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Evaluation of Rubella Immunity among Iranian pregnant women: A systematic review and meta-analysis

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Abstract

Introduction : Maternal infection with measles and rubella during pregnancy causes fetal complications and multiple abnormalities in the fetus, and is more evident in the case of rubella. The aim of this was the Evaluation of Rubella Immunity among Iranian pregnant women.
Methods: The methods used in this systematic review are developed based on the Checklist Guidelines (PRISMA).
Results: According to the random effects model, the overall prevalence of rubella immunity in 4321 pregnant women was 9.6% (9.5- 10.5% at 95% confidence interval and I^2 = 99.5%
Conclusion: World Health Organization proposes two methods to prevent CRS: the first method recommends immunization of teenage girls and child- bearing aged women to prevent CRS, and the second method recommends universal vaccination of children along with their supervision and assurance of safety of childbearing aged women to eradicate rubella.

Keywords: Rubella, Immunity Levels, Rubella antibodies, pregnancy, women.

Introduction

Maternal infection with measles and rubella during pregnancy causes fetal complications and multiple abnormalities in the fetus, and is more evident in the case of rubella (1). Measles is an acute and fever viral disease characterized by whole body rash and head lymphadenopathy or lymphadenopathy behind the ear (2). The disease is usually mild in children and teenagers; however, infection in early pregnancy, especially in the first trimester, may lead to congenital fetal defects including blindness, cardiovascular defects, deafness, fetal growth restriction, and other abnormalities in the embryo (3). The risk of embryo infection varies by gestational age. If the infection occurs in the first trimester, the risk of embryo infection is 50% and reduces to 10% in the third trimester (4-6).In the case of non- pregnant women, the disease usually presents clinically as a mild self-limiting infection. But during pregnancy it can lead to a fatal infection (7). Multiple important abnormalities (congenital rubella syndrome) occur in a high percentage of infected embryos.

Methods

Inclusion Criteria (eligibility criteria)

The methods used in this systematic review are developed based on the Checklist Guidelines (PRISMA). Cross-sectional studies, case control study, and cohort study are included in this study and case reviews, letters to editors, case reports, clinical trials, study protocols, systematic reviews, and review studies are excluded.

Participants: All studies about the Evaluation of Rubella Immunity in Relation with Iranian pregnant women.

Results: The main objective of the study was the Evaluation of Rubella Immunity in Relation with Iranian pregnant women.

Sampling Methods and Sample Size: All observational studies were included in the systematic review regardless of their design. The minimum sample size was 25 patients or more.

Search Strategy:

The searches were conducted by two independent researchers and the objective was to find studies published from 1/1/2009 to 30/5/2019. Studies were searched in Cochrane Library and the English database, and studies published in MEDLINE were searched through PubMed, and those published in EMBASETM were searched through Ovid. We searched the national database of Magiran and SID to find studies published in Iran. To ensure the adequacy of the studies, a list of references or related reviews found through searches was studied. Systematic review studies were searched through MESH and open-ended terms in accordance with publication standards. After finalizing the MEDLINE strategy, the results were compared to search other databases, and PROSPERO was searched for recent or ongoing systematic reviews. The key words used in the search strategy include: Rubella, Immunity Levels, Rubella antibodies, pregnancy, women.

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Study Selection and Data Extraction

Two researchers independently analyzed the titles and abstracts of the studies according to eligibility criteria. After excluding additional studies, the full texts of the studies were analyzed based on eligibility criteria and information about authors were collected if necessary. General information (relevant author, province, and publication year), study information (sampling technique, diagnostic criteria, data collection method, research conditions, sample size and risk of bias) and exclusion criteria were collected.

Quality Assessment

Hoy et. al.'s developed scale was used to assess the quality of the method and the risk of bias of observational studies.

Data Collection

All eligible studies were included in the data collection after systematic review and data were integrated using the forest plot. The random effects model was evaluated based on the overall prevalence of the disease among the participants. The heterogeneity of the initial studies was assessed using I^2 test. In addition, subgroups were analyzed based on the participants' age, publication year, and country to determine heterogeneity. Finally, a meta-analysis was performed in STATA14 statistical software.

Study Selection

A total of 182 studies were extracted through initial searches in various databases. Among 182 studies identified by analyzing titles and abstracts, 139 studies were removed due to irrelevant titles. Among 43 studies excluded, 36 studies were not complete, Of the remaining studies, 7 met the study criteria. (Figure 1).

Research Properties

A total of 4321 patients undergoing dialysis were evaluated. Of the 7 studies, 6 were retrospective, 1 was prospective and the study design was not mentioned in the other study. A total of 7 studies from 7 provinces that met the inclusion criteria were evaluated. 7 studies conducted in Mazanderan, kerman,Birjand,Arak,Hamadan,Sanandaj,Ahvaz were included in the study. Simple sampling method was used to select the sample (n = 7). In most studies the risk of bias was low. The main method of data collection was medical records. The main study sites were the hospitals (Table 1).

Meta-analysis of theEvaluation of Rubella Immunity among Iranian pregnant women:

According to the random effects model, the overall prevalence of rubella immunity in 4321pregnant women was 9.6% (9.5- 10.5% at 95% confidence interval and I^2 = 99.5% (Figure 2, Table 2).

Subgroup Analysis:

Meta-Regression Results:

Results of Meta-Regression Between Participants' publication year and the Evaluation of Rubella Immunity among Iranian pregnant women:

Regression of the study was analyzed based on the relationship between prevalence of Rubella Immunity in Iranian pregnant womenand participants' publication year. There was no significant linear trend in univariate meta-regression to explain the change in effect size of participants' age (Figure 3).

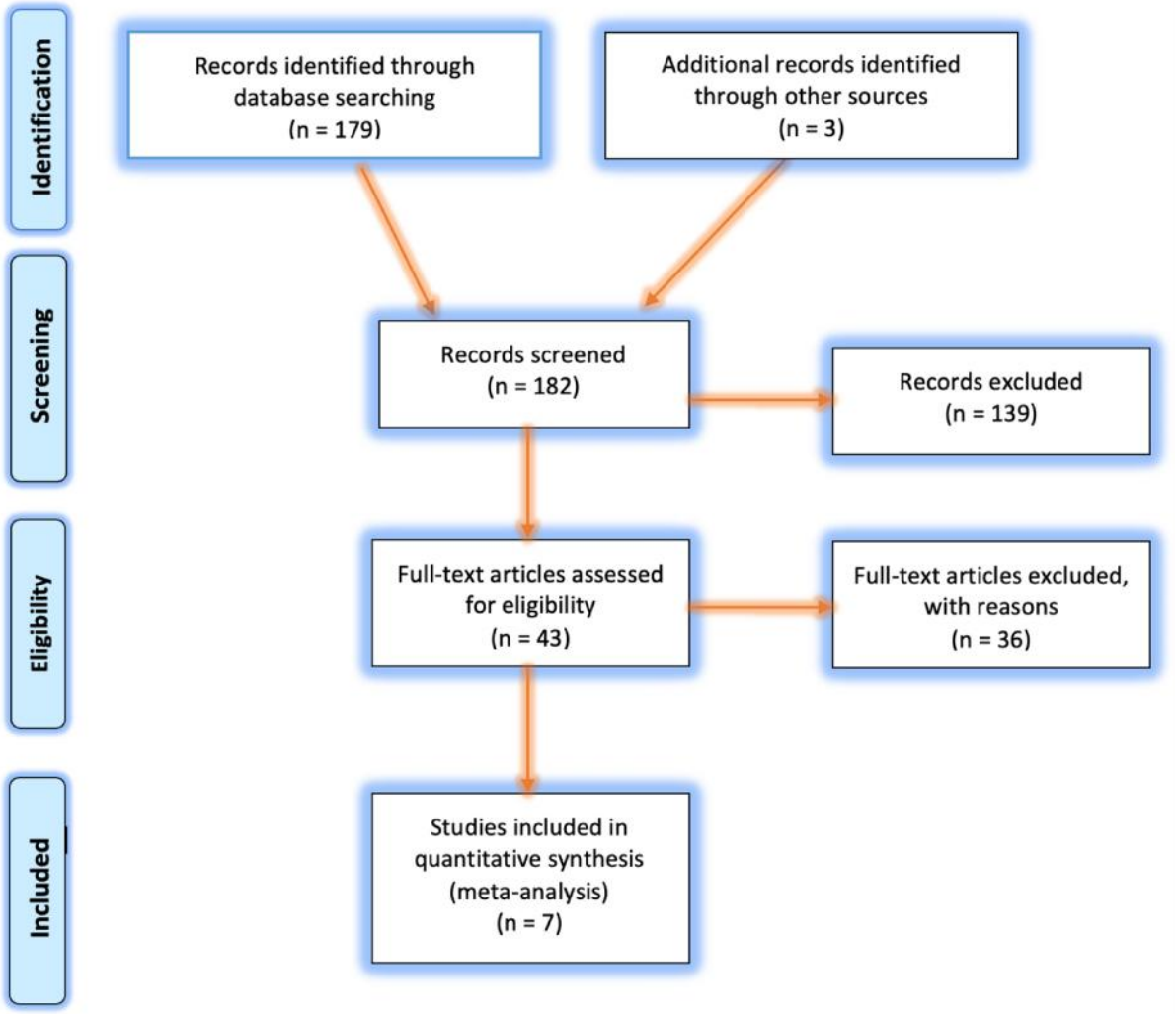

Figure 1. PRISMA flow diagram

Table 1. characteristics of the included studies

ID	Author	Province	Publications year	Number of patients
1	MohammadJafarSaffar	Mazandaran	2000	1420
2	Tahere Ashraf	Kerman	2001	410
3	Zahra azarkar	Birjand	2004	271
4	MasoomeSoofian	Arak	2002	1563
5	Mojganmamani	Hamadan	2006	207
6	FarimaRanaei	Sanandaj	2007	200
7	Mehri Ghafourian	ahvaz	2002	250

Table 2:The meta-analysis of the Evaluation of Rubella Immunity among Iranian pregnant women

First author	95% conf. interval				Publication year	Participants
	Down	Up	ES	Weight		
MohammadJafar Saffar (19)	0.066	0.094	0.080	38.02	2000	1420
Tahere Ashraf (20)	0.029	0.071	0.050	16.74	2001	410
Zahra azarkar (21)	0.024	0.076	0.050	11.00	2004	271
Masoome Soofian (22)	0.180	0.220	0.200	18.79	2002	1563
Mojgan mamani (23)	0.110	0.210	0.160	2.97	2006	207
Farima Ranaei (24)	0.035	0.105	0.070	5.92	2007	200
Mehri Ghafourian (25)	0.046	0.114	0.080	6.56	2002	250
Pooled ES	0.096	0.105	0.096	100	----	------

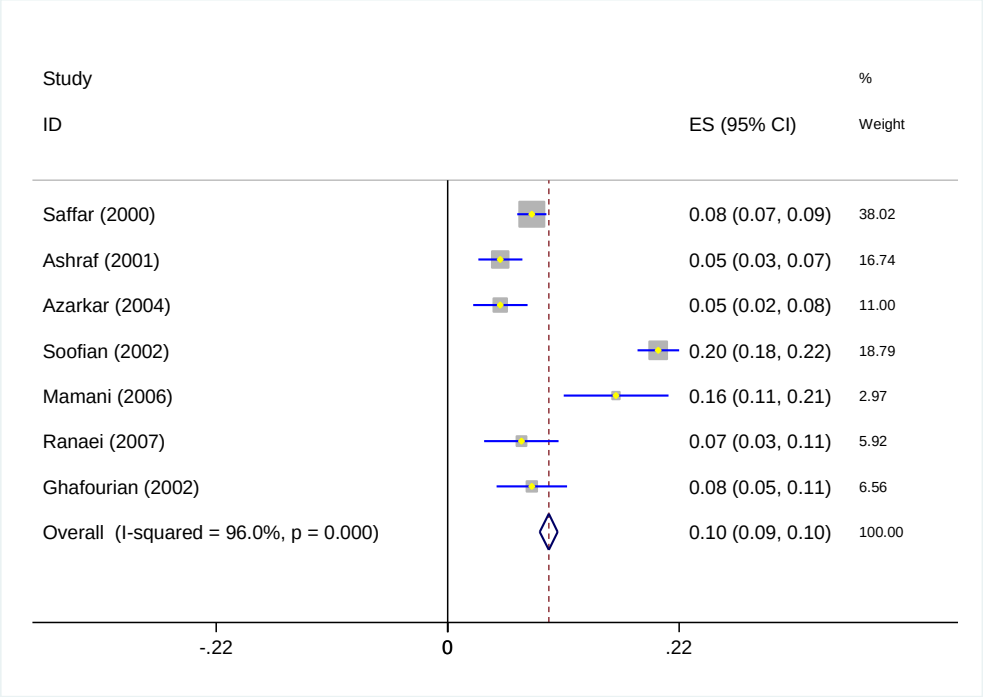

Figure 2. The meta-analysis of the Evaluation of Rubella Immunity among Iranian pregnant women

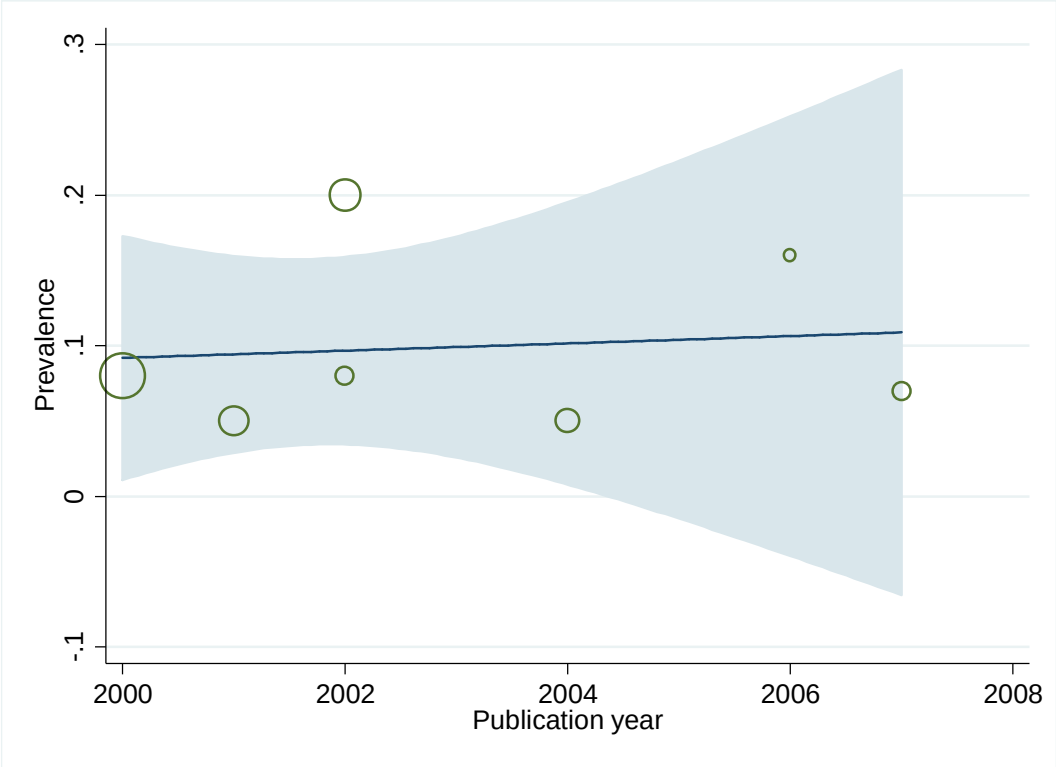

Figure 3.Meta-regression between publication year of study and the Evaluation of Rubella Immunity among Iranian pregnant women

Discussion

According to the random effects model, the overall prevalence of rubella immunity in 4321 pregnant women was 9.6% (9.5- 10.5% at 95% confidence interval and I^2 = 99.5% .The Rubella vaccination program, introduced in 1969, has been very useful and currently the main focus of infection is on unvaccinated adults (8). Recommended cases of rubella vaccination in the United States include: Peopleover one years old, caregivers, staff working in healthcare centers such as men who are in contact with pregnant women, those who travel abroad (9). If the pregnant woman is severely allergic to neomycin or suffers from immunodeficiency, the vaccine should not be administered (10-12). The rubella vaccine should be administered with mumps and measles vaccines and it is best for women who are not vaccinated or arenot infected with rubella, and should be vaccinated when they are not pregnantor immediately after labor and before discharge (13). If the vaccine is accidentally administered early in pregnancy, the risk of fetus infection is low and there is no reason for abortion.

Rubella virus is one of the most recognized teratogenic agents (14). Rubella infection in children and adults is usually mild, even asymptomatic in most cases, while infection in the developing fetuscauses severe complications following transmission of virus from mother to fetus, especially in the first trimester (15). Approximately, 50% of fetal infections occur in the first trimester if the mother is infected with rubella, whichreduces to 30-35% in the second trimester. Infection with the rubella virus in the first trimester can lead to fetal death, premature birth, or congenital abnormalities (16). The incidence of abnormality following congenital infection in the first trimester is about 80-85%. The probability ofcongenital rubella syndrome (CRS) in the acquired infection at week 13-20 of pregnancy is 16-18% and after week 20 is less than 2%. Clinical manifestations of congenital rubella syndrome include eye malformations(retinopathy, cataracts, microphthalmia, glaucoma, and chorioretinitis), ear abnormalities (unilateral or bilateral hearing loss, and speech impairment),cardiovascularabnormalities (patent ductus arteriosus in fetal period, pulmonary artery stenosis, and abdominal wall defects), central nervous system involvement (mental retardation, *sensorineural hearing loss*, and *sensorineural*deficits), low birth weight, transient effects (adenopathy, bone lesions, splenohepatomegaly, hepatitis, meningoencephalitis), and delayed effects (chronic diarrhea, pneumonia, and diabetes mellitus)(17-19).

World Health Organization proposes two methods to prevent CRS: the first method recommends immunization of teenage girls and child- bearing aged women to prevent CRS, and the second method recommends universal vaccination of children along with their supervision and assurance of safety of childbearing aged women to eradicate rubella.

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