



Infective endocarditis in Iranian children: A systematic review and meta-analysis in three age groups

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Abstract

Introduction: Considering that there are no regional published data regarding the epidemiologic findings of infective endocarditis (IE) in Iranian children. The aim of this systematic review and meta-analysis was to evaluate the prevalence of Infective endocarditis in Iranian children.

Methods: The present systematic study has applied developed methods that are in line with accurate instruction of PRISMA checklist. Two researchers have separately investigated all studies conducted up to May 2019; the studies had been collected from international databases (PubMed, Google Scholar, and WOS) and national ones (SID and Magiran) without any time limitation in both English and Persian.

Results: As many as 3 studies conducted on 94 children were included in the meta-analysis. In asymptomatic children, according to the results of random effects mode, the general frequency of infective endocarditis in age groups of <2 years, 2-6 years, 6-14 years old was 1.4% (95% CI 0.9%-10%), 29.4% (95% CI 20.5%-38.3%) and 44.2% (95% CI 36%-52.5%) in 94 children respectively.

Conclusion: Given the underlying factors (congenital heart diseases and rheumatic heart disease), giving due attention to patients with congenital heart diseases and preventing rheumatic heart disease and rheumatic fever, infective endocarditis can be prevented, and the prescription of antibiotics can be prevented before having a definite diagnosis. If infective endocarditis is not treated, it will definitely be deadly. Moreover, it is of high significance to inform the children at risk of infective endocarditis and their parents about the early symptoms including fever, respiratory symptoms, etc.

Keywords: Endocarditis, children, Iran

Introduction

Congenital heart diseases are the children's most common risk factor for infective endocarditis (1 and 2). Although infective endocarditis is a scarce case in a society, it is likely to bring about serious problems for patients at risk of cardiac problems (3). Infective endocarditis is a microbial infection of endothelium, and the most common involvement location is the artificial heart valve (4). The main cause of endocarditis is alpha-hemolytic streptococci followed by staphylococci (5).

Despite the numerous achievements and advances in medicine, endocarditis has poor prognosis (6). Nowadays, given the prevalence of interventional surgeries and increased cases of injection materials abuse, the symptoms of endocarditis and the microorganisms involved have changed (7). Very often, patients suffering from infective have experienced heart surgeries or valve diseases (8). In the last 3-4 decades, given the survival of children suffering from congenital heart diseases and the

reduction rate of rheumatic fever cases, congenital heart diseases have become the main underlying cause of endocarditis in children (9). Congenital heart diseases (such as atrial septal defects or ventricular septal defects and *patent ductus arteriosus* (PDA)), atrial diseases, valvular heart diseases, mechanical tools in the heart including artificial heart valve, and rheumatic fever diseases are the most significant underlying causes of endocarditis (10). The symptoms of this disease include ague, chest pain, arthralgia, dyspnea, lethargy, weight loss, perspiration, seizure, headache, splenomegaly, and heart failure (11). Laboratory symptoms are observed as CRP and positive blood culture, high sedimentation, reduced complement, and hematuria. In echocardiography and vagitation, the valves are observed (12).

Materials and Methods

The present systematic study has applied developed methods that are in line with accurate instruction of PRISMA checklist. However, only observational studies including letters to the editors, journals, poor quality articles (based on HOY tool), and studies conducted on adult participants were removed from the study. It was attempted to include studies only in English and Persian. All observational studies with any sampling and statistical designs have been included in the present systematic study. Two researchers have separately investigated all studies conducted up to November 2018; the studies had been collected from international databases (PubMed, Google Scholar, and WOS) and national ones (SID and Magiran) without any time limitation in both English and Persian. The reference list of the existing studies has been also investigated to find more studies in this regard. Special research strategies have been

adopted by a health science librarian (an expert on systematic studies) through applying MESH browsing vocabulary as well as free vocabulary based on PRESS standard (16). Moreover, MEDLINE research strategy has been applied for searching other databases as well. The keywords applied in the research strategy include: endocarditis, children, and Iran that were combined with Boolean operators such as AND, OR, and NOT. Two researchers have separately investigated the titles and abstracts by considering the qualification criteria. After excluding the repetitive studies, the full texts of the studies were investigated based on the qualification criteria and the required information was extracted. For solving the questions on qualifications, extra information was obtained from the authors whenever needed. Moreover, the required data on conditions, sample size, risk of bias, and the measurement of result (Infective endocarditis) were collected as well. The final extracted data were evaluated by using STAT 14.0.

Results

Study selection: In total, as many as 185 studies were selected from the initial research on PubMed, Google Scholar, SID, Magiran, and Web of Science from the beginning to May 1 of 2019. From 148 non-repetitive studies (in terms of title and abstract), as many as 140 studies were excluded in the screening process; their titles were unrelated. From the remaining 8 studies, 3 studies were qualified for having the required criteria. From 5 excluded studies, 2 studies were reviewed, 1 studies were sent to the editor in chief (letter to editor), 1 studies didn't have the full texts, and 1 studies didn't meet the minimum quality and standards required to be included in this study (Figure 1).

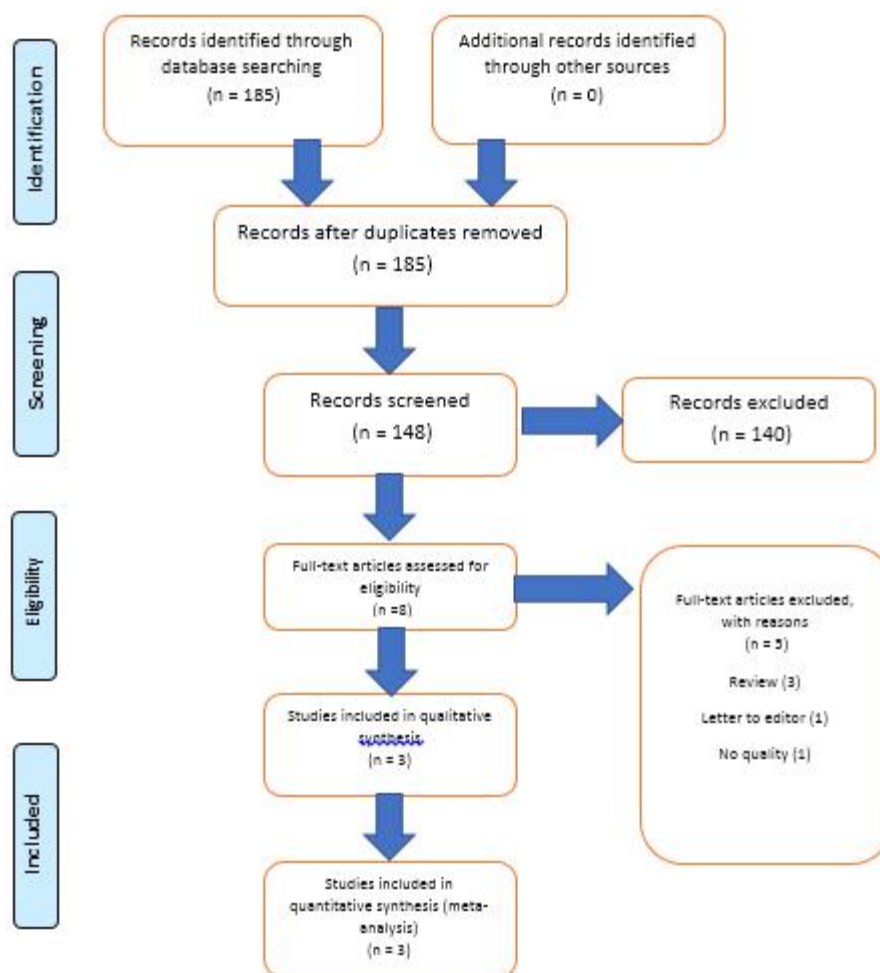


Fig 1. PRISMA flow diagram

Research characteristics:

Aged 14> years. From these 3 studies, 2 studies have provided cross-sectional data, and one study was a prospective research. Moreover, each of Tehran, Isfahan and Shiraz provinces accounted for one study. The most common sampling method applied was convenience sampling method (n=3). More than 50% of the studies had low risk of bias. Hospital was the most prevalent place for conducting the studies (n=3).

Infective endocarditis in Iranian children:

As many as 3 studies conducted on 94 children were included in the meta-analysis. In asymptomatic children, according to the results of random effects mode, the general frequency of infective endocarditis in age groups of <2 years, 2-6 years, 6-14 years old was 1.4% (95% CI 9.9%-10%), 29.4% (95% CI 20.5%-38.3%) and 44.2% (95% CI 36%-52.5%) in 94 children [Table1] respectively.

Table 1: Characteristics of final included studies

Author	Year	Sam ple size	city	<2 years				2-6 years				6-14 years old			
				E S	95% conf. Interval		Wei ght %	ES	95% conf. Interval		Wei ght %	ES	95% conf. Interval		Weight %
					Lo w	Up			Low	Up			Lo w	U p	
Ahmadi ⁽¹⁹⁾	2014	17	Isfa han	0. 41 2	0.1 78	0.6 46	3.33	0.2 94	0.07 8	0.510	16. 89	0.1 18	- 0. 03 5	0. 27 1	28.98
Borzouee ⁽²⁰⁾	2000	37	Shir az	0. 02 1	- 0.0 25	0.0 67	85.7 9	0.1 89	0.06 3	0.315	49. 79	0.7 83	0. 65 0	0. 91 6	38.66
Soltanzade ⁽²¹⁾	2001	40	Teh ran	0. 22 5	0.0 96	0.3 54	10.8 8	0.4 50	0.29 6	0.604	33. 32	0.3 25	0. 18 0	0. 47 0	32.36
Pooled ES	--	94	----	0. 05 6	0.0 14	0.0 99	100	0.2 94	0.20 5	0.383	100	0.4 42	0. 36 0	0. 52 5	100

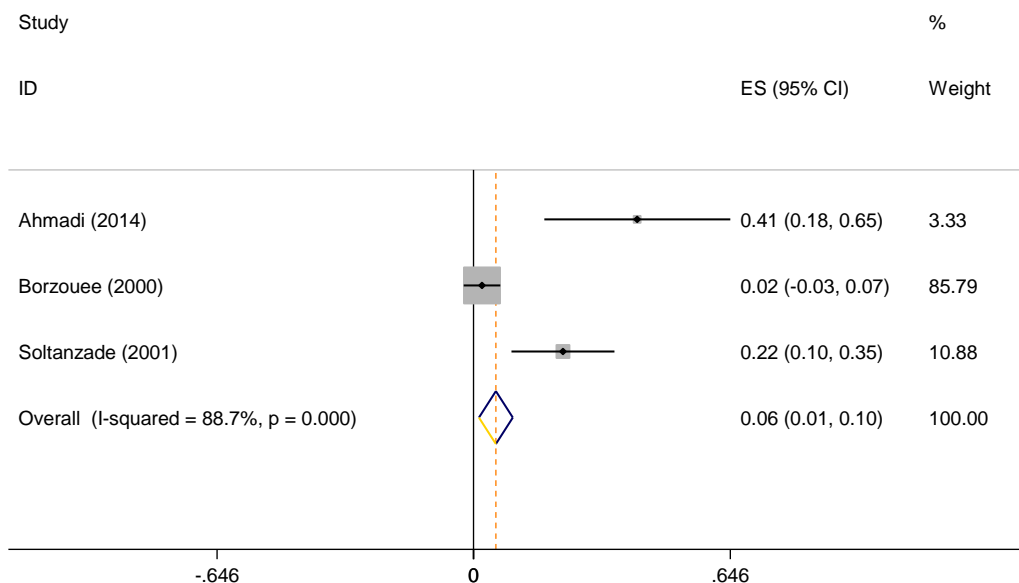


Fig. 2 : Frequency of Infective endocarditis in Iranian children(<2 years) and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the % value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows Frequency of Infective endocarditis in Iranian children

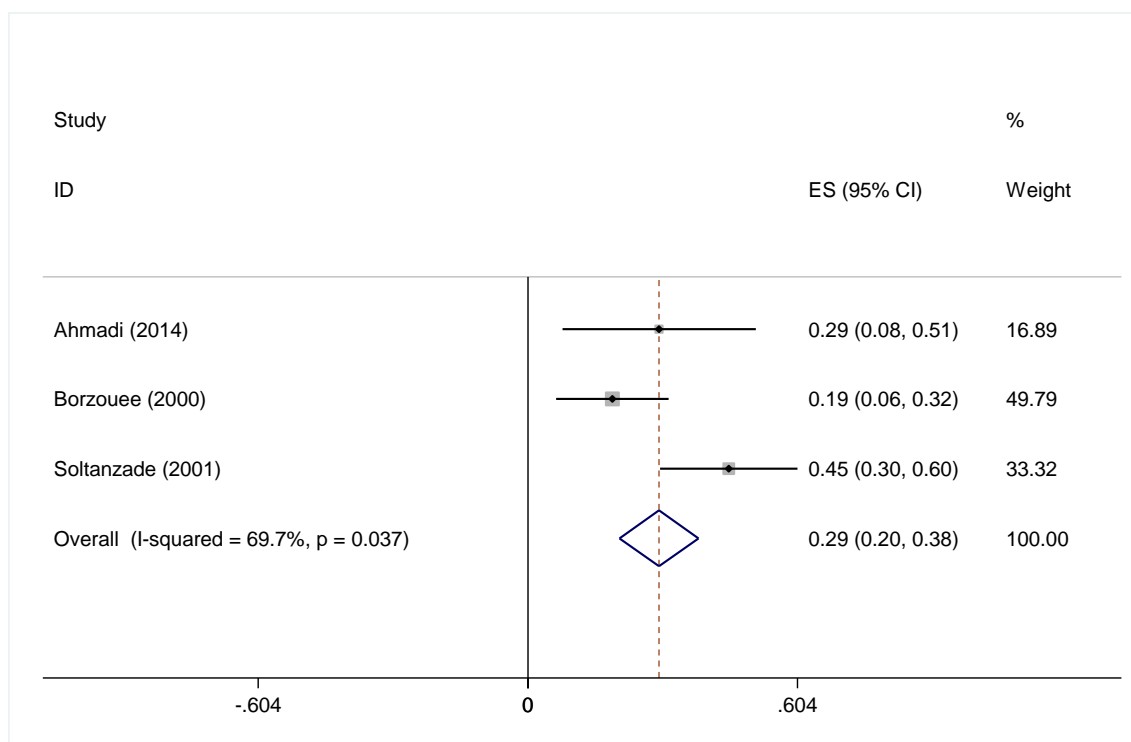


Fig 3. Frequency of Infective endocarditis in Iranian children (2-6 years) and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the % value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows Frequency of Infective endocarditis in Iranian children.

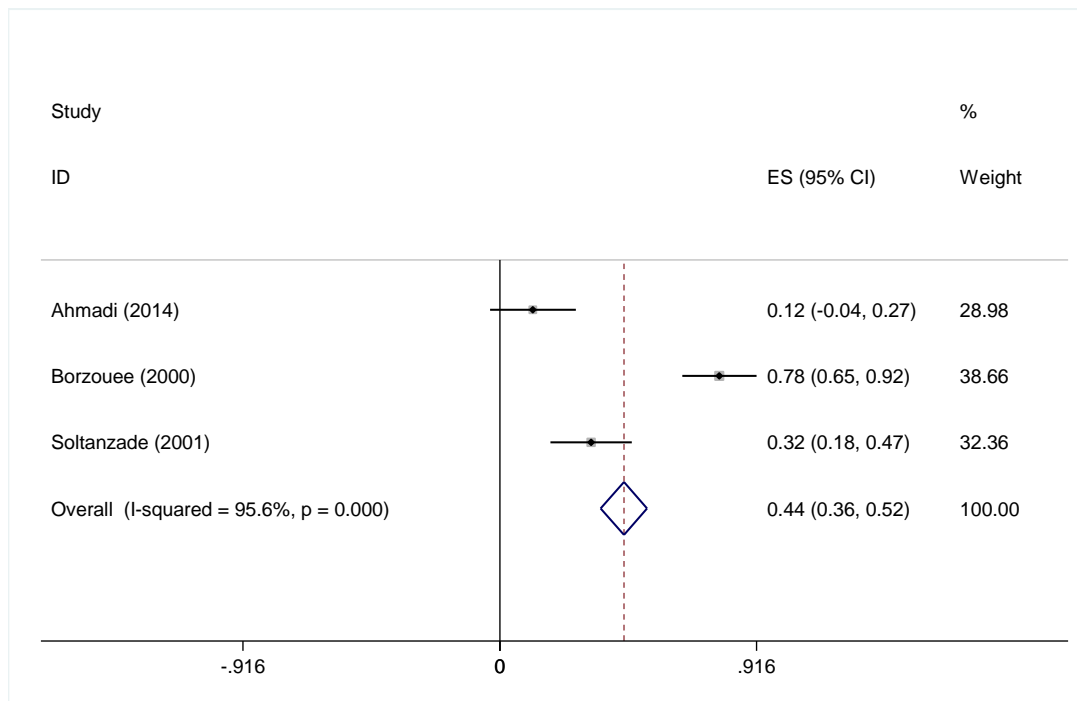


Fig 4. Frequency of Infective endocarditis in Iranian children (6-14 years old) and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the % value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows frequency of Infective endocarditis in Iranian children

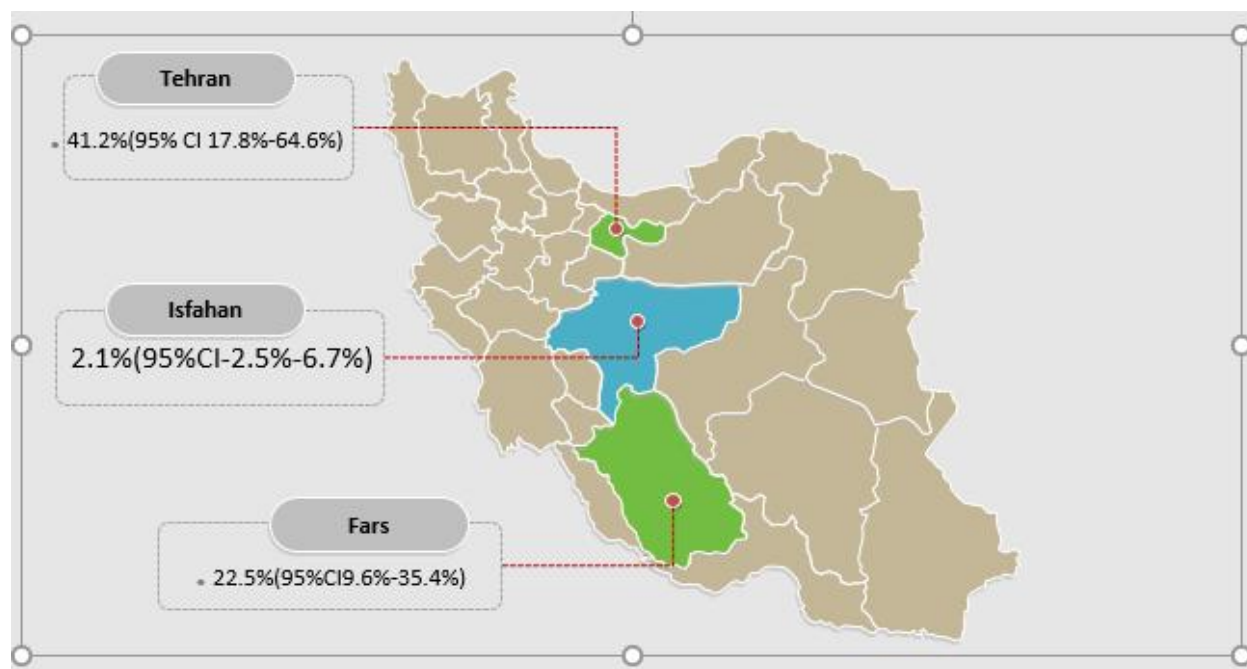


FIG 4. Infective endocarditis in Iranian children (according to the frequency in children (< 2 years) in each province)

Discussion

As many as 3 studies conducted on 94 children were included in the meta-analysis. In asymptomatic children, according to the results of random effects mode, the general frequency of infective endocarditis in age groups of <2 years, 2-6 years, 6-14 years old was 1.4% (95% CI 0.9%-10%), 29.4% (95% CI 20.5%-38.3%) and 44.2% (95% CI 36%-52.5%) in 94 children. Infective endocarditis is a fatal disease; underlying diseases such as rheumatic heart disease and congenital heart diseases are regarded as its risk factors. Over the recent years, given the prevalence of heart surgeries, venous catheters and drug abuse have significantly increased.

Before 1970, almost 30-50% of infective endocarditis used to result from rheumatic fever (14). However, nowadays, congenital heart diseases account for high portion of its incidence. The most prevalent factor is the infection arising from staphylococcus aureus (15). The identification of the underlying risk factors is of great significance in the reduced complications of endocarditis and its aggravation; these factors include pharyngitis, congenital heart diseases, associated infective diseases, and immunity deficiency (16).

Given the underlying factors (congenital heart diseases and rheumatic heart disease), giving due attention to patients with congenital heart diseases and preventing rheumatic heart disease and rheumatic fever, infective endocarditis can be prevented, and the prescription of antibiotics can be prevented before having a definite diagnosis (17). If infective endocarditis is not treated, it will definitely be deadly. Moreover, it is of high significance to inform the children at risk of infective endocarditis and their parents about the early symptoms including fever, respiratory symptoms, etc (18).

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