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PREVALENCE OF ASD AND VSD IN IRANIAN CHILDREN WITH CONGENITAL HEART DEFECT: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Conflicts of Interest: Nil
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ABSTRACT

Aim: The aim of this systematic review and the meta-analysis was to evaluate the Prevalence of ASD and VSD in Iranian children with congenital heart defect.

Methods: The proposed protocol and the methods used in this systematic study were developed based on the Cochrane Handbook for Systematic Reviews of Interventions and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Observational studies conducted on the general population are attached and studies on specific populations (acute conditions, home care centers) were excluded.

Results: According to the results of the randomized method (95% CI), the overall ASD prevalence rate among 1260 persons was 8.1%,(95% CI 6.5-9.5) I^2 = 77.3 %, the overall VSD prevalence rate among 1100 persons was 27.4%, (95% CI 25-29.7)I^2 = 94.4%

Conclusion: To prevent congenital heart disease (CHD), women are advised to start taking multivitamins and folic acid three months before pregnancy and to perform the necessary tests to assess maternal health. If they have diabetes, thyroid disorders, phenylketonuria, infectious diseases, hypertension, etc. they have to undergo appropriate treatment and then plan for pregnancy. In mothers with the above-mentioned diseases or with a history of CHD and chromosomal and genetic diseases in the family and parents, fetal heart echocardiography at 7 weeks of gestation is recommended to diagnose CHD in the fetus.

Key words: Patent ductus arteriosus , Atrial septal defect , congenital heart defectx

INTRODUCTION

Congenital heart anomalies are one of the most common congenital diseases in children (1). Among congenital anomalies, cardiovascular system lesions represent the most common cause of death (2). Some congenital heart diseases require angiography and catheterism and ultimately surgery(3).

Congenital heart disease (CHD) is one of the leading causes of death in the first year of life and is classified as a specific category of heart disease that is present since birth and is typically developed due to abnormal growth of normal fetal structures or the stoppage of the maturation of these structures in the early stages of embryonic development (4-6). Most of these diseases are well tolerated in the uterus, but the problems start after birth, with the closure of the artery and the oval hole and the elimination of fetal blood circulation (7). The prevalence of the disease varies from region to region, but in total, it accounts for 1 in 5 live births (8).

Methods

Enrollment and Inclusion Criteria

The proposed protocol and the methods used in this systematic study were developed based on the Cochrane Handbook for Systematic Reviews of Interventions and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Observational studies conducted on the general population are attached and studies on specific populations (acute conditions, home care centers) were excluded. The results were formulated as reported in the study. The minimum sample size was 25 patients per study. The target population was the entire Iranian population.

International databases (PubMed, Google Scholar, WOS, and Scopus) and national databases (SID, MAGIRAN) and national publications were reviewed to find similar studies without language and regional constraints from September 1 to 30, 2019. The MEDLINE research strategy was used to search for other databases. Specific research strategies were developed by the Health Sciences Library specializing in systematic reviews based on the Peer Review of Electronic Search Strategies (PRESS) . Also, PROSPERO was used for ongoing and recently completed systematic reviews. Boolean operator (AND, OR, and NOT), Medical Subject Headings

(MeSH), cut "*", and related textual words were used to search for titles and abstracts with the following keywords: Patent ductus arteriosus , Atrial septal defect , congenital heart defectx, and IRAN.

Research Selection and Data Extraction

According to the research protocol, two researchers separately reviewed the research titles and abstracts based on the inclusion criteria. In the next step, after excluding repeated studies, the full manuscripts of the studies were reviewed according to the inclusion criteria and the required data and information were extracted. The consensus method was used to resolve differences and inconsistencies between the two researchers. The data extracted included general information (first author, year, and place), research characteristics (the research design, the sample size, location, study period, and bias risk), and output (prevalence) calculations.

Quality Assessment

To assess the quality of the methodology and the bias risk, each observational study was evaluated using the instrument developed by Hoy et al. This 10-item instrument assessed the quality of the study in two dimensions, including external validity (items 1 to 4 assessed the target population, the sampling frame, the sampling method, and the minimum indirect neglect) and internal validity (items 5 to 9 assessed the methods of data collection, case definitions, instruments, and data collection modes, and item 10 evaluated the analysis-related bias). The bias risk was assessed separately by two researchers and any inconsistency was resolved by consensus.

Data Synthesis

All studies that met the inclusion criteria were synthesized after a systematic evaluation. The data were combined with the accumulation graph. The random-effects model was evaluated based on the overall quality of life. The heterogeneity of the initial studies was assessed by I^2 tests. The subgroup analysis was performed to determine heterogeneity based on gender and age. The meta-analysis was performed using STATA14 software (STATA CORP, COLLEGE STATION, TX, USA).

Results

General Findings

Research Selection

In the initial review, 187 articles were selected from different databases. Of the 179 non-useful studies identified in the review of titles and abstracts, 81 articles were deleted because they had inappropriate titles. Of the 98 studies, 7 met the inclusion criteria. Of the 91 excluded studies, 12 were review studies, 2 letter to editor, and 73 articles did not meet the minimum requirements to be included in the review (Fig. 1).

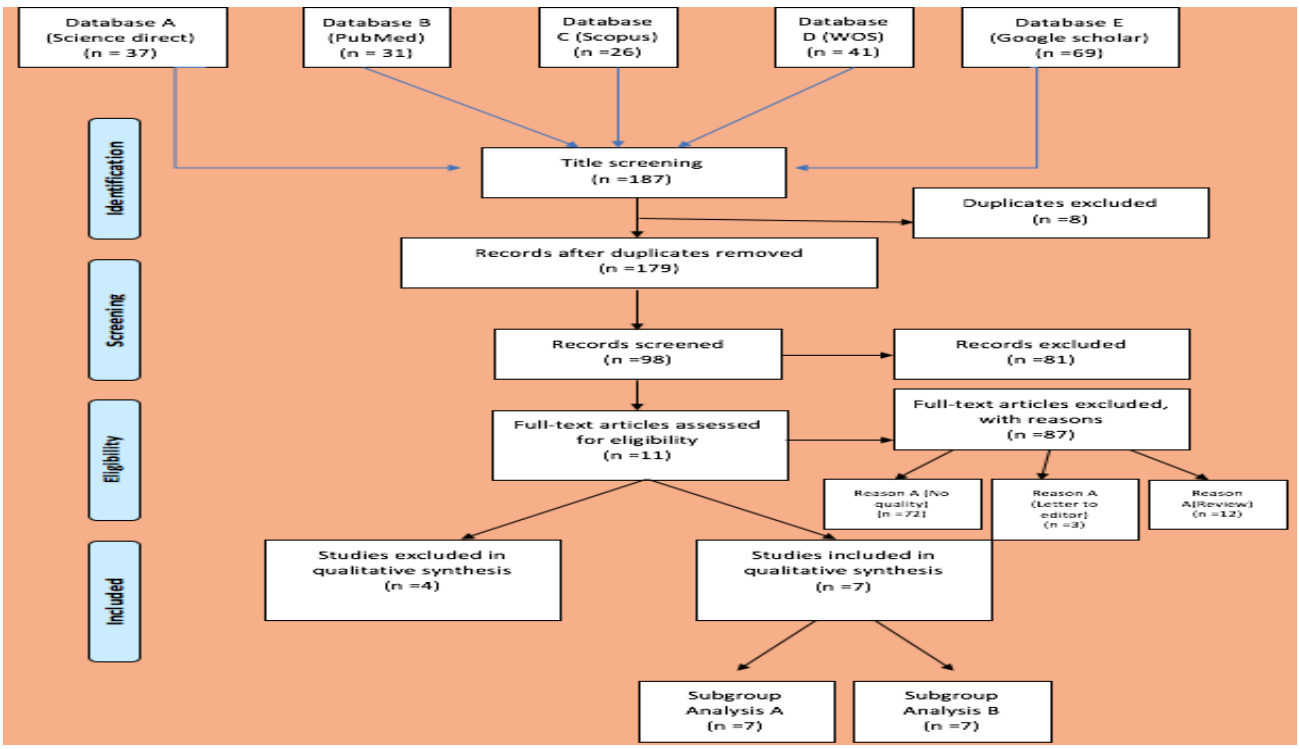

Fig 1: PRISMA flow diagram

Research Characteristics

The study was conducted on 1260 participants. All 7 included studies had cross-sectional data. 7 studies were selected from 7 cities. Studies were selected from Gilan , Rasht , Kermanshah ,Boushehr ,Kashan, Gorgan and Ahvaz ,each with one study. The most frequently used sampling method was multistage random sampling (N = 3). All studies had a low bias risk. (Table 1).

Main Results

According to the results of the randomized method (95% CI), the overall ASD prevalence rate among 1260 persons was 8.1%,(95% CI 6.5-9.5) I^2 = 77.3 %, the overall VSD prevalence rate among 1100 persons was 27.4%, (95% CI 25-29.7)I^2 = 94.4%, (Fig. 2 & 3).

Table 1: Characteristics of final included studies about Prevalence of ASD and VSD in Iranian children with congenital heart defect

	First author	Publication year	Participants	Sex		prevalence		City or province
				Male	Female	ASD	VSD	
1	Maleki	2009	160	48%	52%	---	45%	Gilan
2	Maleknia	2010	208	48.6%	51.4%	5.3%	47.1%	Rasht
3	Solgi	2002	94	--	---	22.3%	11.2%	Kermanshah
4	Yazdanparasr	2006	715	56.2%	43.8%	8.3%	26.3%	Boushehr
5	Movahedian	2002	45	64.4%	35.6%	6.6%	17.8%	Kashan
6	Nikyar	2010	-------	-----	------	---	----	Gorgan
7	Rahim	2008	38	-----	------	19.64	11.7	Ahvaz

Table 2: Prevalence of ASD and VSD in Iranian children with congenital heart defect

Author	Publication year	ASD				VSD				Province
		ES	LOW	UP	weight	ES	Low	up	weight	
Maleki	2009	-	-	-	-	0.450	0.373	0.527	9.49	Gilan
Maleknia	2010	0.053	0.023	0.083	27.55	0.471	0.403	0.539	12.24	Rasht
Solgi	2002	0.223	0.139	0.307	3.60	0.112	0.048	0.176	13.87	Kermanshah
Yazdanparasr	2006	.083	0.063	0.103	62.40	0.263	0.231	0.295	54.49	Boushehr
Movahedian	2002	0.067	-0.006	0.139	4.84	0.178	0.066	0.290	4.51	Kashan
Rahim	2008	0.196	0.071	0.321	1.62	0.117	0.015	0.219	5.40	Ahvaz
Pooled ES	-------	0.081	0.065	0.097	100	0.274	0.250	0.297	100	----------

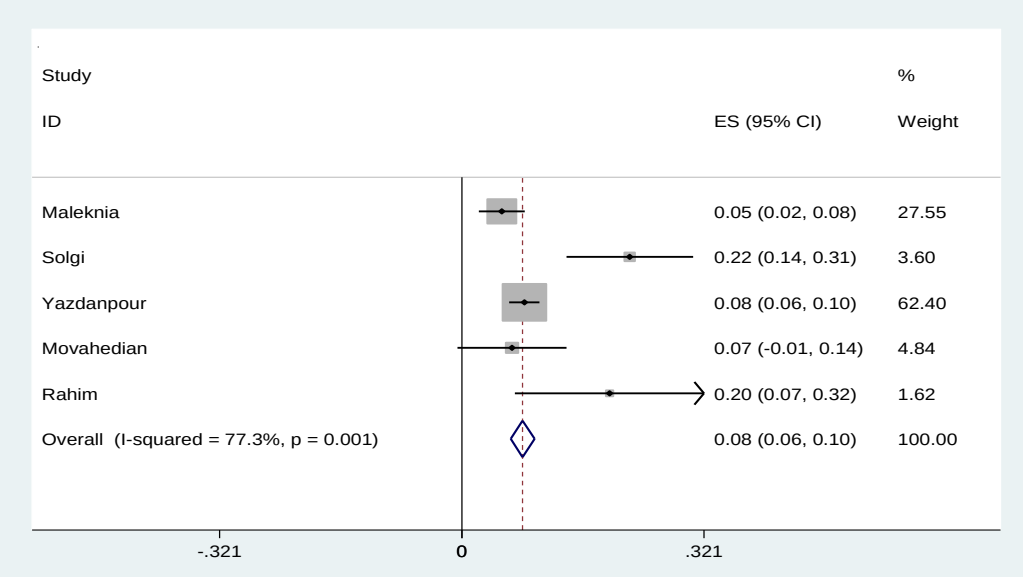

Fig 2: Prevalence of ASD in Iranian children with congenital heart defect and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the% value and the length of the lines showing the 95% confidence interval in each study.

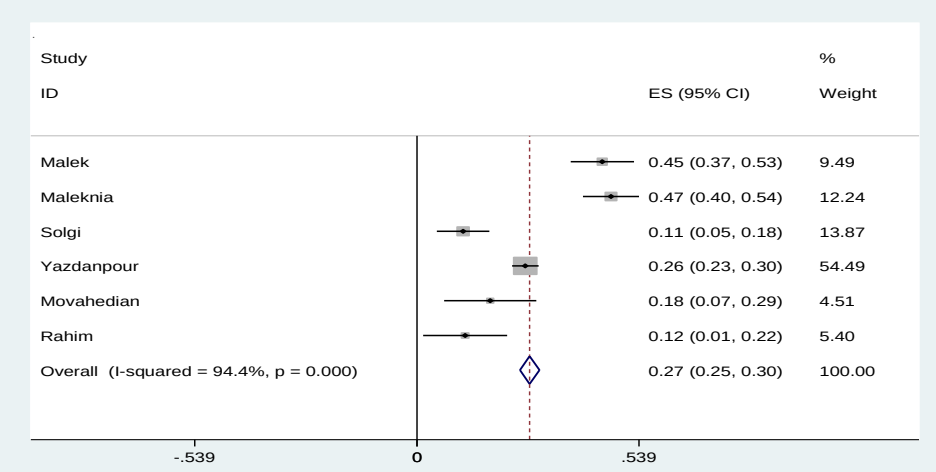

Fig 2: Prevalence of VSD in Iranian children with congenital heart defect and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the% value and the length of the lines showing the 95% confidence interval in each study.

Discussion

According to the results of the randomized method (95% CI), the overall ASD prevalence rate among 1260 persons was 8.1%,(95% CI 6.5-9.5) I^2 = 77.3 %, the overall VSD prevalence rate among 1100 persons was 27.4%, (95% CI 25-29.7)I^2 = 94.4%.Heart disease is often worsening in infants and children, and early diagnosis by a physician is essential, as advanced and surgical treatments can remove many heart defects (9). Although congenital heart disease (CHD) is present at birth, it is not associated with any special symptom in most cases and most affected babies are asymptomatic(10-12).

Signs and symptoms of congenital heart failure depend on its severity and can be mild, asymptomatic, or with symptoms such as discoloration of the nails, lips, rapid breathing, respiratory distress, or the baby may seem to be very sleepy and tired at the time of breastfeeding (13-15).

The most common cause of referral to pediatric cardiologists is abnormal findings in heart sounds. Some neonatal murmurs, many infant murmurs, and most childhood murmurs are benign or harmless (16). However, heart murmurs, especially in infancy, can be an early sign of heart disease. Almost 15% of congenital heart defects are related to the individual's genetic status. About 20% to 30% of people with congenital heart disease are also affected by other known physical problems and deficiencies. For this reason, taking infants and children with murmurs to medical centers for echocardiography and definitive diagnosis is very important and is highly recommended (17).

To prevent congenital heart disease (CHD), women are advised to start taking multivitamins and folic acid three months before pregnancy and to perform the necessary tests to assess maternal health (18-19). If they have diabetes, thyroid disorders, phenylketonuria, infectious diseases, hypertension, etc. they have to undergo appropriate treatment and then plan for pregnancy. In mothers with the above-mentioned diseases or with a history of CHD and chromosomal and genetic diseases in the family and parents, fetal heart echocardiography at 7 weeks of gestation is recommended to diagnose CHD in the fetus.

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