high risk groups including pregnant women without notice to previous history of infection which mentioned by person himself or herself. The Advisory Committee on Immunization Practices also recommends the diagnosis of varicella or verification of a history of the disease by a health-care provider, rather than parental or self-reporting, to be the evidence of immunity in order to limit the number of false-positive reports and ensure immunity (Marin et al., 2007).

Due to potential complications of chicken pox during pregnancy and results of the study that 15.3% of pregnant women who had mentioned history of chicken pox were non-immune, it seems that routine screening of pregnant women who were in contact with chicken pox patients independent of previous history of infection is essential, although, performing a study which assess relation between previous history of chicken pox infection in women in reproductive age and immunity rate is essential. According to these cases it seems that:

- 1) Because varicella vaccine is safe and effective, immunization of children and adolescents who have no contra-indication to vaccination is recommended.
- 2) Serologic tests in pregnant women who have been in contact with suspected or proven cases of chicken pox patients are suggested. In cases where there are no immunities to varicella-zoster virus, preventive care is recommended.
- 3) Given the importance of varicella zoster immune globulin in preventing chicken pox yet its limited availability in Iran, we recommend taking actions to allow for wider access to varicella zoster immune globulin.

REFERENCES

- Akram DS, Qureshi H, Mahmud A, Khan AA, Kundi Z, Shafi S, N-ur-Rehman, Olowokure B, Weil J, Bock H, Yazdani I (2000). Seroepidemiology of varicella-zoster in Pakistan: Southeast Asian. *J. Trop. Med. Public Health.*, 31: 646-649.
- Alanen A, Kahala K, Vahlberg T, Koskela P, Vainionpää R (2005). Seroprevalence, incidence of prenatal infections and reliability of maternal history of varicella zoster virus, cytomegalovirus, herpes simplex virus and parvovirus B19 infection in South-Western Finland. *BJOG.*, 112: 50-56.
- Alfonsi V, Montomoli E, Manini I, Alberini I, Gentile C, Rota MC, Ciofi degli Atti ML (2007). Susceptibility to varicella in childbearing age women, Central Italy: is there a need for vaccinating this population group? *Vaccine*, 25: 6086-6088.
- American Academy of Pediatrics (1995). Recommendations for the use of live attenuated varicella vaccine. *Pediatrics.*, 95: 791-796.
- Bartoloni A, Bartalesi F, Roselli M, Mantella A, Dini F, Carballo ES, Barron VP, Paradisi F (2002). Seroprevalence of varicella zoster and rubella antibodies among rural populations of the Chaco region,

- south-eastern Bolivia. *Trop. Med. Int. Health*, 7: 512–517.
- Centers for Disease Control and Prevention (1996). Prevention of varicella: recommendation of the Advisory Committee on Immunization Pediatrics (ACIP). *MMWR. Morb. Mort. Wkly. Rep.*, 45:1-36.
- Dayan GH, Panero MS, Debbag R, Urquiza A, Molina M, Prieto S, Del Carmen Perego M, Scagliotti G, Galimberti D, Carroli G, Wolff C, Schmid DS, Loparev V, Guris D, Seward J (2004). Varicella seroprevalence and molecular epidemiology of varicella-zoster virus in Argentina, 2002. *J. Clin. Microbiol.* 42: 5698-5704.
- Ghazi HO, Telmesani AM, Mahomed MF (2002). TORCH agents in pregnant Saudi women. *Med. Princ. Pract.*, 11: 180-182.
- Grant A (1998). Varicella infection and toxoplasmosis in pregnancy. *J. Perinat. Neonatal. Nurs.*, 10: 17-29.
- Karunajeewa HA, Kelly HA (2002). Predictive value of personal recall of chickenpox infection: implications for the use of varicella vaccine. *Med. J. Aust.*, 174: 153.
- Knowles SJ, Grundy K, Cahill I, Cafferkey MT (2007). Susceptibility to infectious rash illness in pregnant women from diverse geographical regions. *Commun. Dis. Public. Health.*, 7: 344-348.
- Lee B (1998). Review of varicella zoster seroepidemiology in India and Southeast Asia. *Trop. Med. Int. Health.*, 3: 886-890.
- Mallet E, Maitre M, Delalande-Dutilleul L, Marguet C, Mouterde O (2004). Evaluation of varicella complications through a retrospective hospital survey in a paediatric center over 16 years in France. *Arch. Pediatr.*, 11: 1145-1151.
- Marin M, Güris D, Chaves SS, Schmid S, Seward JF (2007). Advisory Committee on Immunization Practices, Centers for Disease Control and Prevention (CDC). Prevention of varicella: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR. Recomm. Rep.* 22: 56(RR-4): 1-40.
- Meyer PA, Seward JF, Jumaan AO, Wharton M (2000). Varicella mortality: trends before vaccine licensure in the United States, 1970-1994. *J. Infect. Dis.*, 182: 383-390.
- Motamedifar M, Handjani F, Hadi N, Shahkarami M, Mehrabani D (2006). Seroprevalence of varicella zoster virus in children from shiraz-Iran. *Iran. J. Immuno.*, 3: 43-46.
- Pastuszak A, Levy M, Schick B, Zuber C, Feldcamp M, Gladstone J (1994). Outcomes after varicella infection in the first 20 weeks of pregnancy. *N Engl. J. Med.*, 330: 901–905.
- Plans P, Costa J, Espuñes J, Plasència A, Salleras L (2007). Prevalence of varicella-zoster antibodies in pregnant women in Catalonia (Spain). Rationale for varicella vaccination of women of childbearing age. *BJOG*, 114: 1122-1127.
- Plourd DM, Austin K (2002). Correlation of a reported history of chickenpox with seropositive immunity in pregnant women. *J. Reprod. Med.*, 50: 779-783.
- Preblud S (1998). Age-specific risks of varicella complications. *Pediatrics*, 68: 14–17.
- Ratnam S (2000). Varicella susceptibility in a Canadian population. *Can. J. Infect. Dis.*, 11: 249-253.
- Saadatian-Elahi M, Mekki Y, Del Signore C, Lina B, Derrough T, Caulin E, Thierry J, Vanhems P (2007). Seroprevalence of varicella antibodies among pregnant women in Lyon-France. *Eur. J. Epidemiol.*, 22: 405-409.
- Sauerbrei A, Wutzler P (2000). The congenital varicella syndrome. *J. Perinatol.*, 20: 548-554.
- Sauerbrei A, Prager J, Bischoff A, Wutzler P (2007). Antibodies against vaccine-preventable diseases in pregnant women and their offspring. Measles, mumps, rubella, poliomyelitis, and varicella. *Bundesgesundheitsblatt. Gesundheitsforschung. Gesundheitsschutz.*, 47: 10-15.
- Sharifi Z, Emadi Ghanjin S (2005). The seroepidemiology of varicella zoster virus in different age groups in Tehran-Iran. *Iran. J. Allergy. Asthma. Immunol.*, 4: 95-98.
- Silverman NS, Ewing SH, Todi N, Montgomery OC (1996). Maternal varicella history as a predictor of varicella immune status. *J. Perinatol.*, 16(1): 35-8.
- Talebi-Taher M, Noori M, Shamshiri AR, Barati M (2010). Varicella Zoster antibodies among health care workers in a university hospital, Teheran, Iran. *Int. J. Occup. Med. Environ. Health.*, 23: 27-32.
- Varughese P (1996). Chickenpox in Canada, 1924-1987. *Can. Med. Assoc. J.*, 15: 133–134.
- Ziyaeayan M, Alborzi A, Jamalidoust M, Moeini M, Pourabbas B (2010). Seroepidemiology of varicella zoster virus infection among 1-70 years individuals in Iran. *Iran. Red Crescent. Med. J.*, 12: 176-180.